NATIONAL ENVIRONMENTAL ACTION PLAN

1995-1998

(REVISED DRAFT)

MINISTRY OF ENVIRONMENT AND PARLIAMENTARY AFFAIRS

June 1994

MEMBERS OF NEAP WORKING GROUP

Dr. D. Nesiah - Secretary/MEPA
Mr. S.W.P. Bulankulame - Secretary/Environment
Mr. U.Sapukotana - MEPA
Mr. Mano Perera - MEPA
Mr. M.M.S. Fernando - MEPA
Ms. Padmini Batuwitage - MEPA
Dr. J. Ratnasiri - MEPA
Mr. Sterling Perera - MEPA
Mr. G.K. Amaratunga - CEA
Mr. K.G.D.Bandaratilaka - CEA
Mr. O.C. Jayawardena - ML
Mr. A. Gunasekera - MFIMD
Mr. A. Hettiarachchi - MFAR
Mr. C.H. Jayasinghe - MADR
Mr. Roy Jayasinghe - MIST
Mr. K.A.L. Premaratne - NPD
Mr. G.L. Perera - BOI
Dr. D.G. Senadhipathy - CEB
Dr. Tilak Siyambalapitiya - CEB
Mr. B.S. Kahawita - CCD
Mr. N. Ranasinghe - GSMB
Prof. Maduma Bandara - Univ. of Peradeniya
Ms. Sriyani Hulugalle - WB
Mr. Avanthi Jayatillake - USAID
Dr. Sumith Pilapitiya - MEIP
Dr. David McCauley - NAREPP
Ms. Shenuka Chanmugam - NAREPP
Mr. Erik Helland-Hansen - NI/ECL
Mr. T. Diyagama - ECL
Mr. Leslie Wijesinghe - IUCN
Rev. Assaji Thero - SLEC
Mr. K. Wiratunga - SLEC

MEMBERS OF NEAP SUB-WORKING GROUPS

A. Environmental-Economic Linkages

Mr. S.W.P. Bulankulame, MEPA
Mr. U. Sapukotana, MEPA
Mr. Mano Perera, MEPA
Mr. K.A.L. Premaratne, NPD
Dr. David McCauley, NAREPP
Ms. Shenuka Chanmugam, NAREPP
Mr. Erik Helland-Hansen, NI/ECL
Dr. Francisco Szekely, NI/ECL
Dr. Michael Wells, NI/ECL
Dr. Fuard Marikar, NI/ECL

B. NEAP Programme Area Clusters

1. Land and Water Resources

Mr. U. Sapukotana, MEPA
Mr. Gamini Gamage, MEPA
Mr. C.H.de A. Jayasinghe, MADR
Dr. C.M. Wijayarathne, IIMI
Mr. Gamini Batuwitage, IIMI
Dr. S. Somasiri, NI/ECL
Mr. Hans Olav Ibrekk, NI/ECL
Mr. K.P. Sri Bharathie, NI/ECL
Mr. Harald Kristoffersen, NI/ECL

2. Forests and Biodiversity

Mr Leslie Wijesinghe, IUCN
Mr. Thosapala Hewage, FPU
Mr. U. Sapukotana, MEPA
Mr. Gamini Gamage, MEPA
Mr. S. Medawewa, MFIMD
Mr. M.W. Bandusena, MFIMD
Mr. H.W.K. Jayathilake, FD
Mr. H.M. Bandaratilleke, FD
Mr. D.P. Munaweera, FPU
Mr. M.L. Bonita, FPU
Dr. M. Katila, FPU
Mr. P.W. Seneviratne, DWLC
Dr. Andrew Laurie, FAO/GEF
Dr. Sriyani Miththapala, FAO/GEF
Dr. S.W. Kotagama, OUSL
Ms. N. Palewatte, Univ/Colombo
Mr. Avanthi Jayatillake, USAID
Dr. David McCauley, NAREPP
Mr. Edward Scott, NAREPP
Mr. Ari Hewage, NAREPP
Mr. Michael Wells, NI/ECL
Mr. K.P. Sri Bharathie, NI/ECL
Ms. Lalitha Gunawardena, NI/ECL
Dr. Ajantha Perera, NI/ECL

3. Urban and Industrial Pollution:

Mr. G.K.D. Bandaratilake, CEA
Ms. Ramani Ellepola, CEA
Ms. Padmini Batuwitage, MEPA
Mr. Roy Jayasinghe, MIST
Mr. G.L. Perera, BOI
Mr. T. Fernando, BOI
Mr. E.M. Abeyratne, EMACE,
Mr. K.A.Jayaratne, SEVANATHA
Dr. Sumith Pilapitiya, MEIP
Mr. Vasantha Siriwardena, NAREPP
Mr. Bo Terje Kalsaas, NI/ECL
Mr. Hans Olav Ibrekk, NI/ECL
Dr. Harsha Ratnaweera, NI/ECL

4. Coastal and Marine Resources

Mr. B.S. Kahawita, CCD
Mr. R.A.B. Samaranayake, CCD
Mr. H.M.B.C. Herath, MEPA
Mr. A. Hettiarachchi, MFAR
Dr. Padmini de Alwis, NARA
Dr. Alan White, NAREPP
Mr. Mervyn Wijratne, NAREPP
Mr. Hans Olav Ibrekk, NI/ECL

5. Energy & Minerals

Mr. N. Ranasinghe, GSMB
Dr. J. Ratnasiri, MEPA
Dr. Tilak Siyambalapitiya, CEB
Mr. L. Seneviratne, CEA
Mr. Vasantha Siriwardena, NAREPP
Mr. T.A. Diyagama, NI/ECL

6. Policy, Institutional, Education & Culture

Mr. U. Sapukotana, MEPA
Mr. G.K. Amaratunga, CEA
Mr. K.A.L. Premaratne, NPD
Mr. Sterling Perera, MEPA
Mr. M.M.S. Fernando, MEPA
Ms. N. Mohottala, MEPA
Ms. Sriyani Hulugalle, WB
Mr. Avanthi Jayatillake, USAID
Dr. David McCauley, NAREPP
Mr. Ari Hewage, NAREPP
Ms. Shenuka Chanmugam, NAREPP
Mr. Steve Claborne, TAF
Mr. Kapila Bandara, TAF
Mr. J. Balasuriya, SLEC
Mr. Erik Helland-Hansen, NI/ECL
Mr. Mahinda Karunaratne, NI/ECL
Dr. Arne Tesli, NI/ECL
Ms. Lalitha Gunawardena, NI/ECL
Mr. Lalanath de Silva, NI/ECL

ABBREVIATIONS AND ACRONYMS

AD	-	Agriculture, Department of
ADB	-	Asian Development Bank
ASD	-	Archaeological Survey Department
BOI	-	Board of Investment
CCCIM	-	Central Coordination Committee on Irrigation Management
CCD	-	Coast Conservation Department
CEA	-	Central Environmental Authority
CEB	-	Ceylon Electricity Board
CIDA	-	Canadian International Development Agency
CISIR	-	Ceylon Institute of Scientific & Industrial Research
CPC	-	Ceylon Petroleum Corporation
CTB	-	Ceylon Transport Board
CZM	-	Coastal Zone Management
DEA	-	District Environmental Agency
DWLC	-	Department of Wild Life Conservation
EA1P	-	Environmental Action 1 Project
ECL	-	Engineering Consultants Ltd.
EIA	-	Environmental Impact Assessment
EPL	-	Environmental Protection Licence
DANIDA	-	Danish International Development Agency
FAO	-	Food and Agricultural Organisation
FD	-	Forest Department
FINNIDA	-	Finnish International Development Agency
FPU	-	Forestry Planning Unit
FSDP	-	Forestry Sector Development Project
FSMP	-	Forestry Sector Master Plan
FTZ	-	Free Trade Zone
GOSL	-	Government of Sri Lanka
GSMB	-	Geological Survey & Mines Bureau
GTZ	-	German Agency for Technical Cooperation
ID	-	Irrigation Department
IEE	-	Initial Environmental Examination
IFAD	-	International Fund for Agricultural Development
IFS	-	Institute of Fundamental Studies
IIMI	-	International Irrigation Management Institute
IRDP	-	Integrated Rural Development Project
IUCN	-	International Union for the Conservation of Nature
JICA	-	Japan Internationlal Corporation Agency
LAs	-	Local Authorities
LDO	-	Land Development Ordinance
LUPPD	-	Land Use Policy & Planning Division
MADR	-	Ministry/Agricultural Development & Research
MEC	-	Ministry/Energy Conservation
MECA	-	Ministry/Education & Cultural Affairs
MEIP	-	Metropolitan Environment Improvement Programme
MEPA	-	Ministry/Environment & Parliamentary Affairs
MFA	-	Ministry of Foreign Affairs
MFAR	-	Ministry/Fisheries & Aquatic Resources
MFIMD	-	Ministry/Forestry,Irrigation & Mahaweli Development
MHAPC	-	Ministry/Home Affairs & Provincial Councils
MHE	-	Ministry/Higher Education
MHTI	-	Ministry of Handlooms & Textile Industries

MHWA	-	Ministry/Health & Women's Affairs
MHC	-	Ministry/Housing & Construction
MIST	-	Ministry/Industries, Science & Technology
ML	-	Ministry/Lands
MMA	-	Mines & Minerals Act
MOE	-	Ministry of Environment
MPI	-	Ministry/Plantation Industries
MPE	-	Ministry/Power & Energy
MPPI	-	Ministry/Policy Planning & Implementation
MPS	-	Ministry/Ports & Shipping
MRRSW	-	Ministry/Reconstruction, Rehabilitation & Social Welfare
MTH	-	Ministry/Transport & Highways
MTRID	-	Ministry/Tourism & Rural Industrial Development
MLVT	-	Ministry/Labour & Vocational Training
NARA	-	National Aquatic Resources Agency
NAREPP	-	Natural Resources & Environmental Policy Project
NARESA	-	Natural Resource Energy & Science Authority of Sri Lanka
NBRO	-	National Building Research Organisation
NEA	-	National Environmental Act
NEAP	-	National Environmental Action Plan
NESC	-	National Environmental Steering Committee
NERD	-	National Engineering Research & Development Centre
NGJA	-	National Gem and Jewellry Authority
NGO	-	Non-Governmental Organisation
NIE	-	National Institute of Education
NIRP	-	National Irrigation Rehabilitation Project
NORAD	-	Norwegian Agency for Development Cooperation
NPD	-	National Planning Department
NWP	-	North-western Province
NWSDB	-	National Water Supply & Drainage Board
NWSC	-	National Wetland Steering Committee
ODA	-	Overseas Development Administration (UK)
OUSL	-	Open University of Sri Lanka
PAA	-	Project Approving Agencies
PIP	-	Public Investment Programme
PPP	-	Peoples' Participation Programme
SAM	-	Special Area Management
SAREC	-	Swedish Agency for Research Cooperation
SCOPE	-	Scheme for the Control of Pollution of Existing Industries
SCOR	-	Shared Control of Natural Resources
SIDA	-	Swedish International Development Agency
SLAAS	-	Sri Lanka Association for Advancement of Science
SLAS	-	Sri Lanka Administrative Service
SLBC	-	Sri Lanka Broadcasting Corporation
SLIDA	-	Sri Lanka Institute of Development and Administration
SLRC	-	Sri Lanka Rupavahini Corporation
SLSI	-	Sri Lanka Standards Institution
SLSS	-	Sri Lanka Scientific Service
STC	-	State Timber Corporation
TA	-	Technical Assistance
TAF	-	The Asia Foundation
UDA	-	Urban Development Authority
UGC	-	University Grants Commission
UNCED	-	United Nations Conference for Environment & Development
UNDP	-	United Nations Development Programme

UNEP	-	United Nations Environment Programme
USAID	-	United States Agency for International Development
URI	-	University of Rhode Island
WB	-	World Bank

GLOBAL CONVENTIONS

GEF	-	Global Environmental Facility
CITES	-	Convention of International Trade in Endangered Species of Wild Fauna & Flora
RAMSAR	-	Convention for the Conservation of Wetlands of International Importance especially as Waterfowl Habitat
MARPOL	-	Protection of Oceans from Pollution from Ships
BASEL	-	Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal

FORWARD

BY
HONOURABLE DR. WIMAL WICKREMASINGHE,
MINISTER OF ENVIRONMENT & PARLIAMENTARY AFFAIRS

It gives me great pleasure to present the National Environmental Action Plan (NEAP) 1995-1998 and the Environmental Action 1 Project (EA1P) at a time when much interest is being shown in environmental protection throughout the globe. The present exercise is the culmination of a long process which commenced in 1982 with the appointment of a Task Force by the Prime Minister for the preparation of a National Conservation Strategy (NCS) for Sri Lanka. The NCS was completed in 1988 and was recognized by the Government as a blueprint for the conservation of the national resources of the country. NEAP 1992-96 which drew heavily from both the NCS and the Environment Action Plan prepared with World Bank assistance, was prepared concurrently with and as a supplement to the National Report prepared for the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil. Many activities identified in NEAP 1992-96 are already being implemented by Government agencies and in a few cases by non-governmental organisations (NGOs).

The updated NEAP 1995-98 is the result of an attempt to translate many concepts developed in the previous plan to clearly defined project activities. The most significant feature of the present exercise is that all these project activities were developed within the framework of national and sectoral policies. A highly participatory process was followed where representatives of relevant government agencies, as well as NGOs, were given the opportunity to contribute towards development of sectoral policy matrices, as well as to identify the project activities which could address the issues and constraints that were identified.

I am certain that the present format of the plan is acceptable to the World Bank which will function as the financier of last resort, as well as to other interested donors. If development takes place as programmed and if other critical programmes under way work out as envisaged, Sri Lanka's prospects in respect of environmental protection and sustainable development would be very bright by the turn of the century.

However, much spade work needs to be done. A strong policy and legal framework should be in place. The institutional capacity of the Ministry of Environment and Parliamentary Affairs (MEPA), the Central Environmental Authority (CEA) and other relevant agencies needs to be strengthened. The linkages between different agencies of the state and private sectors and between the state and non-governmental organizations need to be built-up.

I have already taken steps to develop an environmental policy for the country with the assistance of an inter-sectoral committee. I have also initiated action to establish economic-environment linkages. International agencies like USAID have already responded to my request to strengthen the institutional capacity of MEPA, and I am expecting further support in this area.

I have the fullest confidence that the Government will be able to address the most critical issues which impinge on environmental protection through the NEAP process.

I wish to take this opportunity to thank the World Bank which financed the preparation of NEAP 1995-98 and also Norconsult International A.S./Engineering Consultants Ltd., who prepared the EA1P project document, in consultation with MEPA and other Government agencies and NGOs. I also wish to record my appreciation for the inputs of USAID/NAREPP.

Hon. Dr. Wimal Wickremasinghe
Minister of Environment & Parliamentary Affairs

PREAMBLE

In recent years we have witnessed a number of significant global initiatives in the field of environmental protection and management. After the path breaking report of "Our Common Future", the international community awoke to the reality that natural resources which are being exploited by a consumer oriented society for their immediate benefits, are not unlimited. It also became evident that the very survival of life in the planet earth could be threatened if pollution of air, land and water continues unabated. It was in this context that the decision in Rio de Janeiro in June 1992 was taken to set in motion the process culminating in the United Nations Conference on Environment and Development (UNCED).

The growing global concern for the environment and the sharpening focus on conservation are very much in keeping with Sri Lanka's traditions and cultural heritage (consistently upheld over at least three millennia). Sri Lanka's response to the global initiatives has therefore been most favourable and backed by a wide public support. The National Environment Act (NEA) was passed in 1980, in terms of which the Central Environmental Authority (CEA) was created in 1981. The Ministry of Environment and Parliamentary Affairs (MEPA) was established in 1990. The Environment Impact Assessment (EIA) Regulations under NEA were gazetted in 1993.

The interest shown by Government in respect to environmental protection is reflected in the number of documents produced within the last few years. Among the more important of these are the "National Conservation Strategy" (1988), the "Environmental Action Plan" (1991), "The Natural Resources of Sri Lanka - Conditions and Trends" (1991), "The National Report for the United Nations Conference on Environment and Development" (1991), and the "National Environmental Action Plan, 1992-1996" (1991). Whereas most other countries sought to develop National Environmental Action Plans after UNCED, Sri Lanka's NEAP was prepared a year ahead of the Rio Conference.

The concepts developed by NEAP 1992-1996 were picked by many environmental agencies, and some of them have grown into multi-million dollar projects. When MEPA was looking for funding sources to implement NEAP projects, the World Bank responded favourably to our proposals. We had a series of discussions and interactions with the Bank which finally led to the preparation of NEAP 1995-1998 which is an update of NEAP 1992-1996.

The process adopted in the preparation of NEAP 1995-1998 (with a total cost on the order of US $100 million) and a companion document entitled "Environmental Action 1 Project" (EA1P)--with a total cost of the order of US $35 million--deserves elaboration. A Working Group with representations from all government agencies and NGOs was formed which eventually took the responsibility for steering and directing the entire exercise of preparation of NEAP 1995-1998 and EA1P, which lists some of the more urgent priority items of NEAP identified for World Bank and other donor funding.

The Working Group identified the following Programme Areas as most critical to the environmental protection programme:

(a) Land and Water Resources
(b) Forests and Biodiversity
(c) Urban and Industrial Pollution
(d) Coastal and Marine Resources
(e) Energy and Mineral Resources.

Two more Programme Areas dealt with cross-cutting issues in the exercise, namely:

(a) Economic-Environmental Linkages; and
(b) Policy, Institutions, Education and Culture.

The Economic-Environmental Linkages group examined the integration between environmental concerns and the national economic development strategy, and the Policy, Institutions, Education

and Culture Programme, evaluated instruments for the implementation for the entire package of activities. The Sub-Working Groups considered the Programme Areas in great detail and developed analytical matrices which looked at issues, constraints, the reforms needed and the activities to be considered under NEAP. The NEAP sub-projects that were identified were those that were considered to be of highest priority based on the logical framework of the policy analysis. In other words, NEAP represents the best available statement of national priorities for environmental action, and EA1P is consistent with this plan, providing further detail and justification for donor financing of NEAP recommendations.

It is well known that environmental problems cannot be resolved through isolated activity. Hence, an integrated approach was adopted where a combination of interventions were identified to facilitate the implementation of environmental programmes. Particular attention was paid to cross-sectoral views and interactions, as well as to identifying policy and institutional reforms and sub-projects to give effect to these reforms. The policy analyses also revealed areas in which applied research is needed.

Another important feature in the present exercise is the participatory process that was adopted. In addition to the Government agencies that ordinarily participate in a planning exercise, the views of the NGOs were sought at all stages. NGOs were represented at the Working Groups, as well as the Sub-Working Groups, relating to the Programme Areas. NEAP has given strong emphasis to the institutional arrangements for the implementation of environment related programmes. The need to strengthen the environment related agencies, including MEPA and CEA, has been clearly recognized in the NEAP 1995-98. It has also recommended the establishment of important institutions, and mechanisms such as a Cabinet Sub-Committee on Environment to handle environmental problems at the highest level. The need for strong coordinating machinery at the Central, Provincial Councils, Divisional Secretaries and Local Authorities levels has also been recognized.

Since Agenda 21--which grew out of UNCED--is even broader in scope than NEAP, the need for a "National Agenda 21" covering areas identified in Agenda 21 but not covered in NEAP has been recognized. MEPA is identified as the focal point for the implementation of both NEAP and National Agenda 21. Unlike NEAP, National Agenda 21 is only at the conceptual stage so far, though it is expected to be developed in the near future. Possibilities of meshing the two programmes have been discussed. However, since National Agenda 21 and NEAP are at different stages of development, the two exercises will run in parallel, with full coordination to avoid any overlapping or duplication.

It is heartening to note that within a short period of time the Government agencies, as well as the community, have become environment conscious. It is also noteworthy that with the passage of the Environmental Impact Assessment regulations, the Project Approving Agencies (PAA) identified by these regulations as well as the private sector are showing a keen interest ensuring that environmental interests are safeguarded in the development process.

NEAP is ready for launching at a very critical time when competing demands are being made by growth oriented planners and by environmentalists. Viewed nationally rather than sectorally, and on a long-term rather than short-term perspective, the objectives of economic growth and environmental conservation are complementary, not contradictory. The wisdom of resolving conflicts and developing an integrated programme of environment and development is becoming apparent. The PAAs are being trained and are developing this mature approach and EIAs are being used as instruments for that purpose. I have no doubt that with the implementation of NEAP many more issues relating to environment and development will surface, and we will be able to steer ourselves into an environment-friendly path of sustainable development.

Devanesan Nesiah
Secretary/Ministry of Environment & Parliament Affairs

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PART 1

INTEGRATING ENVIRONMENTAL & ECONOMIC PLANNING

1: CURRENT ENVIRONMENTAL ISSUES

1.1 INTRODUCTION

The riches and beauty of Sri Lanka's natural environment have been renowned since the earliest recorded histories of the island, and they are still heralded by both residents and visitors today. As the country pushes to achieve more rapid economic development and raise the standard of living of its citizens, it is vital that environmental quality and natural resources productivity be sustained. This introductory chapter to the first update of the National Environmental Action Plan provides a brief overview of the key environmental and natural resources management challenges currently facing the country. A summary is also presented of the policy and institutional mechanisms presently in place to deal with these problems in the context of rapid economic development. Since the remainder of this document deals with these same issues in far greater detail, this introduction focuses on island-wide trends and perspectives which cross the boundaries of the NEAP programme areas.

1.2 NATURAL RESOURCES AND ENVIRONMENTAL CONDITIONS

The most significant environmental problems presently facing Sri Lanka are: deforestation; land degradation, mainly through soil erosion, salinisation and mineral extraction; fresh water management; coastal zone degradation, mainly due to coral mining, pollution and over fishing; urban and industrial pollution; and, to a lesser extent, environmental consequences of energy use. Many factors contribute to the country's environmental challenges, including the resource demands of a growing but largely agrarian population lacking employment opportunities; long-standing civil conflicts; sectoral and macro-economic development policies which often conflict with environmental sustainability; lack of infrastructure necessary for rapid urban and industrial development; and an inadequate environmental policy, institutional and regulatory framework.

1.2.1 Principal Characteristics of the Natural Environment

The island is characterised by two principal ecological zones: the wet and dry zones. Between them lies an intermediate zone, which shares some characteristics of each of the principal biogeographical divisions (see Maps 1.1 and 1.2). Located in the southwest quadrant of the island, the wet zone has an average annual rainfall between 2,500 and 5,000 mm. The natural vegetation is tropical moistforest, but there are gradual changes in composition from the south-west lowland to the central mountains. The dry zone covers the northern, central and south-eastern areas and receives less than 2,500 mm annually. It is characterized by monsoon forest, but in the driest areas (< 1,200 mm/year), only tropical scrub forest can exist. Table 1.1 presents some basic facts about the island and its resources.

It is estimated that annual renewable water resources in Sri Lanka amount to some 43 km^3, equivalent to 5,600 m^3 per capita. Only 15% of this total is used; but of this, the greater part (96%) is consumed by agriculture, with 2% used by industry and 2% for domestic purposes. This rainfall feeds more than 100 rivers, which gradually flow in a radial pattern from the island's central mountains to the sea, through many of these are seasonal streams. Twelve major rivers account for 75% of total river discharge, and about half of these flow through the wet zone. The principal exception is the Mahaweli River--the country's largest--which flows in a northeastern direction through the dry zone to the sea. The country's largest rivers are predominantly used for irrigation and electricity generation, and they are also the principal locations for mining industries, especially gems and sand. [1]

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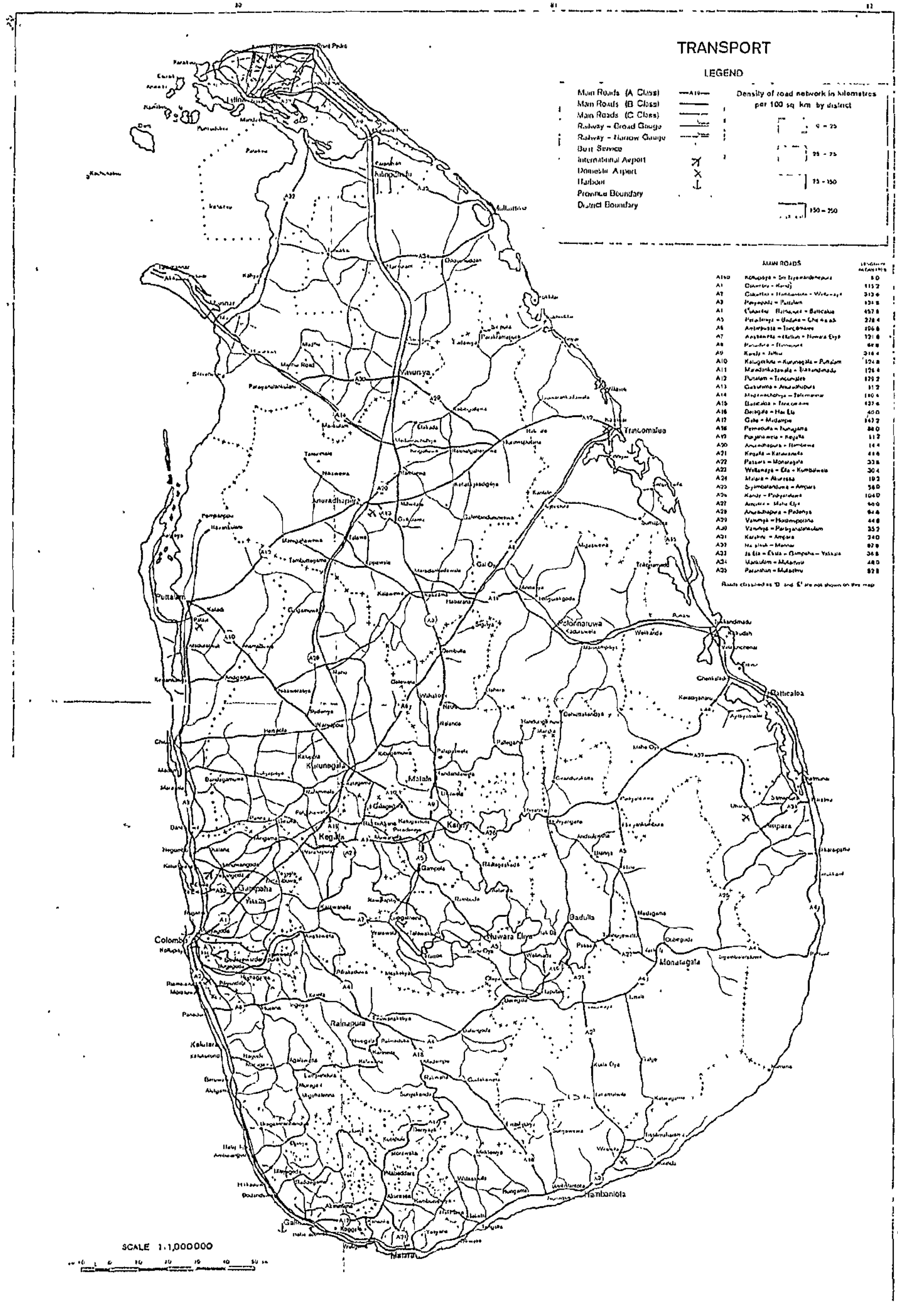
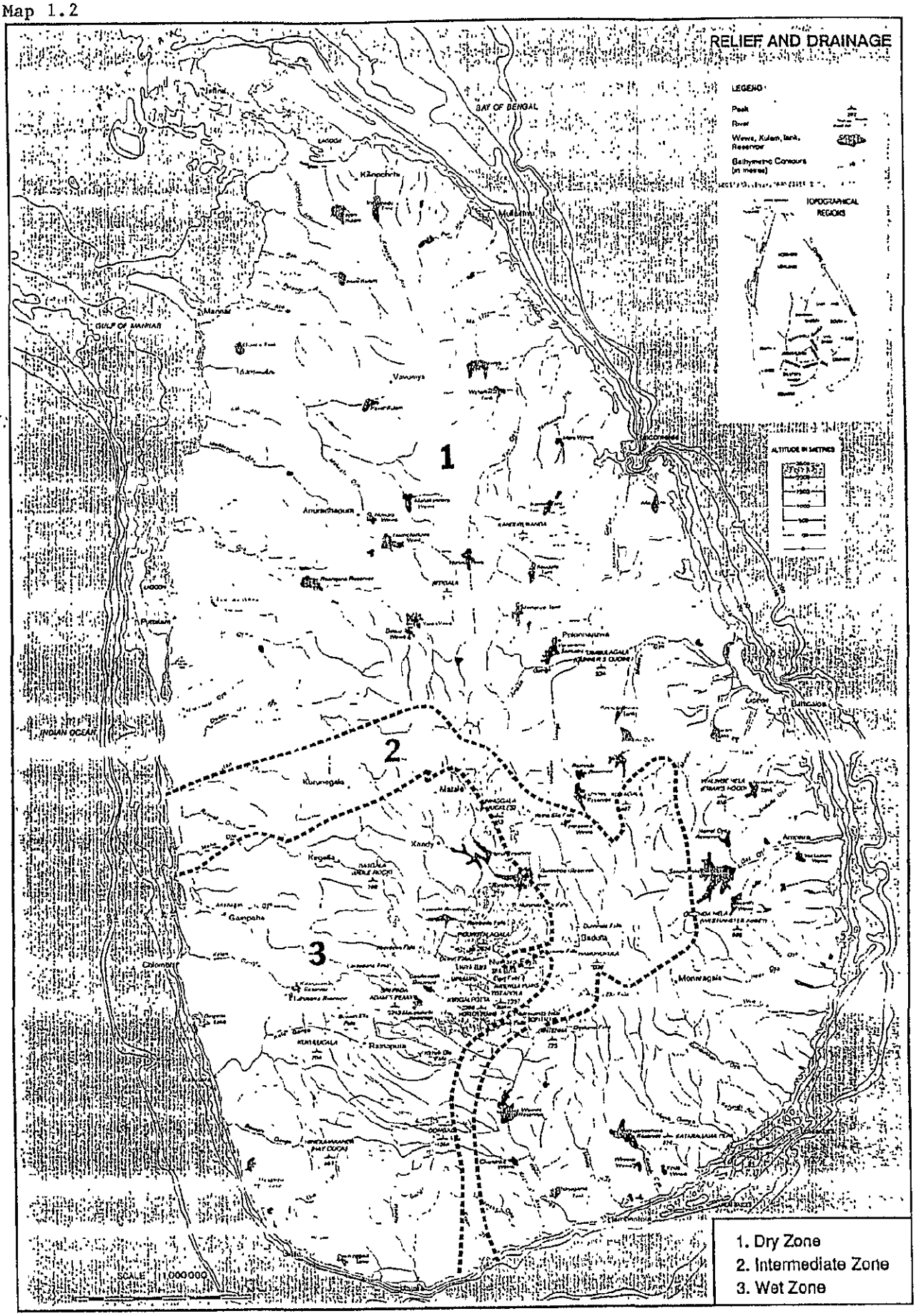
[1] For in-depth coverage of these subjects see: NARESA, *Natural Resources of Sri Lanka: Trends and Conditions* (1991); Marga Institute, *Economic Policies for Sustainable Development: Country Study, Sri Lanka* (1991); MEPA, *Sri Lanka Country Report to the United Nations Conference on Environment and Development* (1992).

Map 1.1


TRANSPORT
LEGEND
Main Roads (A Class)
Main Roads (B Class)
Main Roads (C Class)
Railway – Broad Gauge
Railway – Narrow Gauge
International Airport
Domestic Airport
Harbour
Province Boundary
District Boundary
Density of road network in kilometres per 100 sq km by district
150 – 250
MAIN ROADS
Roads classified as 'D' and 'E' are not shown on this map
Trincomalee
Anuradhapura
Vavuniya
Puttalam
Polonnaruwa
Batticaloa
Kurunegala
Matale
Kandy
Kegalla
Gampaha
Colombo
Badulla
Nuwara Eliya
Monaragala
Ampara
Ratnapura
Kalutara
Hambantota
Galle
Matara
SCALE 1:1,000,000

Map 1.2



Relief, Drainage and Ecological Zones

SRI LANKA FACT SHEET

Table 1.1

Land Area:	65,610km^2
Rainfall:	Wet Zone: 2,500-5,000 mm/year Intermediate Zone: 1,900-2,500 mm/year. Dry Zone : <1,900 mm/year
Ecological Zones:	Wet zone in the south-west (approximately 1/3 of country) Dry zone in the north, central areas & south-east (approximately 2/3rds of the country)
Land Use:	Arable land: 2,037,000 ha Permanent Pasture: 439,000 ha Indigenous Woodland: 1,226,000 ha Plantations: 727,900 ha Land cleared annually for agriculture: about 5,000 ha Protected Areas: 739,771 ha
Agriculture:	Main food crops: Paddy rice; maize; sorghum; pulses Main cash crops: Tea; rubber; coconut; sugarcane; spices
Livestock:	Cattle: 1.8 million Buffalo: 1 million Sheep and goats: 541,000 Pigs: 75,000 Chicken: 8 million
Fisheries:	Marine catch: 183,000 tonnes/year Freshwater catch: 33,500 tonnes/year
Mining:	Gems, including sapphires, rubies, topaz and garnets; graphite; phosphate, mineral sand, and salt by evaporation
Population Size:	17.2 million
Population Growth:	1.3%
Population Distribution:	Spatial- Wet zone: 57% of population Dry Zone: 43% of population Rural areas: 78.5% Urban areas: 21.5%
Urbanisation Rate:	2.5% (1960-1990)

Source: IIED, Environmental Synopsis of Sri Lanka, April 1992.

Deforestation is a major environmental problem. The country's forest cover amounted to some 2.9 million ha in 1956, representing 44% of the total land area. This had fallen to 1.7 million ha, or 27% of the total area in 1981, and stands today at around 20% of the country. This reduction, representing one of the highest deforestation rates in the world at 4% in recent years, has been concentrated in the dry zone, since only small tracts of forest were left in the wet and intermediate zones by the 1970s.

There is an extensive system of parks and protected areas, with 3 strict natural reserves, 10 national parks, 2 nature reserves and some 46 sanctuaries. Altogether, these comprise approximately 14% of the land area--one of the highest figures in Asia. However, there has been extensive encroachment into these protected areas, and few are well managed. The vast majority of the protected areas lie in the dry zone. The wet zone has only one national park, one strict nature reserve and one major sanctuary. This is grossly inadequate to afford sufficient protection for the richly biodiverse habitats in the wet zone, which contain 94% of the island's endemic species of flora.

Sri Lanka's biological diversity is of global significance, and it has greater biodiversity per unit area than any other country in Asia. Its wildlife includes 628 known species of terrestrial vertebrates, 84 species of mammals, 379 birds, 32 amphibians, 133 reptiles and at least 59 species of freshwater fish. Most of the endemic animal and plant species--those found nowhere else on earth--inhabit the rain forests of the wet zone. Approximately 30% of the angiosperm flora, and 18% of the ferns are endemic to the island.

The economy and society remain largely agrarian. In 1987, there were nearly 2 million ha of cultivated lands, representing 34% of the total land area. Plantation agriculture occupied about 1 million ha (54%) and irrigated land approximately 0.6 million ha (30%). An increase in cultivated area from 28% in 1964 to 34% in 1987 was due mainly to the development of the Mahaweli River waters for irrigation in the dry northeast of the country and the resettlement of farming households in small holdings.

The country's coastal and marine resources are highly productive, and the majority of the population resides in the coastal zone. In 1976, an Exclusive Economic Zone was declared around the island, extending the total exploitable marine area to about 525,000 km^2--approximately eight times the land area. Several hundred miles of coral reefs, 123,000 ha of brackish water lagoons, estuaries and mangrove swamps, and about 137,600 ha of fresh water tanks and reservoirs provide the basis for productive marine and inshore fisheries. The vast majority of the fish catch (over 85%) comes from marine sources--about 183,000 tonnes annually. Fish remains the major source of animal protein in the Sri Lankan diet.

As industrialization moves forward, increasing attention is being given to the island's energy production and use. Total energy consumption in 1989 was about 6 million tonnes of oil equivalent, of which 71% came from fuelwood and agricultural residues, 19% from petroleum products and 10% from electricity. Electricity generating capacity in 1989 was 1,115 MW from hydro-power sources and 250 MW from fossil fuels. The only indigenous energy resources exploited on any meaningful scale are fuelwood and hydro-electric power. About 75% of fuelwood is derived from non-forest wood resources such as rubber and coconut plantations, scrub and croplands.

1.2.2 Declining Environmental Quality and Natural Resource Degradation

Other environmental challenges relate primarily to the sustainable management of renewable natural resource systems. Soil erosion and land degradation are mainly the result of deforestation, inadequate conservation measures, and the overcultivation of soils prone to erosion. The soils of the wet zone are shallow and lateritic, and deforestation leads easily to erosion and landslides. Extensive soil erosion also has been caused by clearing vegetation in the montane zone to grow vegetables and other cash crops. Soil in the dry zone is becoming increasingly infertile, and there are now about 1.2 million ha of land, mostly in the dry zone, which are unproductive and put to only limited use.

Despite a good record of legal protection in Sri Lanka, wildlife resources are being depleted at an alarming rate. Deforestation in the wet and intermediate zones has had a significant adverse effect on the biodiversity of these areas. Other sources of biodiverisity--such as coastal wetlands, marine ecosystems, and agricultural germplasm--are also under threat.

Urban and industrial development has accelerated sharply in recent years, and there is growing concern about associated threats to environmental quality. The major industrial areas which grew up starting in the 1960s in the regions north and south of Colombo have since been encircled by urban populations. Special care is now needed to deal with the health and other environmental quality risks posed by this pattern. New industries with any significant potential for generating pollution now are being clustered in industrial estates, where common pollution treatment facilities can be provided. The most severe water pollution problems can be found in the Colombo area. The canal system in Colombo has degenerated to a virtual open sewer. Rivers and lakes in and around Colombo, including Beira Lake, Kelani River, and Bolgoda Lake, are becoming severely polluted. As one of the remedial measures, extensive projects are now being implemented to construct appropriate sewerage systems for Colombo and to clean up its canal system.

Pollution from the urban, industrial, and agricultural sectors inevitably has an impact on the aquatic environment. Fresh water is increasingly contaminated by untreated discharges of pollutants. Water bodies are laden with silt and clay that flow in from eroded croplands and are polluted with chemical residues from pesticides, fertilizers and organic debris washed from surface soil.

Some rivers now contain silt and agrochemicals in quantities that choke and poison coral polyps, sea grasses and similar life forms. Many other activities and processes also affect the marine and coastal zone. Nearly one-third of the 1,600km coastline is subject to varying degrees of erosion, aggravated by sand and coral mining. Both activities are now prohibited and quantity of mined sea sand has been greatly reduced in the last few years. Although the mining of sea coral is illegal, it nevertheless continues as a result of poor law enforcement. It has been estimated that 2,300 tons of coral and 5,400 tons of coral debris are collected annually along a 60 km stretch of the south-west coastline.

This range of environmental problems facing society demands carefully designed solutions based on appropriate policies, strong institutions, adequate information about the nature of the problems and alternative solutions, and on-the-ground investments to address root causes. This is the basis for a policy planning and action framework capable of supporting Sri Lanka's sustainable development.

Though considerable policy and institutional strengthening is needed, recent years have seen major progress. In 1993, strong Environmental Impact Assessment (EIA) regulations were passed requiring all major projects to carry out a thorough assessment of their potential environmental impacts and to take steps to mitigate them. Significant advances are also evident in the expanding pollution regulation capacity of the Central Environmental Authority and in both outreach programmes and legal pressure for high polluting industries.

1.3 ENVIRONMENTAL POLICIES AND PLANNING INSTITUTIONS

Sri Lanka's government functions under a Parliament, a strong Executive Presidency and a presidentially appointed Cabinet. Government institutions exercise policy planning, management, regulatory, research and educational functions through Cabinet Ministers. Under the cabinet ministers are additional ministers (often referred to as "project" or "subject specific" ministers), intended to be primarily concerned with implementing programmes. In addition, there are ministers of state who are junior to the"project" ministers but carry out similar functions. Many of the "project", "subject" and state ministries have important natural resource management responsibilities, which are carried out through a multitude of agencies. Table 1.2 identifies the cabinet ministries with primary responsibility for major aspects of natural resource management. The list is somewhat misleading, as it by-passes many other ministries and agencies involved in related aspects of planning and decision making. Despite this pattern, there are two principal environmental policy ministries:

* **The Ministry of Environment and Parliamentary Affairs (MEPA)**, which is a relatively small *ministry* established in 1990 and includes a project Ministry of the Environment, whose only agency is the Central Environmental Authority; and

* **The Ministry of Policy Planning and Implementation (MPPI)**, *which is responsible for policy* formulation in all sectors, reviews and approves capital projects, establishes the Policy Framework Programme (PFP) and the Public Investment Programme (PIP), approves allocations for the annual Government capital budget.

MPPI and MEPA together coordinate Government environmental programmes and donor proposals through the National Environmental Steering Committee (NESC), which is jointly chaired by the Secretaries of the two Ministries. For coordination of work between the various ministries and to develop environmental policies, the government often relies on inter-agency councils or committees *of senior representatives of ministries* and NGOs. NESC coordinates and monitors environmental initiatives undertaken throughout the country.

1.3.1 Ministry of Environment and Parliamentary Affairs

MEPA was established in 1990 as a Cabinet Ministry. It includes the office of the Project Minister of Environment (MOE) and Minister of Parliamentary Affairs, and has authority over the Central Environmental Authority (CEA) established earlier in 1981. The present structure of the Ministry is inadequate to meet all the needs and challenges related to environmental management and protection in a rapidly changing nation, and there is a need for a more functional and strengthened organisation. MEPA currently lacks the human and financial resources necessary to take full leadership and more decisive role in environmental conservation and natural resource management. Its official strength of eleven professional positions clearly does not presently provide such capacity.

1.3.2 Central Environmental Authority

The Central Environmental Authority (CEA) was established by the 1980 NEA to protect, manage and enhance the environment, and a 1988 NEA amendment further vested CEA with the necessary legal authority. CEA has been carrying out these responsibilities with very limited resources. With the shift of the policy making role to MEPA, CEA now functions more as a technical, executing and regulatory arm of MEPA.

CEA has introduced an environmental licencing scheme (EPL) aimed at regulating polluting industries, and it helped to establish pollution mitigation regulations (1990) and a statutory requirement for EIAs (1993). CEA's other activities have included an inventory of imported chemicals, a review of existing legislative measures affecting the environment, environmental awareness programmes in schools, an environmental volunteer service programme, the production of teaching aides and educational materials, establishing an environmental library, and the presentation of seminars, workshops, radio and TV programmes on environmental issues. CEA assists five PAAs in processing EIA reports and seven in an advisory capacity for most environmental projects. CEA's Legal Unit, though severely understaffed, has initiated legal action against errant polluters.

The broad and growing responsibilities of CEA are not matched by its human and financial resources. The inadequacy of existing staff levels--120 total positions--is compounded by *difficulties in filling vacant posts due to a national shortage of appropriately* qualified candidates and a lack of mechanism for providing attractive levels of remuneration. CEA has recently delegated some of its local regulatory functions to the 308 Divisional Secretariats, but accelerated economic development, including rapid industrialisation, is imposing increasing demands on the Agency in the role as MEPA's technical, regulatory and implementing arm. A major structural weakness in the CEA is that it does not have its district arm. Another *major weakness in the* current environmental enforcement apparatus is the failure of CEA to enlist the service of regular law enforcement agencies like the Police Department.

MINISTRIES AND STATUTORY BODIES WITH NATURAL RESOURCE MANAGEMENT RESPONSIBILITIES

Table 1.2

SECTOR	MINISTRIES	NUMBER OF STATUTORY BODIES
Land Use	* Lands	3
	* Forestry, Irrigation & Mahaweli Development	6
	* Plantation Industries	15
	* Agricultural Development & Research	14
	* Transport & Highways	4
	* Industries, Science & Technology	2
Forests/ Wildlife/ Fisheries	* Lands	1
	* Forestry, Irrigation & Mahaweli Development	2
	* Agricultural Development & Research	3
	* Fisheries & Aquatic Resources	3
	* Ports & Shipping	2
Water Resources	* Lands	-
	* Forestry, Irrigation & Mahaweli Development	3
	* Agricultural Development & Research	3
	* Fisheries & Aquatic Resources	1
	* Ports & Shipping	3
	* Power & Energy	3
	* Housing, Construction & Urban Development	3
Environmental Research	* Policy Planning & Implementation	1
	* Fisheries & Aquatic Resources	1
	* Plantation Industries	3
	* Industries, Science & Technology	4
	* Housing, Construction & Urban Development	1
Env. Impact Assessment	* Environment & Parliamentary Affairs	1
	* Project Approving Agencies (Ref. Table 1 3 1)	
Urban/Industrial Development	* Policy Planning & Implementation	
	* Home Affairs & Provincial Councils	2
	* Industries, Science & Technology	6
	* Power & Energy	5
	* Public Administration	1
	* Transport & Highways	4
	* Housing, Construction & Urban Development	5
	* Tourism & Rural Industrial Development	5
	* Ports & Shipping	2

Note: At least five more ministries have potentially important indirect roles; The Ministries of Education & Cultural Affairs; Higher Education; Finance; Food, Cooperatives and Janasaviya, Health & Women's Affairs; and Reconstruction, Rehabilitation and Social Welfare.

1.3.3 Provincial & Local Institutions

With the Thirteenth Amendment to the Constitution prepared in 1987, the Government took significant steps towards decentralised decision making by establishing nine provincial councils (PCs) and over three hundred divisional secretariats (DSs) with substantial administrative responsibilities. Seven provincial councils with Chief Ministers and provincial ministries have been operating since 1989. The provincial councils are elected by the people and the Governor is appointed by the President.

The lack of involvement of the PCs, local authorities and DSs in environmental management and protection is identified as a critical shortcoming. There are still considerable institutional deficiencies at PC and DS levels regarding devolved functions and duties concerning environmental management and protection.

The Pradeshiya Sabha (PS) is an elected body at town or village level, which to a large extent coincides with the area of the divisional secretariat. The PSs are responsible for planning and implementing environmental projects at local level.

Table 1.3

LIST OF PROJECT APPROVING AGENCIES (PAAS)

A. MINISTRIES

1. Policy Planning & Implementation
2. Lands
3. Forestry, Irrigation & Mahaweli Development
4. Power & Energy
5. Transport & Highways
6. Industries, Science & Technology
7. Housing, Construction & Urban Development
8. Fisheries & Aquatic Resources
9. Agricultural Development & Research

B. STATUTORY BODIES

1. Central Environmental Authority
2. Coast Conservation Department
3. Urban Development Authority
4. Board of Investment of Sri Lanka
5. Geological Survey & Mining Bureau
6. Ceylon Tourist Board

1.3.4 NGOs and CBOs

Though there are numerous non-governmental organisations (NGOs) in the country, some of which are large well managed groups, the overall involvement of NGOs in community-based efforts for sustainable development is considered to be insufficient. The concept of people's participation in the planning and implementation of development projects is well accepted in both government and non government agencies in Sri Lanka. However, the concept of planning and implementation from below still needs to be further strengthened and developed. NGOs and community organisations are growing in importance, and mechanisms whereby public participation can be strengthened and made more efficient are emerging.

Sri Lanka has a large number of environmental NGOs. Most of them are quite small and operate primarily at the local level. Among these are village level groups that can be supported and used to achieve multiple environmental management goals that will be locally as well as nationally beneficial. An increasingly important group of national level environmental NGOs carry out a variety of functions. National level environmental NGOs receive significant levels of support from donors, including the Netherlands, Norway, Canada, and the United States.

Community-based organisations (CBOs) are primarily tied to farm management concerns. Small farmer organisations are being strengthened in many parts of Sri Lanka, especially organisations that are concerned with use and management of water and land resources. These include informal groups formed around a leader for a particular purpose, and government sponsored groups, such as those formed for field and distribution channel management by the Irrigation Management Division of the Ministry of Forestry, Irrigation and Mahaweli Development. Under

support and guidance from several Integrated Rural Development Projects (IRDPs), so-called Social Mobilizers have functioned as organisational catalysts within individual villages. These agents have been quite successful in initiating work linked to conservation of lands and forests, and facilitating community steps towards sustainable economic adaptations and development.

It is vital that such participatory institutions be fully incorporated into the national institutional fabric for environmental management. NGOs and CBOs offer the best hope for mobilising citizens to clean up their neighbourhoods, change soil construction practices or forest exploitation patterns. For this reason, they are given special attention in this NEAP.

2: PLANNING FOR SOUND ENVIRONMENTAL MANAGEMENT

2.1 DEVELOPING A FRAMEWORK FOR NATIONAL ENVIRONMENTAL PLANNING

Over the past decade, Sri Lanka has considerably strengthened its environmental planning and management efforts. In 1991 it became one of the first countries in the world to prepare a National Environmental Action Plan (NEAP)--a comprehensive statement of national priorities for environmental policies and programmes. Today's NEAP dates from the early 1980's, when a National Conservation Strategy (NCS) was formulated by a Task Force appointed by the Prime Minister. This process began in 1982 and was completed in 1988, when it was accepted as the national policy in relation to the country's conservation of the environment and natural resources. The strategy established in the NCS was subsequently transformed from a general statement of programmes and principles to a set of policy guidelines and an action-oriented plan.

The outcome was the draft Action Plan of the NCS, which was developed by the Central Environmental Authority in close collaboration with the Ministry of Environment, the Environmental Council, various interested NGOs and relevant ministries. In 1989, the World Bank initiated discussions with the Government to prepare an Environmental Action Plan (EAP) as the basis for World Bank environmental assistance to the country. The resulting EAP was completed in 1990 and incorporated key recommendations of the draft NCS Action Plan and a few critical environmental issues for immediate attention. At the same time, a policy decision was made to combine the core contents of the Action Plan of the NCS, the Environmental Action Plan, and the country's national report for the United Nations Conference on Environment and Development into a comprehensive National Environmental Action Plan.

The final outcome of all these efforts was NEAP 1992-1996, which was published in October 1991. NEAP 1992-1996 is the parent document for this update, which was initiated in an effort to see a greater number of the recommendations developed into fundable projects. This updating also affords an opportunity to begin the process of linking this environmental planning effort to national economic development policies and plans.

2.2 IMPLEMENTATION OF NEAP 1992-1996 RECOMMENDATIONS TO DATE

The NEAP 1992-1996 established an environmental agenda for Sri Lanka covering an initial five year period. Specific actions to be undertaken in 14 sectors were discussed briefly in the Plan, with an indication of the required time frame and level of investment. The total cost of implementing all recommended actions in NEAP 1992-1996 would have required an investment of some US$80 million.

Since NEAP 1992-1996 was issued, several of its recommended actions have been or are being implemented through various donor-supported and domestic projects. An analysis of the current status of activities recommended in NEAP 1992-1996 (see Appendix A), shows that some 140 activities were identified, among which 35 are either completed or on-going. This represents an excellent start to environment-specific development projects in the country. Table 2.1 presents a selection of the key environmental projects initiated--organised into six programme area clusters--in response to NEAP priorities. All of these major activities also have been incorporated into the Government's Public Investment Programme (PIP).

Major Environmental Projects in Sri Lanka as of 1994

Table 2.1

PROGRAMME AREA	PROJECT	PRINCIPAL FUNDING SOURCE	COST US$ Mn
Policy, Institutions, Educaton and Culture	* Natural Resources and Environmental Policy Project (NAREPP)--Policy, Institutions & NGO Components	U.S. Govt. (USAID)	8.0
	* Environmental Management Project	Norwegian Govt. (NORAD)	4.0
	* Sri Lanka Country Studies to Address Global Climate Change	ADB	0.2
Land and Water Resources	* Water Resources Policies & Institutions Assessment for Comprehensive Water Resources Management	ADB	0.5
	* Land Use Policy Planning Project	ADB	1.1
	* NAREPP/Shared Control of Natural Resources Project (SCOR)	U.S. Govt. (USAID)	7.0
	* Upper Mahaweli Watershed Project	German Govt.	1.5
Forests and Biodiversity	* Forestry Sector Planning Project	World Bank	46.0
	* Forestry Master Plan Revision	Finnish & UK Govts. (FINNIDA/ODA)	1.0
	* Wetland Conservation & Protected Area Management	Netherlands Govt.	1.5
	* Forest/Land Use Mapping Project	British Govt (ODA)	9.3
	* Sinharaja Conservation Project	Norwegian Govt. (NORAD)	1.3
	* Wildlife Conservation & Protected Area Management Project	UNDP/FAO (GEF)	4.1
	* NAREPP/Biodiversity Conservation Component	U.S. Govt. (USAID)	1.0
Urban & Industrial Pollution	* Metropolitan Environmental Improvement Programme (MEIP)	World Bank/ UNDP	3.0
	* Industrial Pollution Reduction Programme	UNIDO	2.1
	* Programme to Phase Out Ozone Depleting Substances in Sri Lanka.	GEF-Montreal	1.8
	* NAREPP/Urban and Industrial Environmental Management Component	U.S. Govt. (USAID)	1.0
Coastal and Marine Resources	* NAREPP/Coastal Resources Management Project (CRMP)	U.S. Govt. (USAID)	2.0
	* Coast Conservation Project	German Govt. (GTZ)	0.8
Energy & Mineral Resources	* Mineral Inventory Data Base Operation	World Bank	0.2
	* Demand-side Management Action Plan	ADB	0.2

2.3 THE NEAP UPDATE

2.3.1 Rationale for Periodic NEAP Updating

Though significant action to improve environmental management in the country can be seen from the many initiatives underway, the Government felt that enough had changed since 1991 to warrant an updating of the NEAP. When NEAP 1992-1996 was prepared M/EPA had just been formed, and it was not yet ready to take a full leadership role in environmental policy and program development. National environmental policy formulation was then in its initial stages and, in consequence, there was no clear policy framework to hold together the projects and proposals presented in the NEAP. This meant that relationships between the national economic development strategy and programs and environmental action priorities were not clearly articulated, and only limited project documentation was provided in the NEAP. At the time NEAP 1992-1996 was formulated, "environment" had not yet become a high priority within the economic development planning and donor communities. There is a clear sense that this has now changed--in part as a result of the NEAP's preparation and implementation. Still, it was felt that far more should and could be done to better incorporate sound environmental management into the economic development process.

2.3.2 The First Updating of NEAP

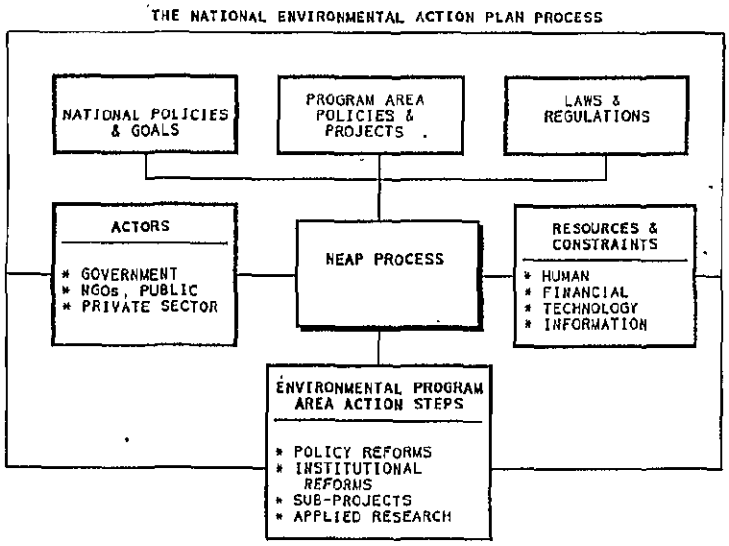
For these and other reasons, the Ministry of Environment and Parliamentary Affairs initiated a NEAP "updating" exercise in late 1993. Three important premises were given for this effort:

i. The updating should be participatory and lead to a consensus document.

ii. The updated NEAP should be a "living" document, which could be further updated and built upon in the future.

iii. The updated NEAP should provide an environmental policy foundation to obtain further financial support for programmes designed to assist Sri Lanka's efforts to achieve environmentally sustainable development.

To meet these objectives, the NEAP updating exercise was organized according to a structured analysis. This proceeded from the examination of environmental problems in each NEAP Programme Area to the identification and prioritization of appropriate actions. This analytical framework was used to guide a participatory process which reviewed the country's most pressing environmental problems in an economic development context, and identified policies and programmes to respond to those problems of highest priority. The figure below depicts a stylized and continuous NEAP analysis process, with its various elements and feed-back modes, which was used in organising the NEAP updating:



2.3.3 Steps in Preparation of NEAP 1995-1998

M/EPA initiated the NEAP updating process by requesting government ministries and agencies, as well as NGOs, to submit their highest priority projects for consideration. Various agencies and NGOs submitted ideas to supplement the NEAP 1992-1996 project list. These proposals, termed concept papers, have been extensively used in the updating process. MEPA also opened a dialogue with the international donor community to develop an "umbrella" environmental project to assist in financing actions recommended in the NEAP. The 1995-1998 action plan presented in this document covers environmental interventions to be implemented within the four-year period commencing and inclusive of 1995.

MEPA led the updating exercise, with assistance from consultants supplied by World Bank: Norconsult International A. S. of Norway, and Engineering Consultants Ltd., of Sri Lanka. The USAID-funded Natural Resources and Environmental Policy Project, numerous government agencies, NGOs, and private sector entities also collaborated in this effort. During the period from late October 1993 to early March 1994, the planning and preparation was based on inputs from: (a) two planning workshops for decision makers; (b) a workshop for NGOs; (c) formation and initial deliberation of a National NEAP Working Group and Sub-Working Groups; and (d) a review of project proposals included in NEAP 1992-1996 and new concept papers submitted during the updating exercise.

A Working Group comprising key government, academic and NGO representatives was appointed by Secretary/Ministry of Environment and Parliamentary Affairs to direct the activities of the NEAP updating exercise. The fourteen programme areas in NEAP 1992-1996 were grouped into six Programme Area clusters, and Sub-Working Groups were formed for each to facilitate the analysis of current environmental problems and both policy and program priorities (see the front of this document for a full list of all Sub-Working Group members). Two planning workshops were held with members of the Working Group, key agencies, academic experts, and NGOs to develop the criteria for relative prioritization of program areas and NEAP interventions. The consultants, along with Working Group members, developed a set of criteria to prioritize recommended actions to be included in NEAP 1995-1998. The six programme areas are:

1. Policy, Institutions, Education and Culture
2. Land and Water Resources
3. Forests and Biodiversity
4. Urban and Industrial Pollution
5. Coastal and Marine Resources
6. Energy and Mineral Resources

In addition, a seventh topic covering broader "environmental-economic linkages" and the role of sound environmental management in Sri Lanka's economic development was identified, and a Sub-Working Group appointed.

The Sub-Working Groups were convened by MEPA and received technical assistance from consultants and other experts in their respective fields. The objective of each group was to carry out a thorough analysis which would support the selection of priority actions under the NEAP. The groups' major outputs were analytical matrices summarising problems and NEAP actions for each Programme Area (see next section) and supporting narratives which were used as the basis for this updated NEAP. MEPA also organized a workshop with NGOs to discuss their involvement in the development and implementation of the NEAP, and to identify ways to improve NGO and public involvement in the NEAP process.

2.3.4 Analysis of Priorities in Each Programme Area

The NEAP updating exercise was carried out over a relatively short period of time and required a large amount of information on widely varying topics. A "Programme Area Policy Analysis Matrix" framework was developed and introduced to organise and guide the Working Groups in identifying the most important problems and issues, and in recommending actions in each of the

six NEAP Programme Areas. This section gives a short description of the contents of the matrix. Further reference also may be made to the six completed matrices given at the ends of Chapters 4-9. This provides a clearer picture of the layout and applications as each Sub-Working Group laboured to apply the matrix's logical framework to their programme area. Six types of questions were asked, starting with identification of crucial environmental problems within the programme area:

Environmental Problem Identification: The first two columns of the matrix, *Environmental Issues* and *Environmental Impacts* were used to identify the key environmental problems and their impacts, and to explain why they are of national concern.

Environmental Problem Analysis & Measurement: The next two columns, *Physical Indicators* and *Economic Indicators,* led Working Group members to identify physical and economic information indicating the significance of the adverse environmental impacts documented in the second column. It proved far easier to estimate the physical impacts than to assign economic values to environmental degradation.

Causal Analysis: The next column, *Proximate Causes*, addresses the obvious or most immediate causes of environmental problems, often reflecting the behaviour of groups or individuals in closest contact with the environment. *Underlying Causes*, refers to the "real" reasons why people behave as they do, which are often associated with incentives created by policies or market forces (or the lack of same). Proximate and underlying causes are distinguished in the matrix to facilitate an emphasis on actions to target the underlying causes (often relatively difficult to implement) rather than only their symptoms (usually easier to implement, but less likely to result in lasting improvements).

Existing Programmes Review: Once the most critical environmental problems and their causes have been identified, the columns *Existing Programmes* and *Scale, Extent and Location* document the extent of initiatives currently underway to address these problems. This information helps avoid duplication and improve coordination of policies and projects.

Options for NEAP Actions: This analytical process applied for each programme area has categorised potential NEAP actions into four types: *Policy Reforms; Institutional Reforms; NEAP Sub-projects;* and *Applied Research*. This was an attempt to preclude the common planning tendency to automatically focus on "projects" as the most appropriate mode of intervention. It assumed that a combination of policy and institutional reforms, and related applied research would be required to facilitate the implementation of any recommended project. Sub-projects were formulated with the aim of solving the underlying causes and constraints relating to the most critical environmental problems identified through this analysis. The applied research column highlights key areas where data is lacking and where further studies must be carried out before appropriate policies, institutional reforms and sub-projects can be developed.

Remaining Unmet Needs: The final column acknowledges that not every environmental problem can be immediately addressed. It identifies environmental problems which lie outside the scope of this current updated NEAP or which could not be tackled because of factors such as the limited absorptive capacities of institutions or lack of human and financial resources.

2.4 LONG-RUN NEAP PRIORITIES AND UPDATING

Future NEAP updating will consist of a similar rolling process of problem analysis and prioritization followed by the identification, design and implementation of actions in programme areas. This NEAP 1995-1998 merely sets the stage for at least three further refinements and updates covering four-year periods through the year 2010. Simultaneous action is needed on a wide range of problems to ensure that Sri Lanka follows a sustainable economic development path. Furthermore, priorities will certainly change in response to economic and/or environmental success or challenges. However, the approximate long-term NEAP areas of emphasis are as follows:

Period	Emphasis
1992-1996	Establishment of environmental management as a national priority; environmental institutions strengthening; pollution prevention and control for existing industries; and improved environmental problem analysis.
1995-1998	Environmental policy and institutions development; sustainable agriculture; improved water management; and pollution prevention and control for new industries.
1999-2002	Biodiversity conservation; environmentally sound tourism development; clean urban and industrial development.
2003-2006	Clean urban and industrial development; environmentally sound energy production for industry; and sustained natural resources management.
2007-2010	Achieving NIC status with sound environmental management.

The next NEAP updating, therefore, will need to take place prior to the end of this current planning period, i.e., by at least 1997. Moreover, further refinements of NEAP priorities and action possibilities will be made continuously as NEAP is implemented, and they need not await future formal updating processes. The pattern established, however, indicates a NEAP updating exercise every two to three years.

MEPA will serve as the apex ministry to coordinate the NEAP planning and implementation process and to carry the responsibility for fulfilling the commitments outlined therein. A permanent NEAP unit will be set up at MEPA to coordinate NEAP planning and oversee implementation. Primary responsibility for implementing actions identified in each programme area will rest with the relevant executing agencies, supported by the private sector, educational institutions, and NGOs. The NEAP unit will play a key role in project design and monitoring as sub-projects are carried out, and it will hold ultimate responsibility for the successful implementation of NEAP.

2.5 ENVIRONMENTAL ACTION PROJECT

In an effort to accelerate implementation of actions recommended in NEAP, MEPA has requested the World Bank (International Development Association) to provide assistance in formulating an "umbrella" project capable of mobilising financial resources from both multilateral and bilateral donors. As a result, the consultants contracted by the World Bank to facilitate the NEAP updating exercise were also asked to prepare documentation for an "Environment Action 1 Project" (EA1P), which identifies concrete projects for implementation according to NEAP priorities. The consultants were assigned the task of translating the recommended actions in NEAP into fundable projects in an agreed format. The main EA1P project objectives were originally defined as assistance to the Government in implementing sectoral policies, strategies and plans aimed at:

a) strengthening the institutional and policy framework to develop environmental protection and conservation of natural resources; and

b) supporting NEAP priority actions, especially in natural resources development.

The set of criteria to prioritize NEAP 1995-1998 programme areas, and the Programme Area Policy Analysis exercise were used to identify components and sub-projects included in EA1P. The actions considered most suitable were grouped under this "umbrella" package. A summary of the proposed EA1P components (as of this date) is presented as Appendix B to this document.

3: THE ENVIRONMENTAL DIMENSION IN ECONOMIC DEVELOPMENT

3.1 NATIONAL ECONOMIC DEVELOPMENT AND SOUND ENVIRONMENTAL MANAGEMENT

To ensure Sri Lanka's economic growth is achieved in an environmentally sound manner--that is, to achieve sustainable development--environmental considerations must be built into all levels of planning and policy development. This includes efforts to ensure macroeconomic stability, sectoral growth, and good design and implementation of development projects. An institutional and policy framework specific to environmental concerns must also be established and maintained.

As indicated in Chapter 1, Sri Lanka faces a wide range of environmental management challenges tied to its economic development. Foremost among these are the interlinked problems of land and water degradation. Unsustainable agricultural and forestry practices are resulting in severe soil erosion on sloping lands and reduced productivity of irrigated areas, and biodiversity loss. Agricultural chemicals and agroprocessing byproducts are polluting soil and water resources. As competition over water increases, efficient allocation measures must be devised to divide this precious resource among its uses: irrigation; industrial water supply; hydropower generation; base flow for rivers; urban drinking water; and other uses. This is further complicated by worsening water pollution from industrial effluents. Air pollution and other threats to urban environmental quality must also be addressed as industrial growth feeds migration to cities. Biological resources--such as forests, agricultural germoplasm, and marine organisms--are facing threats to their very existence, and they remain grossly undervalued by traditional means of economic accounting. All of these environmental problems are inseparably linked with the country's economic growth, and they stand to undermine welfare gains from development if not properly addressed as a part of the process.

This chapter touches on some of the environmental-economic linkages which need to be considered in both sectoral and macroeconomic policy formulation. Sectoral development concerns are placed in their fuller environmental context in the analyses and recommendations of Chapters 4 through 8, which cover the NEAP's five programme areas. The basic elements of the needed environmental policy and institutional framework are presented, with further elaboration provided in Chapter 9 and in the recommended policy reforms given in Chapters 4 through 8.

The country's economic development strategy is based on the rapid expansion of three key growth sectors: industry, agriculture, and services. Sectorally-based economic policies and programmes must also be supported by sound market-oriented macroeconomic policies to guide fiscal, monetary, financial, regulatory, and trade affairs. In addition, fiscally supportable and efficient social programmes are needed to ensure that all segments of society benefit from the development process.

3.2 SECTORAL GROWTH PRIORITIES

3.2.1 Clean Industrialization

Sri Lanka's economic growth strategy--with the goal of achieving Newly Industrialized Country (NIC) status by early 21st Century--rests on the foundation of continued rapid expansion of export-oriented industrial activity. An important lesson to be drawn from the experience of the Asian NICs, however, is that the environmental consequences of the industrialization process must be carefully considered to ensure that economic gains from rapid growth are not undermined by a costly deterioration of environmental quality.

Even Sri Lanka's experience has shown that it is far cheaper to prevent and treat pollution as industry expands than to grow first and clean up later. With this in mind, existing industries

are being provided incentives to assist their transition to cleaner production, while stricter enforcement of pollution regulations begins (see the policy package outlined in Chapter 6). For new industrial investments, Sri Lanka does not have an international competitive advantage in heavy industries with significant pollution levels. Nor does it have abundant energy resources, and the country must be careful to develop its industrial base in a manner which is as clean and energy efficient as possible (see Chapter 8).

Sri Lanka will seek investments from clean industries and strive to establish an international reputation for its attention to environmental quality as part of the development process. New plants will be sited in industrial estates, where adequate wastewater treatment and other pollution control measures can be taken. Utilizing recent advances in pollution prevention and control technology, the country's industrial sector will provide ample employment opportunities and a widening array of goods without sacrificing human health or environmental quality. With high anticipated growth rates, expanding opportunities for industrial employment also should substantially reduce human pressures on the natural resource base.

3.2.2 Sustainable Agricultural Development

At present, nearly three-quarters of the labor force is still dependent upon the agricultural sector for its income. This means that the economic growth strategy must pay careful attention to identifying and grasping opportunities for sustainable agricultural development. This includes both the sustainable increase of mainstay plantation crops (tea, coconut, rubber, and spices) and the diversification of agricultural production. A key feature of this strategy is exposure of the plantation sub-sector to market forces. Agricultural product diversification includes expansion of "non-traditional" agricultural output, such as fresh vegetables and horticultural crops. As in the case of the industrial sector, particular attention will be given to export-oriented investments.

Appropriate policies and programmes must be developed to ensure adequate attention to the wise husbandry of land and water resources as this process accelerates. The success of this strategy will particularly be dependent upon the provision of clear tenurial rights to those entrusted with the long-term management of land and water resources. It is also important that commercial agriculture does not overly rely on economically and environmentally costly pesticides and other agro-chemicals (see Chapter 4 for more details).

Policies and programmes to support sustainable agricultural development cannot be separated from measures to ensure effective forest and biodiversity conservation. The linkages are complex. *Chena* cultivation encroaches on forest areas. Forested watersheds and wildlife reserves protect heavy investments made in dams and reservations for irrigation (and hydropower). Coastal and marine degradation threatens fisheries production. Forests also serve as genetic storehouses, supporting plant and animal materials of tremendous future value to the agricultural sector. The growth strategy for agriculture must recognize these relationships and be closely coordinated with efforts to ensure the wise management of forest, coastal, and biodiversity resources (see details in Chapters 5 and 7).

3.2.3 Eco-Dependent Tourism Development

Rapid expansion of service sector activities represents the third pillar of the country's growth strategy. The environmentally significant opportunities here are dominated by tourism, which already contributes over 5 percent of GDP and a significant and growing portion of foreign exchange earnings. The ability to further expand the tourism sub-sector, however, will be severely hampered by any marked decline in Sri Lanka's natural beauty--its beaches, wildlife parks, rural landscapes, and even urban environments. The current trends raise serious concerns: coastal areas are adversely affected by coral reef degradation and unplanned hotel development; parks and protected areas are subject to encroachment and mis-management; scenic drives and vistas are marred by poorly sited development and graffiti.

To ensure that these trends are reversed, environmental considerations must be fully incorporated into the Tourism Master Plan and incentives affecting the industry's development. Hotel projects requiring environmental impact assessments must be identified early in their design stages, so that appropriate changes can be made in project plans and potentially damaging environmental impacts averted. Through such measures, the country can ensure continued expansion of jobs and income derived from the tourism sub-sector in a manner fully compatible--and dependent upon--the wise management of natural resources.

3.3 ENVIRONMENTAL DIMENSIONS OF MACROECONOMIC POLICIES TO SUPPORT RAPID GROWTH

The accelerated expansion of these three key growth sectors must be supported by appropriate macroeconomic policies. These may be grouped into three areas: fiscal reforms; monetary, financial, and regulatory reforms; and trade reforms. In addition, appropriate adjustments in social programmes are needed to both improve their efficiency and to ensure that all elements of society are included in the economic development process.

3.3.1 Fiscal Reforms

The principal objective of ongoing fiscal reforms is to reduce the national budget deficit, and considerable progress has been made. During the last few years, the Government has exerted increasing fiscal restraint in the approval of new public investments, and it has also initiated several policy measures meant to assist this effort. The following are the key elements of the fiscal reform package:

- o Restructure Public Enterprises
- o Improve Net Returns from Public Investments
- o Rationalize Use of Subsidies, Including Energy and Agriculture
- o Rationalize Tax and Investment Concessions/Subsidies
- o Sustain Capital Assets and Invest in Infrastructure
- o Encourage Private Sector Infrastructure Investments
- o Improve Public Sector Efficiency
- o Employ User Fees (and "Externality" Taxes)

Every element of these fiscal reform measures carries some environmental implication. For example, restructuring public sector plantations to ensure their improved market-based efficiency and to substantially reduce government subsidies has recently resulted in unanticipated adverse environmental consequences regarding the management of forests within their control. On the other hand, positive environmental impacts are anticipated from planned energy pricing reforms. These examples illustrate that much further analysis must be devoted to understanding the potential environmental impacts of alternative privatization and other fiscal reform policies.

3.3.2 Monetary, Financial, and Regulatory Reforms

Reform of monetary, financial and regulatory policies is necessary to achieve an attractive climate for increased domestic and foreign investment. The following are the key elements of the monetary, financial and regulatory reforms package:

- o Move to Indirect Money Supply Controls
- o Move to a Market-Determined Exchange Rate
- o Develop Financial Markets for Domestic and Foreign Investment
- o Encourage Direct Foreign Investment
- o Improve Efficiency of Banking and Insurance Sectors
- o Government Deregulation
- o Commercial Law Reforms

Though not as clearly linked to environmental management, there remain strong potential impacts from these types of reforms. Exchange rate changes can affect the profitability of various natural resource management schemes. The expanded involvement of environmentally conscious foreign investors in both direct investment and equity markets can create important incentives for sound environmental management. Likewise, insurance and commercial law reforms are prerequisites to the use of market-based environmental management policies. Again, such relationships require much better analysis prior to the full implementation of macro-economic policies.

3.3.3 Trade Reforms

Like other macroeconomic reforms, rationalization of the rules and regulations governing trade are driven by the desire to make better use of market forces in determining the allocation of resources. The following are the key elements of the trade reform package:

- o Rationalize Import Tariffs
- o Reduce Non-Tariff Import Barriers
- o Reduce Other Export Barriers

Rationalizing tariff rates and reducing non-tariff barriers should be expected to have a positive impact on the environment. However, careful analysis of current trade policies is needed to examine, for example, the effects of greater availability of pollution control technologies or of increased foreign competition for forest products.

3.3.4 Restructuring Social Programmes

There are even weaker apparent links between efforts to restructure social programmes and environmental management. The two key elements of current reform efforts are:

- o Improve the Efficacy of Poverty Alleviation Programmes
- o Develop Human Resources, Especially Vocational Skills

These programmes are primarily designed to ensure that the benefits from market-based economic growth are equitably shared. The direct relationship between poverty and unsustainable natural resource exploitation is well established. Furthermore, there is also strong evidence indicating a close relationship between improved education--particularly of women--and sound environmental management. In future, such links must be better understood and used to shape social policy.

3.4 INSTITUTIONAL AND POLICY FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT

3.4.1 Legal Framework

The current legal framework for environmental management is based on the 1980 National Environmental Act (NEA), which created the Central Environmental Authority. This also forms the basis for the policy and programming work of the Cabinet Ministry for Environment and Parliamentary Affairs. Environmental Protection Lisences (EPLs) are issued to polluting industries and constitute the principal current regulatory mechanism for pollution control. Since January 1994, the responsibility for issuing EPLs to low polluting industries has been delegated by the CEA to local authorities. The NEA is currently being revised to further improve the enforceability of the EPL scheme (see Chapter 6 for further details).

The single most important recent environmental policy reform was the 1993 passage of new regulations governing Environmental Impact Assessment (EIA). Most large projects are now fully subject to the conduct of an EIA, meant to improve designs by better incorporating

environmental considerations and prescribing appropriate mitigation measures to reduce adverse environmental impacts. The EIA regulations also identify 15 Project Approving Agencies (PAAs), and efforts are underway to establish Environmental Cells in each PAA to serve as focal points for EIA work as well as other sectoral environmental policy and programme analysis.

No discussion of legal issues affecting Sri Lanka's environment would be complete without at least touching on the subject of land tenure. The appropriate and clear delineation of tenurial rights is vital to the establishment of incentives for sustainable land and water resources management. Though considerable progress has been made in recent years, there is still much work to be done in better defining land and water rights as part of broader natural resources policy frameworks (see Chapter 4).

3.4.2 Key Environmental Institutions

This National Environmental Action Plan is meant to begin the process of articulating the relationships between sound environmental and natural resources management and the country's broader economic development efforts. As such, it represents the broadest statement of the country's environmental policies and programmes--including high priority investments. The Ministry of Environment and Parliamentary Affairs takes primary responsibility for compiling this strategy, though it shares implementation duties with other central and regional government agencies, the private sector, non-governmental organizations, universities, and individual citizens. Further analysis of these roles and responsibilities--together with the key elements of an action plan for strengthening environmental institutions--may be found in Chapter 9.

3.5 BETTER INCORPORATING ENVIRONMENTAL CONSIDERATIONS INTO ECONOMIC DEVELOPMENT POLICIES AND PROGRAMMES

3.5.1 Macroeconomic-Environmental Linkages

Table 3.1 presents some of the relationships likely to exist between macroeconomic policies and environmental management. Though far from comprehensive, it illustrates the importance of careful attention to the environmental impacts of macroeconomic policies and comprises an initial agenda for further analysis by the Ministry of Policy, Planning and Implementation as well as the Ministry of Environment and Parliamentary Affairs.

The Ministry of Environment and Parliamentary Affairs will work in close cooperation with the National Planning Department to develop new tools for macroeconomic analysis capable of better explaining relationships such as those given in Table 3.1. This will include macroeconomic models linking economic activities and their environmental consequences as well as new national income accounting methods to better value natural resource assets and the costs of environmental degradation.

3.5.2 Sectoral and Project-Level Environmental Policy and Programme Development

There have been only weak efforts in the past to build environmental considerations into sectoral policies and programmes. The 1993 passage of EIA regulations marks an important step forward in this regard. More importantly, Chapters 4 through 8 of this National Environmental Action Plan lay out an ambitious programme of policy and institutional reforms needed to ensure the success of associated NEAP project investments. Taken together, this represents a comprehensive agenda for better incorporating environmental considerations into sectoral policies and development programmes.

Sri Lanka Environmental - Economic Policy Matrix

Table 3.1

Economywide Policy Reform Goals instruments	Pollution: Industrial, Urban, and Coastal (including Coral Reefs)	Energy Generation and Conservation	Forest and Biodiversity Protection	Water Resources Depletion and Degradation	Agricultural Land Conversion and Degradation
Public Sector Reforms:					
- Improve efficiency and competitiveness	(+) reduce waste in resource-based manufacturing	(+) improve efficiency of generating plants, with pricing reforms (see below), it will also reduce energy intensity among industrial users		(+) promote more efficient provision of urban and industrial water supply	(+) increase efficiency of tea plantations. leading to better land management (note: in lands that are governed by traditional communal systems, privatization may be associated with negative effects, as discussed under institutional reforms below)
- Improve accountability	(+) reduce emissions and effluent discharges				(+) increased accountability of plantation development and operation will contribute to better soil conservation
- Promote private investment	(+) private investments tend to introduce less polluting technology	(+) new plants tend to be energy efficient		(-) together with price increases, this may reduce access to water by the poor	(+) may increase investment in land improvement
Government deficit reduction:					
- Cut expenditures, reduce subsidies	(-) social and environmental programs like urban pollution abatement (e.g. MEIP) are often the first to be cut, poorer communities often at risk: coastal/coral reef protection efforts may further decline (e.g CEA, NARA budget constraints)	(+) reduce energy subsidies also controls wasteful energy use	(-) protection efforts may be reduced especially in forestry (e.g., Forest Dept budget constraints)	(+/-) reduced subsidies will discourage wasteful water use but poor communities may have reduced access to safe supplies	(-) reduced agricultural extension programs, increasing problem of chena cultivation, soil erosion.
- Introduce resource rent taxation and user charges			(+) reduce pressure on use of forest and protected areas and raise funds to improve community self-management or government protection services	(+) encourage more efficient use of water sources	(+) taxation of idle or neglected lands will encourage land improvement
- Introduce environmental taxes and fees (in contrast to above instruments, these are taxes on environmental externalities)	(+) taxes or charges on emission or effluents will increase incentives for abatement	(+) introduce incentives to reduce emissions or effluents in energy generation		(+) tailings or discharge fee will reduce water degradation problems	

(Sri Lanka Matrix–continued)

Economywide Policy reform goals instruments	Pollution: industrial, urban, and coastal (including coral reefs)	Energy generation and conservation	Forest and biodiversity protection	Water resources depletion and degradation	Agricultural land conversion and degradation
Trade promotion: - Export promotion and foreign exchange liberalization		(-) outward-oriented growth will increase energy generation needs	(-\+) export stimulus may increase timber cutting: depending on land tenure and accountability. This may worsen or improve deforestation-reforestation		(+\-) both crop output and input prices will be affected if they are tradables: better land management is encouraged by higher crop prices if tenure is secure (see tenure issue below)
- Reduce tariffs and other trade barriers	(-\+) industrial openness is associated with new and more efficient technologies. but absolute pollution levels may increase with rapid sectoral growth				(+\-) may initially affect industrial output and employment as inefficient firms fail to compete with imports: long-run improvements in resource allocation should increase employment and income, reducing pressures for marginal resource exploitation
Industrial promotion: - Reduce special industry programs and investment subsidies	(+) special government industrial projects tend to favour industries that are often pollution prone. thus. reducing direct government programs will help change structure of industrial output				(+) increased industrial employment may reduce pressures on marginal lands
Sectoral/Inter-sectoral price and institutional reforms: - Resource access rights and land tenure	(+) property rights allowing community-based management of coastal areas and coral reefs could increase the incentives to reduce industrial and agricultural pollution		(+) decentralization and social forestry-type institutional support will reduce open-access exploitation of forest and wildlife resources		(+) terminal security will promote investment and improve land management (note: in some cases. privatization may be externally imposed on lands that are communally managed. leading to a breakdown of traditional management systems)
- Price and subsidy reforms		(+) improving energy prices will promote more efficient energy generation and use		(+) introducing higher industrial and irrigation water fees will encourage efficiency in water supply and use	(+) removal of subsidies will encourage more efficient/reduced use of agricultural chemicals

The common theme which runs through the current NEAP recommendations is the need for better capacity to analyze the environmental consequences and dimensions of sectoral economic development strategies and programmes. This is generally to be accomplished through the strengthening of national line ministries and departments such as the environmental cells at PAAs, but it must also rely on improved policy and programme analysis capacities at MPPI, MEPA and outside of government.

At the project level, further work is needed to ensure that EIA regulations are fully implemented. Steps must be taken to see that EIAs are conducted much earlier in the project design cycle. Environmental economic techniques also deserve much wider application in project appraisal and EIA efforts, and the National Planning Department will establish improved procedures for screening projects on environmental grounds at their earliest design stage--prior to their incorporation into the Public Investment Programme.

3.6 CONCLUSION

Perhaps the single most significant aspect of this first revision of the National Environmental Action Plan is its attempt to better articulate the relationships between the country's broad-based economic development strategies and the steps necessary to ensure that the development process proceeds in an environmentally sound manner. The country's economic growth strategy hinges on further rapid industrialization, and this country's NEAP update outlines some of the key policy and institutional measures needed to see that environmental quality is not unduly sacrificed in the country's drive for Newly Industrialized Country status. Appropriate reforms and investments also have been put forward to see that the sustainable growth of the agriculture and tourism sectors is supported by the wise management of the productive and attractive natural resources upon which these sectors depend.

This document also represents the first effort to begin identifying the potential environmental consequences of macroeconomic policies. On this basis, a preliminary agenda for applied environmental economic analysis has been identified. Though few specific policy prescriptions have emerged at the macro level, the principal has been established that such considerations will be taken into account in all future economic strategy decisions.

4: LAND AND WATER RESOURCES

4.1 INTRODUCTION

Land and water are the most vital natural resources of this country, and they are the essential components necessary for production of basic needs, food, fibre and fuel for the people. Furthermore, preservation of these two critical natural resources is paramount for the protection of the environment and ensuring that the needs of the current and future generations will be adequately met.

Water is interlinked with many elements of the economy, society, and the biophysical environment. Comprehensive water resources management in Sri Lanka will require a framework of sound policies and laws, and strong institutional arrangements. These must provide the context within which planners and decision makers are enabled to work.

Land and water resource management should be considered in a holistic context. To see these relationships, it is best to view the country from a watershed or river basin perspective. This Programme Area chapter therefore deals with land/water in an integrated fashion and in a watershed context. Some aspects of water resources management are of special relevance to Sri Lanka's environment, however, have been singled out for special attention.

4.2 ENVIRONMENTAL ISSUES AND IMPACTS

The degradation of land and water resources in the country is a major environmental and social problem. Almost everywhere, there is decline in agricultural production; in spite of very high use of agro-chemicals, crop yields are low if not declining. There is ample evidence that this is due in large measure to soil erosion and distorted hydrologic cycles.

The main environmental issues related to land and water in Sri Lanka are:

- **Land degradation** from soil erosion due to agriculture on sloping lands without adequate conservation, shifting cultivation in the dry zone, salinisation and waterlogging of irrigated lands. Studies and general observations show that soil erosion in the mid-country, which is defined as the area within the elevation range 300 to 1,000 m above msl, is more than 100 tonnes/ha per annum. The most severe erosion occurs in tobacco lands and neglected tea lands of smallholders. Some reports indicate over 300-400 tonnes/ha/yr soil loss. The total area subjected to shifting cultivation *(chena)* is more than a million hectares. *Chena* cultivation depletes soil fertility and causes weed infestation, soil erosion and decline in crop yields.

- **Water scarcity**, poor management of water and water pollution (water quality).

- **Changes in ground water regime** due to non-systematic excessive extractions.

- **Proliferation of weeds and insect pests** affecting crop yields.

The most significant environmental impacts related to land and water degradation are:

- **Soil erosion**, the principal reason for land degradation and decline in productivity, is loss of the fertile surface soil, exposure of hard subsoil, and changes in the surface configuration. Off-site, high rates of soil erosion translate into heavy sediment loads of rivers and streams--reducing the efficiency of hydro-power and electricity investments.

- **Loss of biodiversity** is a major concern in land degradation. In land clearing some of theendemic plant species may be lost. Soil erosion and land degradation also can limit the regeneration of endemic plants and change the soil fauna as degraded lands are not able to support some animals due to changes in habitat and loss of some plant species.

- **Desertification** is a gradual process of declining biomass on arid land production. Reducedsoil depth and consequent reduction of available water and fertility will change the plant associations to less demanding types while growth rate and dry matter accumulation are reduced. Tall woody trees are replaced by thorny bushes and grasses.

- **Changes in micro-climate** appear to be a direct impact of the loss of forest type vegetation. Grasses and bushy plants absorb less radiation, therefore the ambient temperature can be increased. Inside the forest the temperature is always cooler than in open areas, grasslands etc.

- **Water bodies are polluted** by the silt and clay that flow into them from eroded croplands. It is not only the soil that is transported into the water courses and water bodies, but also all the chemical residues that is deposited in surface soil, organic debris and fertilizers.

- **Polluted water** is a health hazard. Water that contain high concentrations of nutrients, promotes eutrophication and growth of algae. Polluted waters affect aquatic life, therefore biodiversity too is affected.

- **Increased run-off** can cause flash floods and associated loss of life and property as a major impact arising from land degradation due to soil erosion. The exposure of less pervious sub-surface soils reduces infiltration of rainfall and increases the runoff. In degraded lands there is very little opportunity to retain rainfall and recharge groundwater systems so that rainfall can be discharged into streams at a slower rate.

4.3 CURRENT STATUS AND TRENDS

Recent estimates indicate that forest cover in Sri Lanka has reduced to about 20% of the total land area (or less than 1.5 million hectares) from 70% in the beginning of this century. Though illegal logging and state-sponsored land clearing have played significant roles in this trend, at least a major part of the clearing has been from shifting cultivation. Once these lands are abandoned because of loss in productivity, they can remain as scrub jungles. At present, clearing of lands with a well developed secondary or primary forest is not permitted. However, in time to come it will not be possible to implement such regulations and contain the people within current farmlands, without solving the problem of rural unemployment. The other alternative is to stabilize rainfed upland agriculture.

In the dry and intermediate zones, shifting cultivation still remains one of the main agricultural activities of a large section of the population. Most of the country's requirement of coarse grains and pulses continue to be produced in the rainfed lands.

"Land to landless" for agriculture and the dependence on agriculture to find employment in the rural sector are policies still being followed by the state. Recently alienated lands for agriculture under the Presidential Land Task Force includes mostly degraded lands. The productivity of these lands remain very low, the income of the allottees remain very low, and there is little hope for re-investments in land development and productivity improvement.

High income generating crops such as tobacco, potato, red onion, and exotic vegetables are encroaching into most vulnerable areas in the hilly region. Agricultural and trade policies do not discourage the cultivation of these highly erosive crops on undeveloped lands. There are no strategies to prevent or control the use of steep lands for erosive crops.

Today, water-related projects absorb about 22.5% of public sector investments (hydro-power, water supply, irrigation, and so forth). Irrigation is provided to about 67% of agricultural lands. Overall, an irrigation efficiency of about 140% is achieved, that is, an average of 1.4 crops per year. Soil salinity and waterlogging are major concerns in recently developed irrigation projects. However, there are not sufficient efforts to prevent waterlogging and salinity; drainage of irrigated agricultural lands receives very little attention.

In 14 out of 25 districts more than one-third of the population do not have access to safe drinking water and are using unprotected wells, rivers and tanks. The main sources of drinking water to housing units are piped water 17.5, wells 72.9% , and rivers, tanks, and other surface sources 7%. As many as 20% of wells are unprotected and allow inflow of polluted water. Water supplies are nowhere adequate in terms of quality. Water supply and waste sanitation facilities are often in poor condition. Water-related illnesses have a very high incidence - about 120,000 hospitalizations per year for diarrhoea, with probably ten times than many cases unrecorded.

Most new water supply schemes are financed by international donors or development banks. Annual investment is approximately Rs 2,000 million, 70% of which is for urban areas. The GOSL grants to the implementing agency 50% of the cost of urban water supply, 85% of the cost of rural water supply, and 100% of the cost of sanitation schemes. The remainder is provided as a Rupee loan, with an interest rate of 12% and a repayment period of 24 years. The operating authority pays operating and maintenance costs, interest payments and loan repayments from its revenues, but not depreciation.

Due to low levels of treatment of municipal and industrial waste water the receiving waters are considerably polluted. The Kelani River receives untreated effluent from 21 industries and untreated sewage of 1.6 million people living in the metropolitan areas. The Negombo, Koggala Lagoon and Bolgoda Lake receives untreated or partially treated industrial waste from the respective industrial zones.

The largest water supply scheme is from the Kelani River at Ambatale which provides water to the Colombo metropolitan area. The supply from Kelani River at Ambatale has increased considerably, to the extent where the entire Colombo metropolitan area depends on this single intake. A smaller proportion of water comes from the reservoirs at Kalutuwawa and Labugama. During the drought period of 1992, water through this intake had a high salinity level owing to sea water intrusion. At times of drought, the water in the hydro-reservoirs are conserved to generate electricity, and hence the flow of the river is reduced. This results in sea water intrusion upstream. Therefore, this intake is vulnerable to even a small sea level rise. Hence, it is necessary to find other sources of water supply, such as the unused Kalu Ganga, to the Colombo metropolitan area.

In the recent years groundwater extraction for agriculture has expanded rapidly, and there is a growing concern about its sustainability and impact on the environment. Groundwater resources are under much more severe pressure than surface water resources. Most of the surface water potentials have already been exploited and the ground water resources are rapidly becoming a critical issue. A major problem in Sri Lanka is that the irrigation sector is not operated in a financially sustainable way. Payments from farmers, both actual payments and size of fee, have been inadequate. Lack of financing--at least part of the cost of establishing, operating and maintaining irrigation systems--has hindered new investments in major schemes.

The emerging problems relating to water are: depletion of the quantity available; deterioration of water quality; emergence of health issues; and lack of effective management mechanisms. The western zone is the only area with a water surplus, while the most acute water shortage exists in the dry zone--northern, north-western, north-eastern and south-eastern zones. The available supplies are threatened by pollution and the efficiency of utilisation is sub-optimal due to poor management.

The greatest threat to groundwater supply is in the Jaffna peninsula, which is dependent on this source for agriculture and human consumption. Ground water is obtained from caverns in the limestone rock just beneath the surface. These caverns are usually connected to the sea so that fresh water is confined to the top portion lens fed by rain water seepage. Sea level rise can threaten this water supply. Further, a good part of the fresh water used for agriculture goes back into these ground water reservoirs. Therefore, any chemical pollutants from fertilizers and pesticides can pollute this supply. The continued re-cycling of this water can also tend to concentrate the accumulation of pollutants. The latter effect can already be seen in the Kalpitiya peninsular which has been using water extensively for chili and onion cultivation. Therefore, conservation of water resources, as well as a change in agricultural practices, are especially

necessary for these areas. In the case of Jaffna, additional measures have to be taken to increase the ground water supply by preventing much of the surface run-off to the sea after the rains.

4.4 CAUSES OF ENVIRONMENTAL DEGRADATION

There are many causes for land related environmental degradation. Land degradation resulting from soil erosion is primarily due to cultivation of sloping lands for highly erosive crops and chena farming without adequate soil and water conservation strategies. There are many other secondary causes responsible for soil erosion and land degradation. Environmentally more important of these are: lack of alternatives for income and livelihood, un-planned land alienation/use, lack of land identification and demarCation, poverty of land users or lack funds for investment on land improvement, lack of political will to enforce conservation regulations and lack of awareness and knowledge about conservation strategies and techniques. There may be other minor causes for soil degradation. The underlying causes are: attempts to find employment through agriculture, lack of comprehensive soil conservation act and implementation capacity, high income generation by erosive crops, land alienation without land use planning, regularisation of encroachments, short-term leases and management contracts, multiplicity of low capacity institutions with overlapping responsibilities but without proper coordination mechanisms.

Land degradation due to waterlogging and salinity development in irrigated areas are caused by poor water use efficiencies due to poor water management, system water losses due to poor maintenance and lack of controlled delivery, poorly managed irrigation systems, lack of proper training in water use, poor institutional arrangements for water management, and political interference. Underlying causes are: lack of incentives for water saving, irrigation system inadequacies, poor water allocation and individual profit concerns.

Landslides occur due primarily to natural causes. Steeply sloping land masses with geologic structure and formation conducive to slips under conditions of very heavy continuous rainfall usually develops into landslides. People due to lack of knowledge and awareness about landslides create conditions necessary to trigger landslides. A common man made causes are the import of water into vulnerable areas or removal of stabilising footslope materials and unsuitable agricultural practices. Due to landslides heavy losses of life and property results due to non-availability of alternative settlement sites.

The pollution of surface and ground water resources is primarily caused by erosion, poor agricultural practices, lack of waste water treatment, etc. The underlying causes are lack of environmental concerns in the development policy as well as within sectoral policies, e.g. industry and agriculture. This is further linked to lack of awareness and appropriate understanding of the impacts of water pollution. Further, the situation is exacerbated by lack of will to enforce existing laws and provisions.

4.5 EXISTING PROGRAMMES RELATING TO LAND AND WATER RESOURCES

There are a number of programmes relating to land and water resource management which have been implemented with donor assistance from both multilateral and bilateral agencies. A summary of the key initiatives undertaken since NEAP 1992-1996 was prepared are given in Figure 4.1 on the following page.

Figure 4.1

SUMMARY OF CURRENT NEAP ACTIVITIES IN THE LAND AND WATER PROGRAMME AREA

There has been considerable activity in this program area since the 1991 NEAP was issued. The most prominent of the current initiatives are as follows:

PROGRAM	MAJOR FUNDING SOURCE	TOTAL FUNDING (US$ Mn)	START-END DATE
▸ Land Use Policy Planning Project	ADB	17.5	1991-1997
▸ Forest Land Use Mapping in Upper Mahaweli Watershed - Develop detailed databases on land use, physiography, and other physical features	ODA	1.3	1991-1996
▸ Forest Sector Development Project (see Chapt. 5)	ODA	46	1990-1996
▸ NAREPP/Shared Control of Natural Resources Project - Resource user participatory watershed management programme - Management of land and water resources to optimize productivity	USAID	2.3	1993-1996
▸ Upper Mahaweli Watershed Project - Assists private sector and other agencies to promote resource conservation, through SALT techniques	GTZ	1.5	
▸ Water Resources Policies and Institutions Assessment for Comprehensive Water Resource Management - Strengthen institutional capacity in water resources management.	ADB	0.5	1993-1995

4.6 RECOMMENDED NEAP ACTIONS

The important environmental issues outlined are: land degradation due to soil erosion; landslides; degradation of irrigated lands due to salinisation and waterlogging; scarcity of water; pollution of water bodies or water quality deterioration; changes in ground water regime; and flash floods.

In order to address these issues and underlying causes, options for policy and institutional reforms plus recommended NEAP sub-projects and applied research studies have been identified under "land and water resources" and "water resources management".

Land/Water Policy Reforms

In a global perspective the following are some of the very important environmentally related policy areas :

- Population policy
- Land policy
- Agricultural policy
- Rural industrial policy, with particular emphasis on agro-based industry

- Decentralisation policy
- Environment policy.

In this review, it is necessary to separate the global policy issues from policies specific to NEAP. The policy analyses emphasises on matters relevant to improving and maintaining the environmental quality, so as to recommend appropriate policy actions.

Population policy: The current population policy is to encourage voluntary control of births. The government facilitates birth control through non-governmental or semi-governmental organisations in creating awareness on birth control and by providing facilities on demand. Although high population is a major factor contributing to environmental degradation, there is very little that NEAP can address. The population issues are very complex and can be emotional due to the particular nature of the Sri Lankan society. Therefore, this aspect is best left out of NEAP.

Land policy: Although environmental concerns were not highlighted prior to the enactment of environmental laws, the land policy of the country includes many provisions in respect of environmental quality issues related to land and water. Nearly all environmental problems related to land and water are linked to the current land policy as well as policies that prevailed since the British occupation in 1815. However, this section will only review the policies relevant to the recommendations given in NEAP.

Although a comprehensive land policy document is not available, there are many Acts and Ordinances that give effect to the land policy in the country. These reflect the broad policy of the government. The important land policy issues closely linked to land degradation, landslides, deforestation, encroachments on critical areas, flash floods, water quality, and water supply are; land alienation by the state, land to landless for agriculture, degree of state control over alienated lands, encroachment regularisation and land grants to different categories of people to attract investments, too much dependence on land based employment, short-term leasing and privatisation of management, reclamation of low lying land for infrastructure development, and lack of minimum control on private land property.

One of the major issues that come up in land policy discussions is the land tenure rights and state ownership. This is an issue that cannot be taken in isolation. The state policy of retaining a minimum control over lands alienated under LDO after initial permit conversion to *Swarnabhumi* grant is to prevent fragmentation of land into uneconomic size and also to prevent accumulation of lands with any one individual. The need for preventing accumulation of land with one single organisation should also be considered.

There is no consensus on granting freehold status on land alienated to the public, particularly in the dry zone colonisation schemes and regularised encroachments. Granting free hold status to the peasantry on lands alienated under LDO permits/*Swarnabhumi* cannot be taken in isolation for the sake of the environment. It has more ramifications and complexities than what is seen superficially.

In regard to NEAP recommendations, it is relevant to assess the implications of having free hold on land or lack of it and its impact on the environment. In Sri Lankan society, free title is good only for one generation. It is a common practice not to transfer lands to the heirs by a deed of transfer or a Last-will. The second generation will either share the crop or the produce. Generally, by the second and third generation, the land is completely neglected and allowed to degrade. It appears that free titles do not ensure good management of lands and that they are also subjected to the same type of degradation as alienated or encroached lands.

The recommended NEAP land policy options to address the main causes of land degradation are:

- Shifting cultivation is the main rainfed agricultural system in the dry zone. Under the particular agro-ecological conditions in the dry zone, this has been a more suitable system of crop production under conditions of low population densities. However, due to the current high population density and increased demand for agricultural products there has been excessive land clearing. Decline in forest cover and soil erosion are main impacts of chena cultivation.

For the same reasons agriculture on sloping lands have spread into very steep slopes, marginal lands and to vulnerable areas. Both chena and sloping land agriculture are predominantly on encroached lands at one time.

The suggested policy options to limit the growth of unsuitable land uses are:

- Adopt a policy of land alienation to landless for agriculture only with land use planning.
- Stop regularisation of encroachments.
- Stop alienation of lands for agriculture in districts, where the potential is already exhausted. However re-allocation of lands currently used for other agriculture activities may be permitted.
- Stop reclamation of low lying land for infrastructure development.
- Limit the conversion of prime agricultural lands, private or public, to other uses. This is a major problem in privately owned property management. Agriculturally good lands are fragmented and put into unproductive uses. People will be forced to move into marginal lands in order to collect food, fibre and fuelwood and in consequence this will lead to land degradation.

The other important land policy options are:

- Land tenure, short term leases for agriculture do not create necessary incentives for land development and improvement of productivity. It promotes the exploitation of the resources to the maximum. The land lease for annual crop production should be long enough to encourage land development and improvement.
- Land management contracts should be on a longer contract period that will give the contractor the benefits of land improvement and protection.
- Housing and road construction are two major activities that increase soil erosion. Adopt a policy of proper planning in housing and roads construction on steep slopes (30%).

The lack of freehold title on land has been considered to lead to land degradation. The argument is that without a clear title no one will invest on land improvement. The government lands alienation to the peasant class on a LDO permit is a 99 year lease, provided the land is developed within a specified time. It should be noted that freehold in this country had not helped to prevent land degradation. There are extensive free-hold lands that have low productivity and subjected to neglect and degradation. The fragmentation of freehold lands beyond economic sizes is much more than the fragmentated alienated lands.

As a policy reform the government should facilitate voluntary consolidation of fragmented lands and shared control of resources. Some of the best agricultural freeholds are converted to non-productive uses. There is a need to apply some minimum controls on the private land use and management. This may be possible with the current Acts in force. Land is a national resource and conservation of it is a responsibility of every citizen. The nation has to bare at least part of the cost.

Agricultural policy: The National Agriculture, Food and Nutrition Strategy (1984) provides a comprehensive statement with respect to the Agricultural policy of Sri Lanka. The current policy thrust more focused to ensuring food security, controlling cost of living, maintaining farm income, and encouraging exports of non-traditional crops, particularly horticultural crops. Further, the more recent Ministry directives indicate that certain commodities, such as rice, chili, pulses, potato, and onion will be protected through import restrictions. Some of the policy adjustments and strategies adopted are as follows:

- Providing lands to landless farmers and taking steps to improve the land productivity.
- Improving land water, forestry and other resources management.

- Strengthening of agricultural support services especially in research and extension.
- Strengthening agricultural producers by organising them into statutory bodies under Agrarian Services Law.
- 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.

In the current agricultural policy, the strategies that are adversely affecting the environment are: support for soil erosive crops, dependence on crops like tobacco for much of the government revenue, thereby giving indirect support, and introduction of crops for export that require high chemical inputs that affect the environment. Review of these policies are necessary. It is useful to weigh the benefits of supporting environmentally damaging crops against imports of such crops or adoption of different strategies.

The reduction of the green house effect and its consequences have to be addressed at a global level by the reduction or at least in the increase of carbon dioxide sent to the atmosphere by the burning of fossil fuels, etc. An important green house gas is Methane produced by the anaerobic decomposition of organic matter such as vegetable and animal tissues. In the case of Sri Lanka, any reduction in the release of green house gases has to be with regard to the release of Methane. In addition to the production of Methane in the wetlands, considerable amounts are also produced owing to the agricultural practice of flooding paddy lands for weed control. The ADB regional study (MARGA Study) had the terms of reference under which studies were to be recommended regarding flooding of paddy fields. The suggestion was to institute studies to find out the time required for weed control as against continued flooding resulting in larger quantities of Methane production.

Trade policy: Trade policies relevant to NEAP actions in the area of land degradation are those policies linked to the availability of agricultural commodities that may be produced locally. Importation of commodities for the local market have direct impact on local agriculture, and as a result there are impacts on land and water resources. The main features of the trade policy are: controlling the cost of living, providing commodities to satisfy consumer demand, and marginally supporting local production of crops. Past experience shows that imports commonly compete with local agricultural production. When this happens the profit margins of the local producers drop too low and reduce the reinvestment capacity of the land user on land improvement. On the other hand import restrictions on some commodities favour expansion of such crops into vulnerable areas, for example potato and red onion are highly erosive crops grown on steep lands. Trade policy reforms are in much need.

Industrial policy: The current drive is to achieve NIC status through industrialization. The government's goal is to expand industrial activity in the rural sector, which will have a direct impact on the use of land and water resources. With the establishment of industries in the rural areas, a large section of the rural labour force will move out from the erodible marginal lands. Moving away from agricultural based employment is one of the policy measures recommended for NEAP action. Also if rural industries are linked to agricultural produce, profit margins can be increased to enhance the re-investment capacity of the land users.

Institutional Reforms

Institutions have been established to implement policies and strategies designed to mitigate adverse impacts on the environment. There are many institutions with overlapping responsibilities. A major problem faced by all these institutions is lack of capacity to perform the statutory functions effectively. There is a dearth of trained personal and the capacity of all the institutions at the field level is very weak. Most institutions are not able to monitor, evaluate and take appropriate action at the correct time. Institutional reforms for NEAP actions must include capacity building in the institutions responsible for maintaining environmental quality. There is also a need for suitable coordination mechanisms between agencies.

Recommended NEAP Sub-projects in Land/Water Area

The key to lessening the environmental impacts of land degradation is to implement projects that will reduce soil erosion and improve agricultural productivity. Potential NEAP sub-projects which will help improve land degradation are as follows:

- Integrated land and water resources management to improve the land productivity.
- Integrated management of minor tank ecosystems.
- Implementation of the Soil Conservation Act.
- Integrated pest management.
- Shared control of natural resources (SCOR).
- Rehabilitation and replanting of degraded tea lands.
- Reclamation of degraded land (saline lands, drainage, etc.)
- Landslide hazard mapping and geological mapping.
- Study on feasibility of increasing ground water potential in the Jaffna peninsula by minimising rain water loss.

Applied Research Needs in Land/Water Area

There is a need to initiate research programmes to cover the following issues:

- Study of land tenure issues including a comparative study of soil erosion from private land and state lands.
- Undertake review of the land to landless agricultural policy.
- Develop a database on soil erosion and other soil degradation mechanisms and develop criteria for monitoring and evaluating land degradation.
- Study the use of groundwater for supplementary irrigation and drainage development.
- Study appropriate incentives to conserve water.

4.7 RECOMMENDED NEAP ACTIONS IN WATER RESOURCES MANAGEMENT

Supplementary to the focus on land/water aspects, there is a need to discuss water resources management (water sector) separately. The Institutional Assessment for Comprehensive Water Resources Management Project will prepare proposals for institutional strengthening and capacity building in the area of comprehensive water resources management. The project is to cover all aspects of the water sector, with its main emphasis on institutional arrangements. The draft report entitled "Institutional Assessment for Comprehensive Water Resources Management" sets out the following two guiding principles for water resources management:

1. Water must be managed holistically; and
2. Water must be managed efficiently.

In addition, the ADB study presents an action plan at an overview level. The key actions are presented below;

- Establish a National Water Council.
- Develop a National Water Policy.
- Prepare and enact a National Water Act, and amend other water-related legislation.
- Reorganise and strengthen the management of water-sector institutions.
- Implement existing, proposed and new policies designed to achieve financial sustainability in water sector operations.
- Establish the systems needed to provide the data and information required by decision-makers.

Policy Options in the Water Sector

The water sector must be responsive to overarching national policies and at the sametime, must be fully integrated into the process of developing them. There are over 40 Acts of Parliament with relevance to the water sector. The laws are administered by numerous agencies with a wide range of sometimes overlapping and conflicting responsibilities. However, the greatest single weakness is a lack of effective administration and enforcement.

Strong legal provisions must be made for the allocation and the administration of rights to take and use water, both from surface water bodies and from groundwater aquifers. The need for a Water Act is urgent in Sri Lanka. The National Water Council should place a high priority on drafting a National Water Act, in conjunction with rationalisation of existing water-related law.

Comprehensive water resources management requires a strategic vision and plan, which guides more detailed planning and annual budgeting. Water sector agencies should strengthen their strategic and corporate planning, introducing best practice from the world of business to themselves to become more business-like. It will require considerable training in the new techniques, inculcation in staff of a new "managerial" culture, and persistence.

The National Water Council should place a high priority on developing a National Water Policy. This may synthesize from the existing body of water-related policy, but must use extensive consultation with water users and providers, all levels of government and the community, and others with relevant experience. The process must ensure that the National Water Policy is in harmony with existing environmental policies and legislation.

Institutional Reforms in Water Sector

The ADB study calls for the establishment of a National Water Council. This council should be granted the responsibility of developing a national water policy as well as participate in the elaboration of water sector policies and plans.

Thorough management reviews should be undertaken in all water sector agencies which have not recently been reviewed. Where necessary an "organisational development intervention" should be undertaken. The National Water Council should provide the Government with independent advice on arrangements which most effectively meet the interests of water users and managers.

Privatisation of the water utility companies might solve some of the problems. Privatised or corporatised companies would be forced to cover long-term operating costs through adequate charges for the services supplied. However, as they operate in a monopoly situation, supplying goods to cover vital social needs, a full privatisation would require a price regulatory body.

Another solution could be to let the local communities own the public utilities covering urban water supply. If sound, long-term sustainable practices were followed in such utilities owned by the local community, the need for privatisation would not be necessarily. From an economic point of view, this mix of community ownership and sound financial management would secure an optimal solution for long-term operation of pubic utilities.

Recommended Water Resources NEAP Sub-projects

The key project is to implement the recommendations contained in the ADB study. This document should form the framework for initiating projects to improve the management of water resources in Sri Lanka. Further, the following projects should be undertaken:

- Develop comprehensive river basin plans for the major river basins.
- Continue and expand the water supply and sanitation programmes to extend the coverage of adequate supply of drinking water and sanitation facilities.

- Set up a comprehensive surface and ground water quality monitoring programme and develop ambient water quality standards applicable to Sri Lanka.
- Prepare management plans for polluted waterbodies, e.g. Beira Lake, Kelani River.
- Develop criteria for assessment of ground water resources.
- Initiate action to augment Colombo metropolitan area water supply from other sources such as the presently unused Kalu Ganga.

Applied Research Needs in Water Sector

Sector agencies should study future needs for water-related data and information, and re-design their existing data acquisition programmes to ensure that they will meet those needs. Particular attention must be paid to programmes for nation-wide monitoring of groundwater quantity and quality, water use, and baseline surface water quality. Further, additional research is needed to study feasible and appropriate water allocation mechanisms as well as water pricing.

The matrix given at the end of this chapter provides a more detailed description of the land and water resources analysis, and identifies the proposed NEAP actions together with additional policy and institutional reforms.

ANALYSIS OF LAND AND WATER RESOURCES PROGRAMME AREAS

Environmental Issues	Environmental Impacts	Physical Indicators	Economic Indicators	Proximate Causes	Underlying Causes	Existing Programs	Scale Extent Locations	Options for NEAP Actions: Policy options	Institutional Reforms	Sub-project Investment	Applied Research
LAND RESOURCES											
-Land degradation -Decline in land productivity	-Rapid siltation of water bodies -Changes in micro-climate -Loss of Bio-diversity -Water Pollution -Desertification -Flash floods & associated losses of of lives & property including agricultural lands	-On the average 50 - 100 tonnes/ ha/yr of soil loss -Increase in demand for regular maintenance of minor irrigation systems -Damage to croplands in valleys and loss of paddy production -High rate of reservoir siltation	-Loss from tea 1000kgx100,000x50/= = Rs 5000 0 M Loss from small holder 400kgx40,000x50/= = Rs 800 0 M Loss from other lands over Rs 1000 0 M? -Power loss -Irrigation loss -Cost of water treatment -Cost flood damage	-Population pressure and the lack of alternatives for income/livelihood -Un-planned land use -Shifting cultivation or temporary occupation of lands -Lack of funds for land improvement -Absence of clear land ownership -Lack of land marking and identification -Lack of land consolidation strategies -Poorly planned infrastructure development -Conflicting interest in sharing resources -Lack of awareness and knowledge -Political interference -Lack of political will to implement conservation regulations	-Attempts to find employment through agriculture -Lack of a comprehensive soil Conservation Act and implementation capacity -High income from crops that cause accelerated soil erosion -Land alienation without adequate land use planning -Policy of regularization of encroachments where agriculture is unsustainable -Short-term leasing/it is a dis-incentive to attract investments for land improvement -Proliferation and multiplicity of institutions with overlapping responsibilities without proper coordination mechanisms	-SCOR/IIMI -GTZ -ODA -ADB -IRDP- - Hambantota Kalutara Monaragala Ratnapura N Eliya Kandy -ODA - Forestry Sector Development Project -Land Use Planning Project ADB -South East Dry Zone Agriculture Development Project -HADABIMA -Upcountry peasantry commision - JICA -Perennial tree crop project -Small holder tea subsidy program	-US $ 2 3 M in 2 division & parts of 5 divisions covering two parts of watersheds Rs. 4 0 M Assisting private & public sector organizations in adopting SALT techniques -Forest Land Use Mapping, Upper Mahaweli -US $ 10 0 M Participatory forestry whole island -Small component on land management -Funds nearly exhausted ----- -Funds nearly exhausted Awaiting extension of project Awaiting extension of project Operated on very limited scale -US $ 9 3 M -Project funding over -No funds, 2250 farm families in the zone -No Funds, in 7 districts -Pilot project 25 ha in two divisions with JICA assistance -Loan funds - wet zone -57,000 to 67,000 per ha available, used very little	-Land policy. Land alienation to landless for agriculture only with land use planning. Stop adhoc regularization of encroachments. Stop alienation of land in districts where the potential for sustainable agriculture is exhausted - Limit expansion of erosive crops such as potato/onion on steep lands, Limit reclamation of low lying lands for infrastructure development, Adopt a policy of proper planning of housing to limit construction on steep slopes (> 30%) -Land tenure, stop short term < 5yrs leasing for seasonal crops, Use management contracts at least for a period of 30 yrs, both leasing and contracts with specific conditions, Limit conversion of prime agricultural lands private and government for other uses; -Develop incentives to promote land productivity-soft loans and grants,	-Enhance the capacity of DOA for effective implementation of the Soil Conservation Act -Establish the soil conservation fund -Strengthen the land use planning capacity at national, provincial and divisional levels -Develop implementation capacity of agricultural development agencies and establish mechanism to link agency collaboration in multi-sectoral crops -Increase awareness, to apply community pressure on politicians and make politicians accountable to the community -Develop resources user organizations to protect and use resources -Develop mechanisms to coordinate environmental actions of different agencies - Attach environmental conservation measures to subsidies. -Establish land tenure and productivity centre	-Land productivity improvement -Implementation of the soil conservation Act -Resources management in the village tank ecosystem -Integrated pest management -Extension of SCO 5 project by two yrs -Watershed management in selected watersheds with emphasis on wet zone -Rehabilitation and replanting degraded Tea lands in plantations -Weed management in the dry and wet zones	- Applied research programme for land tenure & land use issues -Evaluate the consequences of LDC land alienation on second and third generation -Review the land to landless for agriculture policy -Develop a data base on soil erosion and other soil degradations -Develop criteria for monitoring and evaluation of land degradation -Evaluate comparative situation of land degradation in private lands

ANALYSIS OF LAND AND WATER RESOURCES PROGRAMME AREAS

Environmental Issues	Environmental Impacts	Physical Indicators	Economic Indicators	Proximate Causes	Underlying Causes	Existing Programs	Scale Extent Locations	Options for NEAP Actions			
								Policy options	Institutional Reforms	Sub-project investment	Applied Research
-Land degradation under Irrigation	-Encroachment of salinity and alkalinity -Waterlogging and loss of agricultural lands -Healthe effects- increase in water borne diseases -Pollution of water courses and ground water by pesticides and fertilizers -Poor ground water quality	-5000 - 6000 ha ? -Pollution Levels	-Capital loss Rs. 250,000x1000 = Rs 250 0 M Annual yield loss 0 5t/ha Rs 100 0 M/yr	-Poor water management -System water losses -Inappropriate cropping -Poor institutional arrangements for water management -Lack of drainage of agricultural lands -Uncertain water supply -poorly managed Irrigation systems -Lack of awareness and knowledge -Lack of proper training in water use -Over design/ erroneous design of systems -Political interfer- ences in water management decision making	-No incentive for saving water. -Poor water allocation -Irrigation system Inadequacies -Individual profit concerns			-Set up incentives for saving water -Develop water allocation policy -Increase water use efficiency	-Establish user organizations -Involve water user organizations in water management -Develop training programs in water management -Increase advisory services	-Reclamation of saline lands -Water management managment in the low country -Drainage project in the low country -Drainage improvement in Irrigation schemes	-Study the use of ground water for supplementary irrigation and drainage improvement -Study appropriate incentives for saving of water -Study relationship of water supply stability and water use efficiency -Study the contribution of Irrigation system losses for waterlogging

ANALYSIS OF LAND AND WATER RESOURCES PROGRAMME AREAS

Environmental Issues	Environmental Impacts	Physical Indicators	Economic Indicators	Proximate Causes	Underlying Causes	Existing Programs	Scale Extent Locations	Options for NEAP Actions			
								Policy options	Institutional Reforms	Sub-project Investment	Applied Research
				-Lack of inter-institutional arrangements and coordination mechanisms -Absence of long term research agenda	-High values attached to land under our social setup and political environment -Deficiencies in the judicial system -Lack of comunity/ public participation mechanisms			-Adopt diversified land use for mid-country smallholder tea lands -Agricultural policy Device policy measures through Soil conservation Act to make soil and water conservation conditional to cultivation of erosive crops. -Device specific policy measure to make cultivation of erosive crops less attractive -Adjust trade policy to reduce incentives to grow erosive crops -Provide incentives to establish agro-based industries in the rural areas to reduce pressure on land	-Strengthen the agencies responsible for land marking and identification		

ANALYSIS OF LAND AND WATER RESOURCES PROGRAMME AREAS

Environmental Issues	Environmental Impacts	Physical Indicators	Economic Indicators	Proximate Causes	Underlying Causes	Existing Programs	Scale Extent Locations	Options for NEAP Actions			
								Policy options	Institutional Reforms	Sub-project Investment	Applied Research
-Landslides	-Loss of life & property -Loss of bio-diversity -Landless refugees and health problems -Degradation of human life -Water pollution -Siltation of water bodies	-Annually several major slides	-Annually several millions of rupees worth of property lost -Loss of life invaluable	-Excessive rain leading to saturation of soil substrata -Import of water into vulnerable areas -Unsuitable Agricultural practices -Lack of awareness & knowledge -Lack od information on vulnerable areas unplanned settlement	-Natural phenomena -Lack of alternative lands for settlement -Lack of information on land slides	-Land use hazard mapping project NBRO/UNDP		-Land settlement on the basis of land use planning -Prepare emergency plans -Limit transfer of water in to vulnerable areas	-Strengthen natural disaster fund	-Continuation of landslides hazard mapping -Detailed geologic mapping of transitional areas between major planation surfaces	-Develop advance warning criteria -Develop an awareness programs
-Reduction in sustainability or decline in the quality agricultural environment.	-Rapid fluctuations in productivity, Development of resistant pests and diseases, crop losses water pollution loss of bio-diversity, sterilization of soils	-Pollution levels crop failures outbreak of pests	-Highly variable	-Reliance on chemical fertilizers,pesticides, fungicides and and weedicides	-Lack of proper integrated pest management on a wide scale, high profit motives	-Limited integrated pest management research scale			-Provide training in IPM to agricultural extension workers, strengthen the plant protection service	-Integrated pest management Alternative agricultural	

5: FORESTS AND BIODIVERSITY

5.1 INTRODUCTION

Sri Lanka's remaining natural forests are now located primarily in the dry zone, with much smaller wet zone forests situated almost entirely in hilly or mountainous regions. The country's total closed canopy forests--comprising old growth areas, secondary regrowth from previously logged forests, and plantations--cover approximately one-fifth of the country. As mentioned in Chapter 1, this is down from four-fifths at the turn of the century. Forests provide a variety of economically and ecologically important services to society, ranging from their hydrological and soil conservation benefits, to their biomass production and biological storehouse functions. Forests provide the basis for tourism earnings associated with the wildlife habitat they provide, and they are also sources of fuelwood, timber, medicinal plants and other non-timber products. Properly valued, however, the benefits from their watershed and biodiversity conservation functions would far outweigh these more tangible outputs.

The nation's biological diversity is threatened. This important national asset is defined as the variability among living organisms from all sources, inter alia, terrestrial, marine, and other aquatic ecosystems, and the ecosystems of which they are part. This includes variation within species, between species and of ecosystems. Biodiversity loss results from the decline in forest cover as well as from wetland degradation, coral reef destruction, medicinal plants overexploitation, increasing reliance on a very few food crop cultivars, and from other factors. The answers to these problems will be found in a variety of well targeted approaches which extend well beyond forest conservation and park protection schemes. We are only just beginning to understand the economic significance of precious biological resources, and this chapter reviews the threats to the country's forests and biodiversity, and recommends appropriate steps to reverse the current negative trends.

5.2 CURRENT STATUS AND TRENDS REGARDING FORESTS AND BIODIVERSITY

Sri Lanka's biological resources have helped regulate micro-climates, recycle nutrients, protect soil and water, control pests and diseases, and have provided essential habitats for wildlife. Some key impacts or consequences of forest and biological resource losses are:

- The destruction and isolation of wildlife habitats, especially in the wet and intermediate zones.

- Disrupted hydrological cycles from decreased forest cover, which are apparently contributing to altered microclimatic conditions (island-wide, dry areas appear to be getting drier, and wet areas wetter). Decreased forest cover also reduces rainfall infiltration and increases soil erosion, leading to greater run-off and less opportunity for groundwater recharge and increased sediment loads in rivers, contributing to shortened lifespans for irrigation channels and reservoirs supporting hydro-electric and irrigation dams, as well as the loss of aquatic species.

- Decreased availability of valuable timber species and other forest products formerly housed in natural forests, many of which are now using scarce foreign exchange. The annual value of timber lost through conversion of forests to agriculture may be in the range of Rs.300 million.

- Fuelwood is becoming scarcer, leading to higher prices and increased labour requirements for collection.

- Increased risks for agriculture and plantation systems dependent upon monocultures. The likelihood of developing new and valuable uses of natural products from wild genetic resources is also diminishing because wild species are being overexploited and their diversity is being reduced.

- Prospects for ecotourism are being jeopardized.

As mentioned, the economic costs associated with these consequences are likely to be very significant, even if they are difficult to measure. These losses are not captured by traditional benefit-cost analyses or the current system of national income accounts (calculating Gross National Product), because the conservation and non-market benefits from biological resources (and the economic costs associated with their loss) are not counted.

The area of remaining natural forests in Sri Lanka by type is given in Table 5.1. Closed canopy natural forests cover an estimated 1.33 million ha or 20.2% of the land area (compared to 44% cover in 1956 and 70-80% around 1900). Teak, eucalyptus and pine plantations cover a further 117,000 ha. The annual rate of deforestation is in the region of 50,000 ha (4%). Deforestation has been most severe in the wet zone, where only relatively small patches of undisturbed forest remain. As a result, species-rich lowland rainforests are limited to less than 10% of the total forest area, and the remaining natural forests are concentrated in the intermediate and dry zones.

REMAINING EXTENT AND TYPES OF SRI LANKA'S NATURAL FORESTS

Table 5.1

TYPE	AREA	% OF TOTAL FORESTS
Dry Monsoon Forest	572,630	43.04
Moist Monsoon Forest	524,910	39.45
Lowland Rain Forest	120,320	9.04
Sub-montane Forest	66,530	4.99
Dry Zone Riverain	37,930	2.85
Mangroves	6,980	0.52
Dwarf Montane	1,280	0.10
Total: Dense Natural Forest	**1,330,550**	**100.00**
Dry Zone Total	1,135,580	85.00
Wet Zone Total	195,110	15.00

But the true picture is far worse. Many of the remaining natural forests have been seriously degraded, leading to substantially reduced biodiversity and low productivity. Recent survey figures indicate that undisturbed old growth forests represent less than 5 percent of the total remaining natural forests outside of protected areas.

As an island nation, Sri Lanka's isolation has led to the evolution of many unique--or endemic--species found nowhere else in the world. For this reason, the country's biodiversity is of global significance. Because of the range of topography and climate in the island, Sri Lanka also holds the distinction of having the greatest biodiversity per unit area in Asia.

Although over 12% of the land area has been set aside for conservation, most of the relatively large reserves are in the dry zone, and not in the wet southwest region where plant and animal diversity and endemism are most significant. The Department of Wildlife Conservation has jurisdiction over parks and other protected areas totalling 620,000 ha. Many encroachments have incurred within these areas, some of the forests within these areas have been commercially logged, and most are becoming seriously degraded. Under the Forestry Department, 36 biosphere reserves cover 127,000 ha, and certain other areas have in principle been set aside for conservation. But many of these areas have not been demarcated, protection is minimal, habitats are deteriorating rapidly, and some areas have been planted with exotic species.

If current trends continue, important forest, wetland, coastal and marine ecosystems will continue to be damaged, some of them irreversibly, and biodiversity will decline at an accelerating rate. Goods and services derived from these natural systems will become more scarce and expensive, and substitutes will need to be found, if possible. These trends will have serious implications for the economic welfare of the nation as well as for its environment.

5.3 CAUSES OF FOREST ENVIRONMENTAL DEGRADATION AND BIODIVERSITY LOSS

Deforestation contributes to a substantial portion of biodiversity loss, and its causes are similar to those leading to degradation of other critical ecosystems:

- Forest lands have given way to large infrastructure and settlement projects, especially for hydro-power and irrigation. About 50% of the loss of forest cover during the last decade was due to such activities, with the Mahaweli River Basin scheme alone responsible for the conversion of approximately 200,000 ha of mostly dry zone natural forest to other uses.

- Over 95% of the country's forests are state owned. Weak enforcement of land use regulations has allowed increasing rates of agricultural encroachment into protected areas as well as substantial rates of illegal timber felling for construction wood and fuelwood.

- There has been widespread overexploitation of economically valuable plant and animal species.

- Chemical pollution from agricultural and industrial activities is exerting ever greater strains on the assimilative capacities of wetland, coastal and marine ecosystems.

But these are mostly symptoms rather than fundamental causes. The underlying issues are more complex and have barely begun to be understood. Underlying causes of forest degradation and biodiversity loss include the following:

- **Population Pressures and Economic Growth:** Though the population growth rate has slowed in recent years, there is still an inherent pressure on the natural resources base from the large proportion of society which directly depends upon land, water, forest, coastal, and biological resources for its sustenance. For example, the still growing population's increasing demand for land and for agricultural products--in the absence of sufficient alternative livelihood options--has led to the continual expansion of planned as well as unplanned agriculture at the expense of forests and wetlands. Protected areas often provide a refuge of last resort for the landless, effectively subsidizing economic development deficiencies in other sectors. Moreover, many of the extensive and unproductive cultivation methods in use probably have less economic value than the forests or wetlands which they replaced.

- **Lack of Appropriate Policy Frameworks:**
  Forestry: Sectoral policies in forestry have largely been directed towards maximising timber revenues (although there is a moratorium on commercial logging in natural forests). But low royalties on timber extraction have led to the rapid exploitation of forests, and little attention has been given to multiple-use forestry or biodiversity conservation. Existing forest policies, or their absence, have led to inefficient landuse decision-making and substantial economic losses.

  Biodiversity: There is no set of national policies and programmes establishing priorities for biodiversity conservation. Systematic identification of the genetic resources, species and ecosystems which need to be conserved and protected has only recently begun with initiation of forest ecosystem inventory work. Biodiversity in coastal and marine areas and outside of protected areas has been virtually ignored.

  Other Economic Sectors: National policies aimed at stimulating production in agriculture, fisheries, energy and industrial goods include a variety of measures which can have--usually unanticipated--adverse impacts on the economic benefits provided by natural ecosystems.

These include subsidies, tax credits, concessionary leases and price controls (certain of which have recently been reduced as part of liberalisation policies). Inter-sectoral coordination is badly needed to consider the cross-sectoral consequences of development policies on forests, agriculture germplasm, medicinal plants production, fisheries, wildlife protection, coastal zone management, and other natural products or systems.

- **Institutional Inadequacies:** Laws applicable to the conservation of forests and biodiversity have been deficient and difficult to enforce. They place responsibility on too many agencies, assign unrealistic responsibilities to government agencies, and often impose inappropriate sanctions. For example, existing laws have not been enforced strictly against illegal logging, poaching, and agricultural encroachment in forests and other protected areas.

  As in many other countries, the Forestry Department has, until very recently, been dominated by a traditional orientation towards logging, and it has given little consideration to other forest uses, including watershed and biodiversity conservation. The Department has not been guided by clear policies and faces many operational constraints. There are few operational forest management plans, harvesting techniques are destructive and uneconomic, and the potential use of wood substitutes in construction or household energy use has been ignored. The Department has lacked resources for adequate staffing, training and technical inputs, and coordination with other government agencies with overlapping interests has been minimal.

  The Department of Wildlife Conservation is in urgent need of a concerted capacity-building effort. Basic on-the-ground protected area management functions are not being carried out, much less routine planning and research. The Department has virtually no technical staff to guide its programmes and implement complex management responsibilities. Partly as a consequence, its field staff are poorly supported by management planning and training.

  Although there are many NGOs within the country with relevant interests and capabilities, very few have played a significant role in forest management or other biodiversity conservation efforts. Of the international NGOs, IUCN has made an important contribution to the Sinharaja Conservation Project and to a continuing assessment of high priority sites for forest conservation (see below).

- **Inadequate Information and Analytical Capabilities:** The level of understanding and quality of information available to support management decision-making in key agencies responsible for forest and biodiversity conservation is grossly inadequate. Applied research programmes are extremely limited, and they are generally not providing useful information on key management-oriented problems. Where information does exist on key biological resources, it is often not shared between agencies. Monitoring and evaluation of existing programmes and projects has been very limited. There has been very little analysis of the value of biological resources or their contribution to the national economy. Most significantly, little or no consideration has been given to how conservation can be reconciled with local people's development aspirations and to which systems of local community involvement and incentives to induce active participation work best.

- **Lack of Popular Support for Biodiversity Conservation:** Local people have often been treated as opponents of forest management and biodiversity conservation rather than partners. The state controls about 80% of the land, and there are few incentives for local people to support forest management or wildlife conservation programmes. Local management systems--which are often sustainable, having been developed over very many years--have largely broken down as national laws and policies replaced traditional authority structures. Government agencies' weak ability to manage state lands, combined with individuals' inability to establish tenurial or access rights, lead to forests and protected areas becoming open access resources which are overutilised and degraded because individuals have no incentive to conserve resources, despite the social benefits. Communities generally lack opportunities and incentives to participate in and benefit from conservation of natural resource systems. There are very few social forestry or other truly participatory programmes.

5.4 EXISTING FOREST MANAGEMENT AND BIODIVERSITY CONSERVATION PROGRAMMES

The 1986 Forestry Sector Master Plan (FSMP) reflected traditional priorities and concentrated on timber production and marketing, giving little attention to broader environmental issues and soliciting virtually no public or NGO participation. The Plan's recommendation that most of the remaining lowland rainforests be logged was widely criticised, and it paid little attention to fundamental legal, organisational and policy issues. The Forestry Sector Development Project (FSDP) was initiated in 1990 to implement some of the recommendations in the FSMP and to make revisions, as needed, to the FSMP.

The Forest Sector Master Plan Revision effort initiated in 1993 is meant to address the shortcomings of the FSMP and to prepare a new national forest policy with an associated sectoral investment programme. A significant feature of this effort is the National Conservation Review, which specifically examines the forest-based biological diversity of the country. These and other current programmes are summarized in Figure 5.1

Current biodiversity conservation initiatives include a project financed by the Global Environmental Facility focused on improved protected area management. Other efforts center on conservation of forests, wetlands, and mangroves.

5.5 RECOMMENDED NEAP ACTIONS

Policy and Institutional Reforms

It is already clear that urgent and fundamental policy and institutional reassessments and reforms are needed within forestry and, especially, wildlife conservation. Analysis of these issues has already begun under an ODA-funded institutional development study under the revised FSMP umbrella. But these steps must be carefully formulated and then approved by the highest levels of government. Piecemeal tinkering seems unlikely to be effective.

Effective management and conservation of what is left of Sri Lanka's forests, other natural habitats and biodiversity will require as a prerequisite:

i. High-level political commitment to establishing an appropriate legal, organisational, and policy framework.

ii. Improving political and public understanding of the economic and environmental benefits from forest and biodiversity conservation.

PART 2

ENVIRONMENTAL ACTION PROGRAMME AREAS

Figure 5.1

SUMMARY OF CURRENT NEAP ACTIVITIES IN THE FORESTS AND BIODIVERSITY PROGRAM AREA

PROGRAM	MAJOR FUNDING SOURCE	TOTAL FUNDING (US$ Mn)	START-END DATE
▸ Forestry Sector Development Project	WB/UNDP FINNIDA/ODA	46 (Total)	1990-1996
- Forestry Management and Plantations Project--Block Planting in the Victoria Reservoir Area	ODA	9	
- Forestry Research and Information Project	ODA	6	
- Forest Plantation Management and Training Project--Block Planting in Degraded Dry Zone Areas	World Bank	31	
- Forest Sector Master Plan Revision	World Bank/ FINNIDA/ODA	1	
▸ Forestry Sector Development Project II	World Bank/ Other Donors	82 (TBD)	1996-2000
▸ Participatory Forestry Project - Develop Homestead Gardens, Farmer Woodlots and other Approaches to 15,000 ha of Land in 24 Districts	ADB/ Australian Govt.	25	1994-1999
▸ Mangrove Conservation Project - Identify and Demarcate Mangrove Areas - Carry out Biological and Socioeconomic Studies	NORAD	0.3	1993-1996
▸ Wetland Conservation and Protected Area Management Project - Identify Priority Sites and Prepare 10 Management Plans	Netherlands Govt.	1.5	1991-1996
▸ NAREPP/Biodiversity Conservation Component - Support Preparation of Biodiversity Conservation Action Plan - Institutional Strengthening	USAID	1.5	1991-1996
▸ Forest/Land Use Mapping Project	ODA	1.3	1991-1996
▸ Sinharaja Conservation Project (Phase 2) - Research Studies and Management Plan--including Demarcation of Boundaries and Establishment of a Buffer Zone - Awareness and Education	NORAD	1	1994-1998
▸ Knuckles Range Conservation Project (Phase 2) - Research Studies and Management Plan--including Demarcation of Boundaries and Establishment of a Buffer Zone	NORAD	TBD	1994-1998
▸ Wildlife Conservation and Protected Area Management Project - Institutional Strengthening of DWLC - Training	UNDP/FAO (GEF)	4	1992-1996
▸ National Conservation Review - Inventory of Wet Zone Forests, including Sinharaja and Knuckles Ranges	UNDP/FAO (IUCN)	-	1993-1996

The 1986 Forestry Sector Master Plan failed to address these issues adequately. In contrast, the revised Plan (due to be completed in November 1994) will emphasize the following:

Institutional Development	- Forest policy and legislation - Organisations and human resources development - Forestry research and development - Forestry extension and communication - Monitoring and evaluation
Man and Environment	- Land use and forest resources - Forest-based rural development - Conservation of ecosystems and biodiversity - Watershed management
Forest Production and Utilisation	- Management of natural forests - Forest plantation development - Non-forest wood production and substitutes - Fuelwood and rural energy - Wood-based industrial development - Non-wood forest product development

Since the Forest Sector Master Plan Revision effort is still underway at the time of this NEAP updating exercise, it would be premature to propose specific policy reforms for the forest sector until these studies are completed and forest policy and institutional recommendations are developed.

Some of the key questions to be addressed can be mentioned, however, including the following:

- How can communities be fully incorporated into the national strategy for forest management?
- Should the moratorium on natural forest logging be converted to a ban?
- What management approaches will be best suited to capture watershed, biodiversity and recreation benefits from forests?
- Will the new forest policies and programmes be able to arrest the rapid rate of deforestation?
- Can the private sector play a positive role in forest management under appropriate regulations and incentive structures?

Sri Lanka does not yet have a national action plan for the conservation of its biological diversity. There are several disparate efforts underway which can contribute to such a strategy, including the biodiversity conservation aspects of the Forest Sector Master Plan Revision, marine ecosystem studies, work on agricultural germplasm, and ayuverdic materials research. However, it is important that a unified national Biodiversity Action Plan (BAP) be prepared as an integral part of NEAP. This effort should be overseen by the National Committee on Biodiversity chaired by the Secretary/MEPA.

Applied Research

A range of high priority studies and applied research in forestry has been included in the revised Forest Sector Master Plan. Designing an integrated protected area network is one of the most critical needs in biodiversity, and the National Conservation Review and the GEF-supported Wildlife Conservation and Protected Area Management Project have begun this process. Other priority studies and applied research needs in biodiversity include the following:

- Studies in the valuation of biological resources to help incorporate biodiversity considerations into economic development decision-making.

- Analysis of sectoral and cross-sectoral economic development policies on forests and biodiversity, including wider use of EIAs.

- Pilot programmes to test alternative approaches for engaging local communities in activities which will improve their living standards and contribute to biodiversity conservation.

- Identifying sources and opportunities for generating non-government and private sector funding for conservation.

- Evaluating the potential economic and environmental contributions of ecotourism.

Developing the institutional capacity to identify and conduct applied interdisciplinary research involving the Government, universities, and NGOs will be as important as the findings of the studies themselves.

NEAP Sub-projects

The Forest Sector Master Plan Revision process and the national Biodiversity Action Plan are meant to identify additional policy and institutional reforms as well as an investment agenda. However, immediate priorities can be identified in the following key areas:

- Expanding and improving professional networking and training programmes in forest management and biodiversity conservation.

- Public awareness and community participation programmes in rural areas to support sustainable forest management and biodiversity conservation.

- Well targeted conservation actions--involving local communities--designed to avert irreversible biodiversity losses.

- Establishment of a national biodiversity data base, preferably including Geographic Information System features for easy use in the Biodiversity Action Plan preparation.

Overall priorities in this programme areas should be reviewed again when the necessary policy and institutional reforms have been identified and specific recommendations for these and related investment formulated.

Specific consideration should also be given to establishing appropriate financial mechanisms for small grant disbursement to NGOs, universities and government agencies working in these fields. Well planned and realistic projects to address high-priority and/or short-term emergency needs can be supported through such a mechanism.

The matrix given at the end of this chapter provides a summary of the forests and biodiversity analysis, and identifies the proposed NEAP actions together with additional policy and institutional reforms and associated demands for applied research in far greater detail.

ANALYSIS OF FORESTS AND BIODIVERSITY PROGRAMME AREA

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACTS	PHYSICAL ECONOMIC INDICATORS	PROXIMATE CAUSES	UNDERLYING CAUSES	EXISTING GOSL NGO DONOR PROGRAMS	OPTIONS FOR NEAP ACTIONS			APPLIED RESEARCH
						POLICY REFORMS	INSTITUTIONAL REFORMS	SUB PROJECTS	
-Loss of forests through logging, burning, and conversion to agriculture. -Loss of wetlands through filling and conversion to agriculture and settlements. -Destruction of coral reefs, overexploitation and depletion of other aquatic ecosystems. -Loss of genetic diversity in agriculture and plantation forestry through the spread of monocultures.	-Reduction in biodiversity due to the destruction of wildlife habitats, especially in the wet and intermediate zones. -Disrupted hydrological cycles are leading to increased droughts and floods, increased sediment loads in rivers, and shortened lifespans for irrigation channels and hydroelectric dams, as well as the loss of aquatic species -Increased soil erosion and loss of soil fertility are leading to agriculture which is often less economically productive than the forest which it replaced -Decreased availability of valuable timber species and other forest products, many of which now have to be imported using scarce foreign exchange.	-Closed canopy natural forests cover an estimated 1.33 million ha or 20.2% of the land area (Compared to 44% cover in 1956 and 70–80% around 1900). Teak, eucalyptus and pine plantations cover a further 117,000 ha. -The annual rate of deforestation is in the region of 4.0% -Many of the remaining natural forests have been seriously degraded, leading to reduced biodiversity and low productivity. -The Department of Wildlife Conservation has jurisdiction over protected areas. Many encroachments have incurred within these areas, some have been commercially logged and most are becoming seriously degraded	-Forest lands have also given way to large infrastructure and settlement projects, especially for hydropower and irrigation. About 50% of the losses of forest cover during the last decade was due to such schemes. -Weak law enforcement has allowed increasing rates of agricultural encroachment into forests and other protected areas as well as substantial rates of illegal timber cutting for construction wood and fuelwood -The selective overexploitation of economically-valuable plant and animals. -Increasing chemical pollution from agricultural and industrial activities. -Prospects for ecotourism are being jeopardized	a. Human population growth The growing population's increasing demand for land and for agricultural products has led to the continual expansion of planned as well as unplanned agriculture at the expense of forest lands b. Lack of appropriate policy frameworks 1. Forestry: Sectoral policies in forestry have largely been directed towards maximizing timber revenues (although commercial logging in natural forests has temporarily been suspended). But low royalties on timber extraction have led to the rapid exploitation of forests and little attention has been given to multiple-use forestry. Existing forest policies, or their absence, have led to inefficient land use decisionmaking and substantial economic losses -2. Biodiversity: There has been no systematic quantitative identification of the areas which need to be conserved and protected strictly. Biodiversity outside protected areas has been virtually ignored. -3. Other Economic Sectors: National policies aimed at stimulating production in agriculture, fisheries, energy and industrial goods include a variety of measures which tend to favor production in these sectors without taking into account the economic benefits provided by the natural ecosystems. These include subsidies, tax credits, concessionary leases and price controls (certain of which have recently been reduced as part of liberalization policies). Intersectoral coordination to consider the impacts on forestry & biodiversity is lacking c. Institutional inadequacies -Laws applicable to the conservation of forests and biodiversity have been deficient and difficult to implement. They place responsibility on too many agencies, assign roles which agencies cannot carry out, and impose inadequate penalties. The Forestry Department has, until very recently, been dominated by a traditional orientation towards logging. The Department is not guided by clear policies and faces many operational constraints. There are few	Forestry -The 1986 Forestry Sector Master Plan (FSMP) was largely funded and prepared by FINNIDA. -Forestry Sector Development Project (FSDP) to implement the recommendations of the FSMP. 1991–95. 2,300 million Rs. World Bank, FINNIDA, ODA, UNDP -Preparation of a new FSMP began in 1993, based on the new FSMP findings, a further 5-yr investment program for 1995–2000, around 4,000 million Rs. -Participatory forestry project. ADB, Govt of Australia. 1994–99. $25 million. 15,000 ha of public and private lands in 24 districts. -Forestry Management and Plantations Project. ODA. 1990–95. 6.2 million pounds. Block planting in the Victoria Reservoir catchment area. -Forestry Research and Information Project. ODA. 1990–95. 4 million pounds. Developing research unit NW -Forest Plantation Management and Training Project. World Bank. 1990–96. $ 31 million Rs. Nationwide. To identify and demarcate mangroves, and carry out biological and socio-economic studies Biodiversity -Sinharaja Conservation Project. NORAD. 1988–92 (Phase I) 7 million Rs. 1994–98 (Phase 2). 48 million Rs. Studies and management plan, demarcation of boundaries, establishment of buffer zone, awareness and education, visitor facilities, research	-Effective management and conservation of what is left of Sri Lanka's forests and biodiversity will require as a prerequisite -High-level political commitment to establishing an appropriate legal, organizational and policy framework. -Improving political and public understanding of the economic and environmental benefits. -It is now recognized that the 1986 Forestry Sector Master Plan failed to address these issues adequately. In contrast, the new plan will emphasize the following: INSTITUTIONAL DEVELOPMENT Forest policy and legislation (Proposed forest policy) Organizations and human resources development Forestry research and development Forestry extension and communication Monitoring and evaluation MAN AND ENVIRONMENT Land use and Forest Resources Forest-based rural development Conservation of ecosystems and biodiversity Watershed management FOREST PRODUCTION AND UTILIZATION Management of natural forests Forest plantation development Non-forest wood production and substitutes Fuelwood and rural energy Wood-based industrial development Non-wood forest product development It would be premature to propose specific policy reforms for the forest sector until these studies are completed and the revised plan formulated. Sri Lanka does not have a Biodiversity Action Plan and proposals for biodiversity planning within the new Forestry Sector Master Plan are still provisional. A national biodiversity plan is essential, but it should be complementary to and run parallel with the new FSMP. It would be premature to propose specific policy reforms for the biodiversity sector until this work has been completed and recommendations developed -It is already clear that urgent and fundamental policy and institutional reassessments and reforms are needed within forestry and, especially, wildlife conservation. But these steps must be carefully formulated and then approved by the highest levels of government. Piecemeal tinkering seems unlikely to be effective -It is recommended that a NEAP forestry/biodiversity fund for small grant disbursement be established -Funding needs and the financial contribution of the NEAP to be reviewed again when the necessary policy and institutional reforms have been identified and specific recommendations formulated. In the meantime, well-planned and realistic projects to address high-priority and/or short-term emergency needs can be funded through the sectoral fund	-Studies and applied research needs in forestry have been included in the new Master Plan. -Designing a protected area network is one of the most critical needs in biodiversity, and the National Conservation Review and the GEF project has begun this process. Other priority studies and applied research needs in biodiversity include the following areas -Studies in the valuation of biological resources to help incorporate biodiversity considerations into economic development decisionmaking -Analysis of sectoral and cross-sectoral economic development policies on forests and biodiversity. -Development of programs to win the support of local people for biodiversity conservation. Options for building the capacities of local communities to develop productive activities which do not deplete biodiversity. -Identifying sources and opportunities for generating non-governmental and private sector funding for conservation. -Evaluating the potential economic and environmental contribution of ecotourism

ANALYSIS OF FORESTS AND BIODIVERSITY PROGRAMME AREA

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACTS	PHYSICAL ECONOMIC INDICATORS	PROXIMATE CAUSES	UNDERLYING CAUSES	EXISTING GOSL NGO DONOR PROGRAMS	OPTIONS FOR NEAP ACTIONS			
						POLICY REFORMS	INSTITUTIONAL REFORMS	SUB PROJECTS	APPLIED RESEARCH
	-Fuelwood is becoming scarcer, leading to higher prices and increased labor requirements for collection. -Increased risks for agriculture and plantation systems dependent on monocultures. The likelihood of developing new and valuable uses of natural products from wild genetic resources is diminishing	Annual value of timber lost may be in the range of 2–3,000 million Rs.		operational forest plans, harvesting techniques are destructive and uneconomic, coordination with other government agencies with overlapping interests has been minimal. d Inadequate human resources -Staff numbers in the Forestry and, especially, Wildlife Departments are inadequate Many staff are underqualified, poorly trained and unequipped to deal with complex conservation issues. e Inadequate Information and analytical capabilities -The level of understanding and quality of information available to support management decisionmaking is totally inadequate f Lack of popular support for biodiversity conservation -Local people have often been treated as opponents of forest management and conservation rather than partners The state controls about 80% of the land and there are few incentives for local people to support forest management or conservation programs Communities lack opportunities and incentives to participate in and benefit from biodiversity conservation. There are very few social forestry or other participatory programs	-Knuckles Conservation Project, NORAD 1988–92 (Phase I) 7 million Rs. 1994–98 (Phase 2) Funding to be determined Montane forest region. Studies and management plan, demarcation of boundaries, establishment of buffer zone, research. -Wetlands Conservation Project in CEA with funding from the Dutch govt. National scope. Identifying priority sites and preparing management plans. $ 1.5 million since 1991 -IUCN and the Forest Department are carrying out an National Conservation Review to be completed by 1996, with UNDP/FAO funding. -Wildlife Conservation and Protected Area Management Project. The Department of Wildlife Conservation is the implementing agency for $4 million Global Environment Facility training and institution–building project 1992–96, UNDP/FAO Project activities have virtually been suspended due to critical organizational and human resource constraints within the Department which have rendered on–the–ground conservation efforts virtually ineffective.			

6: URBAN AND INDUSTRIAL POLLUTION

6.1 INTRODUCTION

As explained in Chapter 3, the economic development goal of becoming a Newly Industrialised Country (NIC) by the early 21st Century clearly will lead to accelerated urbanization and industrialization. Soaring land prices and expansion of investment activities, with new factories coming up in various parts of the country, are good indicators that this process is already well underway. It is therefore inevitable that the environmental issues and impacts which relate to both urbanization and industrialization will be of major importance to the future development of the country. These current development trends will place particular pressures on urban environments, where industries and dense urban populations are in close proximity. This will also put an additional burden on already strained urban environmental services. If industrial-led economic development is to be accomplished without experiencing a corresponding decline in environmental quality, it is vital that steps be taken now to wisely shape the pattern of the country's urban and industrial growth. This chapter reviews these problems and the current responses. It also lays out a future agenda for action to ensure that Sri Lanka's urban and industrial development occurs in an environmentally sound manner.

6.2 KEY URBAN AND INDUSTRIAL POLLUTION ISSUES

6.2.1 Urban Environmental Problems

The urbanization process in Sri Lanka has contributed to a growing number of adverse environmental impacts. For example, the inability of municipalities and other local authorities to appropriately dispose of the increasing quantity of municipal solid wastes--including hazardous hospital wastes--is considered a serious and growing environmental problem. This situation has led to *ad hoc* practices of solid-waste disposal both by individuals and local authorities. Other key urban environmental issues include: environmentally unacceptable land use, e.g., inappropriate land use is directly identified with flooding problems in most urban areas; vehicle-based air pollution; and heavy demands on environmental services provided by municipalities (such as sewerage removal). Degradation of surface and ground water quality--including faecal contamination--also results from high population densities in urban areas. All of these problems have associated sanitation issues and health impacts.

Urbanization is inevitably associated with a concentration of both large populations and considerable wealth within a comparatively compact geographic area, resulting in high population densities and heavy economic activity. This is also why cities generally face worse pollution problems than rural areas. Urban pollution sources tend to be more densely clustered and produce higher pollutant concentrations. This usually results in strong pressures on the underlying urban ecosystem and on government agencies for the provision of services to offset these adverse impacts. The root causes of observed urban environmental problems include the following:

- The inability of the economy to meet demands on services.
- Uncontrolled and unplanned migration into urban areas.
- Poverty and income distribution inequalities.
- Large quantities of industrial and domestic waste generated within close geographic concentrations.
- Policy and institutional failures in planning, design and enforcement of regulations, and service delivery.

Local authorities as well as the central government are faced with the increasingly difficult task of providing amenities and services in a setting of limited resources and considerable institutional constraints. This situation has contributed to neglect of urban environmental quality needs. As a result, certain areas have already deteriorated severely. Some examples are Beira Lake in Colombo, Lunawa Lagoon in Moratuwa, and a large number of low income ("shanty") settlements in urban areas throughout the country.

6.2.2 Environmental Consequences of Industrial Growth

Closely associated with urban growth, the industrialization process has been identified as the principal contributor to three major environmental problems: industrial pollution; risks and hazards from industrial activity; and the global environmental problems of climate change and atmospheric ozone depletion. Industrial pollution is clearly a growing problem in the country, demanding policy attention to both existing and new industries. Industrial risks are also increasing, and can be linked to both loss of life and property as well as health impacts. Sri Lanka contributes little to global environmental problems such as sea level rise from greenhouse gas emissions, though it may experience the impacts of such changes.

The most significant environmental impacts of industrialization can be identified in association with the media affected: air (including noise pollution); water; and land. Air pollution is caused by gaseous emissions from stationary (industry) as well as mobile (vehicle) sources. These emissions also include dust and smoke. Industrial activities also result in pollution of water bodies (both surface and groundwater) and the soil. Surface water bodies and soil are polluted mainly by industrial wastewater and solid waste. Groundwater pollution is caused by the same factors through leaching and seepage. Noise pollution results from machinery and equipment used in industrial processes, from transport, construction, and other sources. The main reasons for noise pollution are poor maintenance, weak operational and installation practices, plus inappropriate industrial siting (eg., adjacent to residential areas).

To identify opportunities for action, industrial pollution impacts can be considered in an analytical framework grouping them by their scale:

- **Individual Industry Impacts:** These are site specific industrial pollution impacts which can be directly attributed to an identified industry. These impacts are usually limited to the immediate locality of the industry.

- **Aggregate Impacts:** This is the combined impact of many "point source" industrial activities. No individual industry can be held responsible for this type of impact. Such impacts are often spread over a wider geographic area and may be felt even at places far away from their source. They may also result from "non-point sources" or the combination of point and non-point pollution.

- **Regional and Global Impacts:** Resulting from emission of ozone depleting substances, greenhouse gases and other pollutants which cross international boundaries, these impacts are primarily upon the global atmospheric and climate system.

Bio-physical and socio-economic indicators must be identified as measures of pollution damage to identify target sites/areas which are adversely affected by industrial pollution, and to serve as baselines for measuring changes in environmental quality over time. Some suggested indicators are given in Table 6.1.

6.3 CURRENT POLICY RESPONSES TO URBAN AND INDUSTRIAL POLLUTION PROBLEMS

There has been considerable amount of activity in response to NEAP priorities in this programme area--particularly relating to industrial pollution prevention and control (see figure 6.2). In order to sustain industrialization in harmony with environmental protection, the Central Environmental Authority (CEA) has recently developed an Industrial Pollution Management Strategy. This strategy

Table 6.1

Socio-economic	Indicator
▸ Land Price	• Industrial pollution of atmosphere, land and water bodies results in depressed land prices in those areas. • Poverty and associated poor upkeep of housing and environmental services also can lower property values.
▸ Loss of Productivity	• Fisheries: Pollution of water bodies has resulted in decrease (or destruction) in fish production. This has both social and economic effects, e.g. Lunawa lagoon. • Agriculture: There are few examples of impacts of industrial pollution on agriculture, eg. Embilipitiya Paper Mill, Natural Rubber Processing Industry effluents. • Loss of work days due to health impacts.
▸ Economic Costs	• Pollution results in extra cost to the economy to provide public amenities, eg. higher cost in water treatment. • Pollution also prevents productive uses of resources (opportunity costs). • Higher health care costs.
▸ Public Complaints	• Public protests relating to pollution problems. • Media coverage of pollution issues.
▸ Prevalence of Pollution Related Diseases	• Worker productivity decreases as a result of pollution-related disease. • Health care costs escalate.
Bio-physical	
▸ Environmental Quality Parameters	• A number of environmental quality parameters can be used for this purpose. These include, for eg., pollution load parameters such as Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) as well as parameters such as pH, Suspended Solids, Heavy Metal concentration and Coliform Counts. These quality parameters can be used to identify the extent of damage in already degraded systems such as Ratmalana.
▸ Flooding	• Damage to infrastructure. • Lost productivity.

begins with source management and control, which is seen as a key to minimizing the quantity of waste requiring treatment. The application of waste minimization in Sri Lankan industry should improve profits and productivity, thereby enabling a large number of industries to be in a position to better afford treatment of those wastes which cannot be recycled or otherwise omitted. CEA has also developed pollution discharge standards and criteria regulating industrial behaviour. These include liquid effluent standards as well as emissions standards for gaseous pollutants. Industries are required to meet such standards to minimize harmful effects on the environment. Industries have been classified as "existing" and "new" with differential short term regulations. Existing industries will be required to meet these standards fully, though they have been granted a phase-in period of several years. New industries are expected to meet the standards immediately. The Authority is also implementing an Environmental Protection Licence (EPL) scheme for industries, whereby they are granted permits to discharge any type of liquid, solid or gaseous waste into the environment according to set standards established by the Authority. The EPL issued to industries stipulates these standards for each individual industry.

The CEA has also classified industries into three categories: low, medium and high polluting. This takes into consideration the manufacturing process and raw materials used in each industry as well as its pollution characteristics. Until recently, all industries--whether they were classified as low, medium or high polluting--were required to obtain an EPL. In view of the thousands of industries scattered around the country and the regulatory burden placed on limited CEA staff, EPL issuance to all industries had become very difficult. In order to relieve this institutional constraint to some extent and concentrate on the principal pollution sources, the issue of licenses to low polluting industries was delegated to the relevant Local Authorities beginning in January 1994. Furthermore, the nation's banking system is now engaged in this process as well, since they are providing preliminary pollution classifications for all potential investors.

Amendments to the National Environmental Act are also moving forward which will allow the Minister of Environment and Parliamentary Affairs to prescribe those industries requiring a license. It is expected that prescribed industries will only be those in the high and medium polluting categories. This will allow the CEA to more closely monitor the activities of major polluters, while the smaller scale polluters will be monitored by Local Authorities and other agencies.

For those wastes that are unavoidable, the Industrial Pollution Management Strategy envisages an integrated approach to industrial wastewater pollution prevention and control, embracing a number of measures. These include:

- Relocation of "offensive trades" (highly polluting industries, particularly those that produce toxic or hazardous waste) to designated areas where suitable common effluent treatment facilities can be provided (e.g., leather tanneries and pesticide formulating plants);

- Provision of new sewerage schemes in areas of existing industrial concentration to collect both domestic and industrial waste; and

- For small scale industries, special provision of centralized collection schemes coupled to a common wastewater treatment and recovery centres.

This strategy removes the present onus of effluent treatment responsibility from many individual industries and transfers it to central treatment or disposal facilities that provide not only benefits of scale but also allow for dilution of more difficult wastewater. This immediately relieves a large number of industries of the capital costs for installation of major pollution control equipment and associated problems of land availability. More importantly, it allows central treatment plants to invest in properly trained, dedicated personnel. In addition, the monitoring and enforcement of effluent discharges will be greatly simplified. The amortized capital cost and operating charges of the treatment processes will be borne by the polluting industries on a per discharge unit basis.

The Government has recently made a policy decision that, in future, all high and medium polluting industries will be located only in industrial estates with suitable infrastructure, including centralized waste treatment facilities. A committee comprising representatives of the CEA, BOI and the Ministry of Industries will decide on the siting of high and medium polluting industries during the interim period until the industrial estates are provided with common waste treatment facilities. The selection of suitable sites for and establishment of industrial estates--and the provision of wastewater treatment facilities for existing and new industrial estates--is considered to be an urgent and critical need in the country in view of the rapid industrialization expected to take place within the next few years.

Another major milestone during the 1992-1994 period has been the passage of Environmental Impact Assessment (EIA) Regulations for major development projects. Under these regulations, which came into force in June 1993, certain prescribed projects are required by law to undergo EIAs. Large scale and/or hazardous industries such as iron and steel industries, chemical industries, petroleum refineries, petrochemical manufacture, sugar, cement, paper and tanneries above a certain production capacity and others have been listed as prescribed projects which require an EIA study prior to commencement. In addition, all industrial estates exceeding 10 hectares will also be required to undergo an EIA.

In view of the relatively rapid expansion in the industrial sector envisaged within the next few years, the establishment of industrial estates with suitable infrastructure facilities for waste treatment is considered a very high priority. The establishment of the industrial estates after EIAs should be expedited, and urgent action must be taken to provide funding for infrastructure facilities including waste treatment facilities for such sites. This should be given high priority if mistakes made in the past by the haphazard siting of industry are to be prevented. Table 6.2 gives a more detailed description of the IPM strategy.

Table 6.2

INDUSTRIAL POLLUTION MANAGEMENT STRATEGY

♦ **Technological Actions**

- Source management and control (waste minimization)
- Relocation of high polluting industries (eg. tanneries)
- Combined industry/domestic wastewater collection in North Colombo and disposal to existing ocean outfall
- Combined industry/domestic wastewater collection in Ratmalana/Moratuwa with disposal via a new ocean outfall
- Centralized collection and treatment for small scale industries
- Siting of all new polluting industries in estates (approved by Cabinet)
- Wastewater treatment for stand alone industries
- Disposal of industrial sludges
- Hazardous waste management programme
- Kelani River water quality protection by designating it as an environmentally sensitive area

♦ **Economic Instruments**

- Charges for private abstraction of water
- Introduction of effluent charges
- Control scheme for import and use of hazardous/toxic chemicals
- Incentives for private off-site treatment and disposal services
- Linking of existing tax concessions to comply with environmental requirements
- Charges for centralized waste collection and treatment

♦ **Support Measures**

Legislation
- Amendments to the National Environmental Act
- Scheme for the Control of Pollution from Existing Industry (SCOPE)
- Development of effluent/emission standards for stationary and mobile sources
- Regulations on hazardous waste management
- Regulations for the control of toxic chemicals

Institutional Development
- Development of a second generation database for the Environmental Protection and Management Information System (EPMIS)
- Implementation of the Environmental Laboratory Accreditation Scheme
- Development of an Environmental Consultants and Consultancy Scheme
- Delegation of some CEA powers to other authorities such as BOI and Local Authorities
- Establishment of a Private Sector Environmental Unit
- Establishment of regional officers of the CEA
- Upgrading of the CEA laboratory to a referral laboratory

Training and Awareness
- Training in waste minimization and pollution control
- Training for the private sector in sector specific codes of practice for source management and control
- Continuing education programs and university curricula development
- Development of awareness material and dissemination to the community

Source: Central Environmental Authority (1994)

6.4 EXISTING PROGRAMMES

Perhaps the greatest NEAP response has occurred in this programme area, and there are many programmes currently being carried out to deal with industrial and urban pollution control and management. Most focus on industrial issues in the Colombo Metropolitan area, and they also center on control of pollution from existing rather than new industries. A list of major ongoing programmes is given in Figure 6.1. The UNDP/World Bank funded Metropolitan Environmental Improvement Programme (MEIP) has played a prominent role in organising policy and institutional analysis and reforms, and in serving as a catalyst for identification of high priority investments. The most significant outcome has been the design of a new Colombo Environmental Improvement Project, proposed for World Bank (IDA) financing.

Figure 6.1

SUMMARY OF CURRENT NEAP ACTIVITIES IN THE URBAN AND INDUSTRIAL POLLUTION PROGRAM AREA

Given its close relationship to the economic development strategy, this program area has attracted considerable attention and donor resources since the NEAP was introduced. The main problems being addressed relate to the following:

* Urban solid waste management and air pollution policy
* Industrial wastewater minimization and treatment
* Pollution prevention and control institutions.

The most prominent of the current initiatives are as follows:

PROGRAM	MAJOR FUNDING SOURCE	TOTAL FUNDING (US$ Mn)	START-END DATE
▸ Metropolitan Environmental Improvement Programme (MEIP) - Clean Air 2000 - Industrial Pollution Management Study - Colombo Environmental Management Strategy - Common Industrial Wastewater Treatment Plant Feasibility Studies	World Bank/ UNDP	3.0	1990-1995
▸ Colombo Environmental Improvement Project - Restoration of Beira Lake - Solid Waste Management - Implementation of the Industrial Pollution Management Strategy - Common Wastewater Treatment Plants for the Ekala-Ja-Ela and Moratuwa-Ratmalana areas - Public Awareness	World Bank	75.0	TBD
▸ Natural Resources and Environmental Policy Project (NAREPP--Urban and Industrial Environmental Management Component) - Efficient Pollution Reduction Through Environmental Audits (with MEIP) - EPL and other Regulations Review - Ambient Water Quality Monitoring - Community-Based Environment Management Demonstrations	USAID	2.0	1992-1996
▸ Industrial Pollution Reduction Programme - Cost Effective Reduction Techniques for textile, distillery and other selected industries	UNIDO	2.1	1993-1996
▸ Pollution Control for Selected Industries - Feasibility Studies for Textile, Rubber, Desiccated Coconut, Pesticide and Tourist Industries - Waste Water Treatment Plant for Rubber Industry	Netherlands Govt.	2.0	1992-1997

6.5 RECOMMENDED NEAP ACTIONS

Actions still required are of two types: preventive measures (approaches to manage and control industrial pollution) and damage control (pollution clean up actions). As mentioned, recent action has focused on damage control, so preventive actions are now considered more important and the given priority, mainly due to the need to sustain NEAP efforts. Similarly, recommended urban pollution control actions focus primarily on the preventive side, while actions related to damage control or environmental quality improvement will take the shape of demonstration projects designed to be easily and cheaply replicable in cities around the country.

With the exception of the activities planned under the new Colombo Environmental Improvement Project, most of the donor funded on-going NEAP efforts in both industrial and urban pollution control have been limited to management studies and institutional strengthening. In fact the same areas have been repeatedly covered by several studies, and improved coordination is needed. The strengthening of regulatory bodies such as the CEA is of prime importance if effective programmes on environmental protection and management are to be implemented. The new concept papers submitted by various agencies to MEPA in 1993 spell out more tangible projects including investments in infrastructure. These concept papers relate mainly to three areas of action: improvements to drainage facilities (46%), solid waste disposal (21%) and improvements to sanitation facilities (11%).

With agreement having already been reached on the Industrial Pollution Management Strategy, a strong agenda for pollution policies and related institutional reforms is now in place. There is still a need for further analysis of regulatory and market-based incentives to support pollution prevention and control efforts. There is also a strong demand for expansion of common wastewater treatment facilities in new industrial estates to be established.

Another extremely important issue is the need for and expedition of the delegation process for pollution control oversight. This must be institutionally linked to strong support programmes for local authorities. It is also envisaged that several regional offices of the Central Environmental Authority will be set up within the next few years in order to facilitate better coordination between Local Authorities and the CEA and to provide easier monitoring of major projects around the country. There should also be a strong emphasis given to involving the universities in a major role in technical as well as planning efforts.

The matrix given at the end of this chapter identifies the proposed NEAP actions together with additional policy and institutional reforms and associated demands for applied research in far greater detail.

ANALYSIS OF URBAN POLLUTION PROGRAMME AREA

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACTS	PHYSICAL INDICATORS	ECONOMIC INDICATORS	PROXIMATE CAUSES	UNDERLYING CAUSES	EXISTING PROGRAMS	SCALE AND EXTENT OF LOCATION	OPTIONS FOR NEAP ACTIONS				REMAINING UNMET NEEDS
								POLICY REFORMS	INSTITUTIONAL REFORMS	SUB PROJECTS	APPLIED RESEARCH	
URBAN POLLUTION -Heavy demand on Urban environmental Services -Disposal of Municipal Solid Waste. -Disposal of hazardous hospital waste -Environmentally unacceptable land uses -Air Pollution from vehicle exhausts.	-Congestion -Soil pollution due to solid waste disposal -Degraded water quality due to sewerage and solid waste dumping -Flooding due to blocked canals and loss of flood retention area -Degraded air quality due to vehicles exhaust fumes -Health problems -Noise problems	-Increased travel time, in urban areas, mainly Colombo -Frequent flooding of urban areas -Poor air quality in certain areas of Colombo -High lead levels in the blood of selected groups of colombo population -Faecal contamination of ground and surface water bodies -Poor levels of sanitation for certain groups of urban dwellers	-Health care cost -Loss of productivity due to illhealth	-Inadequate development of environmental infra-structure -Shanty areas along canal banks -Non availability of suitable facility for disposal of hospital waste. -Proximity of location of wells and septic tanks -No facilities for on-site treatment of solid waste -Absence of standards for vehicle exhausts or poor enforcement of laws regarding vehicle exhausts. -Poor vehicle maintenance	-Increase in demand for transport, increase in number of vehicles in urban areas, mainly Colombo -Inadequate urban planning & lack of good urban land use policies -Undeveloped and un-protected public land,leading to encroachment -Lack of ability to invest adequately on urban and environmental infrastructure to meet the demand -Institutional weaknesses at LA level in planning and enforcement, also resource availability -High land prices and land shortage has resulted in small plot sizes -Poverty -No clear policy(ies), for urban planning and management of urbanization. -Use of high S diesel & leaded petrol	-Safe drinking water for all by Year 2000 -Incinerator for disposal of hospital waste MEIP-WB -Solid waste management plan MEIP -Restoration of Beira Lake MEIP. -Canal rehabilitation project -Clean Air 2000 -CEA, NBRO and CISIR air quality monitory programs	-Country wide covering all urban areas Colombo Metropolitan area Colombo - Group of Hospitals -Colombo City -Colombo -Greater Colombo -Island wide -Colombo	-Review existing urban land and transport policies and identifying necessary policy reforms to meet following *encourage public transport systems in urban areas *Tenure and ownership of urban public land -Review existing policies affecting urbanization and develop suitable policies in controling/ managing urbanization, so that urbanization process will not impose excessive demands on urban infrastructre & environmental services -Establishment of regulatory control on emissions from diesel and petrol vehicles (standards for emissions)	-Most of LAs do not have adequate financial resources to meet the demand for urban services Adequate reforms are required. (a) To enhance financial strengths by having adequate tax structure, and mobilizing outside funding -(b) LA needs technical assistance regarding environmental issues connected with planning to meet this need It is recommended to set up a strong environment (planning) unit in the UDA with the main objective of providing TA to LAs	-Installation of Incinerator for disposing hospital waste in Colombo. -Implement clean Air 2000 program -Develop demonstration and pilot solid waste management, flood control and sanitation projects in selected LAs for purposes of providing replicable models for other LAs -Complete Canal rehabilitation program for Colombo -Complete Beira Lake restoration work -Provision of unleaded fuel for petrol vehicles In order to reduce emission of lead and other pollutants Provision of low sulphur diesel for vehicles in order to reduce emissions.	-Economic evaluation of urban pollution as case studies -Identify urban areas adversely affected by urban pollution, on the basis of priority for clean up action.	-Clean up programs for already degraded areas other than Colombo to be Identified

ANALYSIS OF INDUSTRIAL POLLUTION PROGRAMME AREAS

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACTS	PHYSICAL INDICATORS	ECONOMIC INDICATORS	PROXIMATE CAUSES	UNDERLYING CAUSES	EXISTING PROGRAMS	SCALE AND EXTENT OF LOCATION	OPTIONS FOR NEAP ACTIONS				REMAINING UNMET NEEDS
								POLICY REFORMS	INSTITUTIONAL REFORMS	SUB PROJECTS	APPLIED RESEARCH	
INDUSTRIAL POLLUTION												
-Pollution by industrial discharges, emissions and idustrial solid waste disposal.	-AIR POLLUTION	-Poor air quality in the vicinity of industrial plants with gaseous emissions, including smoke, dust and other pollutants -Public complaints	-Increased health care cost -Loss of Productivity (damage to agricultural crops) -Damage to buildings, monuments etc. (Acid rain)	-Poor enforcement of industrial regulations -Inadequate enforcement of EPL Program -Outdated and poorly designed, installed and operated industrial plants & boilers. -Lack of pollution equipment and/ or treatment system in early established industry	-Absence of an air emission standard for Industry -Inadequate personnel and other resources in regulatory agencies such as CEA,BOI. -Financial difficulties faced by industries in implementing pollution control measures -High cost of air pollution control equipment specially in older industries -Lack of technical Know – how and skills, in design of treatment systems etc -Insufficient public presure	-CLEAN AIR 2000 PROGRAMME -CEA,NBRO & CISIR air quality monitoring program -Emission standards for Industry CEA/WHO -MEIP – World Bank project on pollution control -CEA/UNIDO demonstration treatment plants(Textile/ distillery) -CEA/Dutch demonstration treatment plants for rubber -NAREPP/IFS Water quality monitoring program	-Colombo City -Country wide -Metropolitan Colombo -12 key surface water bodies spread around the country.	-EPL regulations to be reviewed to bring on more flexibility for progressive implementation of the regulations to achieve National Effluent Disposal standards as given in the present regulations. These flexibilities should be provided on * geographic basis and * Industry sector (performance) basis -Revision of fee structure for industries on the basis of pollution load. -Application of Market Based Instruments for Pollution control -Enact laws to consider Environmental liabilities to be considered in ownership transfers (of industries). -Development of an appropriate scheme for charges for private extraction of waste.	-Strengthening of Local Authorities to implement Pollution control programmes at LA level for low polluting industry -Strengthen laboratory capabilities of regulatory agencies such as CEA to monitor industry(high/ medium polluting) -Institutionalize environmental Audit process -Legal unit in the Ministry of Environment for monitoring of implementation of international environmental agreements to which Sri Lanka is a signatory -Strengthen the Legal unit of the CEA to meet the demands of the EPL and EIA programme implementation.	– Develop Training and TA Program for LAs to meet the needs of LA's pollution control program Implementation. – Set up regional CEA offices in key areas to assist the delegation process & polluton control work. – Develop ambient water quality standard for major water bodies – Implement financial assistance program to assist Industries in implementation of pollution control measures –Provide TA to MIST (Team of Consultants on priority bass to clear the selected Industrial sites on environmental grounds including preparation of EIAs) – Provision of effluent treatment systems/ incineration plants for selected industrial estates around the country on a priority basis	-CEA to set up an unit in the protection division supported by a technical committee to cary out rescareach related to pollution control and in following areas * Linking of ambient standards to discharge standards. * Use of MBIs -Develop water quality management modal for Kelani River	-Clean up programs for already degraded areas like Lunawa Lagoon etc.
	WATER POLLUTION (Pollution of surface water bodies and ground water.)	-Loss of aesthebc beauty -Detenorating water quality of selected natural water bodies and ground water -Public complaints	-Reduced land prices -Loss of productivity in Fishery and – Agriculture -Increased cost of treatment for public water supplies -Opportunity cost	-Discharge of liquid and solid industrial waste into water bodies marshy lands and on ground								

ANALYSIS OF INDUSTRIAL POLLUTION PROGRAMME AREA

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACTS	PHYSICAL INDICATORS	ECONOMIC INDICATORS	APPROXIMATE CAUSES	UNDERLYING CAUSES	EXISTING PROGRAMS	SCALE AND EXTENT OF LOCATION	OPTIONS FOR NEAP ACTIONS				REMAINING UNMET NEEDS
								POLICY REFORMS	INSTITUTIONAL REFORMS	SUB PROJECTS	APPLIED RESEARCH	
INDUSTRIAL POLLUTION												
-Industrial Hazards and Risks, Large scale industrial accidents	-Destruction to Life and property	-Loss of Life -Acute and chronic health effects from exposure to chemicals/fumes etc	-Loss and damage to property	-Unsafe industrial processes and practices -Inadequate attention to safety & risks. -Lack of emergency preparedness plans for potentially hazardous industries	-Poor siting -Lack of human and other resources for effective regulation and enforcement ordinances -No regulation on the import and use of toxic/ hazardous industrial chemicals -Inadequate safety measures in transport, storage and use of chemicals -High level of industrial and economic activities related to excessive emission of green house gasses -Loss of forest areas -Use and emission of CFCs -Power generation (Fossil fuel base) -Lack of monitoring capability in Customs and Other authorities	-Industry inspection program by Labour Dept -Hazardous waste disposal regulations to be developed -Technical advisory committee on chemicals -London Guideline scheme for chemicals -Montreal Protocol and GEF -Basel convention on transboundary movement of hazardous waste.	-Country Wide -Country Wide -Metro Colombo -Sri Lanka is a Signatory to the agreement.	-Policy on the import of potentially hazardous industries from other countries required urgently. -Regulations for the import and use of hazardous/toxic chemicals and their environmental legislation to require large scale potentially hazardous industries to prepare emergency preparedness plans through appropriate legislation. -Enact legislation for phasing out CFCs -Enact legislation for restricting impacts of hazardous waste.	-Strengthen agencies such as CEA, BOI to assess potential hazards posed by new industries -Strengthen agencies such as Customs, Import/ Export, CEA in order to monitor chemical imports -Strengthen Dept of Labour, CEA to monitor emergency preparedness of industry -Strengthen Customs, Import/ Export, CEA to monitor transboundary movement of hazardous waste. -Strengthen Laboratory capability in the country (CEA, CISIR) for analyzing of hazardous waste.	-Separate collection and disposal (treatment system for liquid hazardous waste generated in Metro Colombo) -Separate disposal system for hazardous solid waste -Assist potentially hazardous industry in preparation of emergency preparedness plans.	-Research on use of less toxic chemical substitution in industry	-Refer NEAP Emergency secter.
-Global environmental issues	-Sea level rise -Climate change -Health impacts -Transboundary Movements of hazardous waste.	-Loss of coastal areas	-Loss of Land and small islands -Loss of agricultural productivity, fisheries etc	-Emission of green house gasses -Use of ozone depleting substances such as CFCs.								

ANALYSIS OF INDUSTRIAL POLLUTION PROGRAMME AREAS

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACTS	PHYSICAL INDICATORS	ECONOMIC INDICATORS	PROXIMATE CAUSES	UNDERLYING CAUSES	EXISTING PROGRAMS	SCALE AND EXTENT OF LOCATION	OPTIONS FOR NEAP ACTIONS				REMAINING UNMET NEEDS
								POLICY REFORMS	INSTITUTIONAL REFORMS	SUB PROJECTS	APPLIED RESEARCH	
	-Soil Pollution	-Presence of Toxic heavy metals and other pollution in soil. -Damage to Agricultural crops presence of toxic heavy metals in plant tissue.	-Loss of Agricultural Productivity -Reduced Land Prices	-Unacceptable practices of disposal of industrial solid and liquid waste	-Same as for water pollution -Lack of suitable industrial solid waste disposal methods eg secure landfill, Incinerator -Lack of regulations for hazardous waste disposal. -Inadequate rasources in regulatory agencies such as CEA,BOI for monitoring and regulation	-MEIP -- WB	-Metropolitan Colombo	-Enact regulations on NEA for hazardous waste Management -Establishment of regulatory controls on emissions from diesel and petrol vehicles (Standards for emissions from Petrol & Diesel vehicles)	-Strengthen capability of regulatory bodies such as CEA, BOI -Moratuwa University Env Technology center Urban Matrix	-Establish accredited laboratories to support the EPL monitoring -Ekala -- Ja-ela and Ratmalana combined effluent treatment system for industries -Provision of Incinerator/ Landfill for hazardous waste for Colombo area (Location of landfill sites underway) -Provision of training and noise level measurement equipment to LAs	-Carry out survey of hazardous waste generation qualities -Research on cost effective disposal methods treatment/ disposal methods for hazardous waste.	
	-Noise Pollution	-Public complaints -Adverse health impacts		-Inappropriate Industrial siting -Poor installation, maintenance and operation of industrial equipment and machinery	-Ineffective enforcement of regulations -Lack of adequate siting policy/guidelines -Miscellaneous causes eg Loudspeakers	-EPL programme CEA/BOI/LA	Contry Wide					

ANALYSIS OF INDUSTRIAL POLLUTION PROGRAMME AREAS

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACTS	PHYSICAL INDICATORS	ECONOMIC INDICATORS	PROXIMATE CAUSES	UNDERLYING CAUSES	EXISTING PROGRAMS	SCALE AND EXTENT OF LOCATION	OPTIONS FOR NEAP ACTIONS				REMAINING UNMET NEEDS
								POLICY REFORMS	INSTITUTIONAL REFORMS	SUB PROJECTS	APPLIED RESEARCH	
					-Lack of physical space for treatment systems (in some cases)	-NAREPP Environmental audit training program -SCOPE programme for early established industry MEIP/WB,CEA -CEA/Dutch project of Environmental guidelines for industry	-Existing Industry (Country wide) -Guidelines developed for selected Industries	-Incentive scheme for private off site treatment and disposal services for industrial waste. -Development of a scheme for charges for centralized pollution and treatment of industrial/domestic waste. -Establishment of an import surcharge for chemicals. -Review of existing effluent quality standards for industry and revision as necessary. -Review of existing industrial emmision standards for gaseous pollutants and revision as necessary	-Strengthening of CEA's regulatory capabilities by provision of adequate trained staff and other resources. -Upgrading of the CEA salary scales to make the CEA in par with other government agencies -Setting up regional offices of the CEA in key outstation cities to facilitate monitoring of environmental quality in areas outside Colombo and to facilitate better coordination with local Authorities -Development of university curricula to include Environmental Management and protection sectors.	- Develop TA program to enhance the skills of private sector - Develop & implement relocation plan for Tanning and pesticide industries 1 Common waste treatment system industry/domestic waste water in Ekala Jeala and Moratuwa Ratmalana with ocean outfall disposal 2 Designation of Kelani River basin as an environmentally sensitive area and development of a comprehensive monitoring scheme for existing and new industries in the area 3 After development, a TA programme to enhance skills of projects such as development of an accreditation scheme for private sector consultancy services on pollution control and EIA 4 Training in waste minimization and pollution control for industry and regulating agency personnel Training Programme for the private sector in specific codes of prabce for source Management.	-Treatability and pollution control research work. (Research institutions, universities) -Development scheme of registration of private sector consultants pollution control and EIA -Develop monitoring programme for air, water & soil quality in areas where industrial development is planned in order to obtain baseline data	

7: COASTAL AND MARINE RESOURCES

7.1 INTRODUCTION

As an island nation, Sri Lanka is endowed with a rich variety of coastal and marine environs which are intrinsically linked with the country's history and economy. From beautiful sandy beaches to mangrove forested estuaries, these often fragile ecosystems provide the basis for the marine fisheries industry, coastal tourism and a host of other productive benefits.

This chapter summarizes the key issues to be addressed if the country's coastal and marine resources are to be wisely managed in the context of its economic development. The major problems confronting these resources are reviewed, together with their principal causes. A set of recommended actions is then presented, including needed policy and institutional reforms. The material presented combine the inputs of the *Coastal 2000*[2] national policy statement and the work of the NEAP sub-Working Group in this programme area. Further detail is provided in the Programme Area and Policy Analysis matrix given at the end of the chapter.

7.2 ENVIRONMENTAL ISSUES FACING COASTAL AND MARINE RESOURCES

Sri Lanka's coastal and marine resources are facing increasing threats from a variety of development related sources. The key environmental and resource management issues in the coastal zone are:

Loss of habitats and nursery grounds, which include beaches, coral reefs, seagrass beds, mangroves, estuaries, lagoons and habitable marine waters. Loss of habitats is causing a reduction of biodiversity in coastal and marine ecosystems, lowered productivity of fisheries, general ecosystem degradation, and erosion. Its observed physical consequences are accelerated beach erosion along most of the south and west coasts, reduced beach width, receding coast lines, reduced coral cover on most reefs, reduced coral reef life diversity and abundance, increased nearshore wave action, increased turbidity in the water, reduced mangrove cover, decreased fish and shrimp catch and reduced bird populations. The resulting economic impacts include: loss of fish and invertebrate catches by fishermen; increased cost of coastal protection; the loss of tourism to areas where aesthetic appeal has been destroyed; and the reduction of quantity and diversity of mangrove products.

Overexploitation of coastal resources, which include fish and other aquatic fauna, and sand from beaches, limestone, land (space) and vegetation. Overexploitation is causing reduced fish catch in nearshore areas, changes in ecosystem composition of fish especially where aquarium fish are collected, changes in invertebrate and algae abundance, habitat damage, and overall reduced productivity of the system. Observed physical consequences are noted by changes in quantities caught of fish and commonly exploited marine organisms. Catch per unit effort is declining for most nearshore fisheries. This results in longterm declines in revenue from nearshore fisheries per capita and changes in catch per unit effort of fishermen. Prices of commonly used coastal resources such as fish, limestone, sand and land are also increasing as a result, but there is an overall loss of economic earnings in the sector.

Marine pollution caused by upland erosion, deforestation, industrial effluent, human settlements (sewage), tourism development and coastal infrastructure. Marine pollution is causing reduced growth rates for coral reefs and other living organisms in the marine environment, health hazards for recreational users of polluted waters, reduced fish production in certain areas, and unsightly conditions in some nearshore waters on the south coast. This can be measured by testing water

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[2] *The information contained herein is mostly derived from the analysis and policy recommendations of the Coastal Resources Management Plan (CRMP). "Coastal 2000": A Resource Management Strategy for Sri Lanka's Coastal Region.*

quality for salinity, clarity, dissolved oxygen, pathogens, and heavy metals, and it is also noted through changes in patterns of abundance of marine organisms such as certain invertebrates and algae in sites on the south and northwest coast where pollution is a problem. The economic consequences of this may be seen in the cost of prevention and clean up, such as for an oil spill. The loss of a tourist beach to oil pollution could be quantified in terms of tourism revenue lost and complaints of visitors.

7.3 CURRENT TRENDS REGARDING THE COASTAL AND MARINE ENVIRONMENT

The prognosis for the condition of the coastal environment in Sri Lanka by the end of the century is bleak if the current trends of environmental deterioration continue at their present rates. Water pollution in estuaries and lagoons will be more severe. Mangrove forests will be reduced to less 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 an integral part of the island ecosystem, which includes uplands, agricultural areas and the many human activities in the coastal zone. 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. The need to implement the recommendations contained in *Coastal 2000* is evident, and swift action is needed to enhance and to protect coastal and marine resources.

7.4 CAUSES OF COASTAL AND MARINE ENVIRONMENTAL DEGRADATION

The loss of coastal habitats has many causes, both obvious and profound. The apparent causes are coral mining, sand mining, destruction of mangroves, unauthorized industries, bottom trawling, reclamation of wetlands, lack of appreciation for the ecological functions provided by habitats, as well as increasing human population and its demands for coastal land and space.

Behind these proximate causes often lie more basic factors affecting human behaviour. Taking coral mining as an example, some of the underlying causes are as follows:

- Coral limestone is valuable and saleable.
- Incomes derived from coral lime are better than available alternatives.
- Regulation cannot be effective when poor coral miners are put out of work with no alternatives.
- National policy has not supported actions and investment to develop alternative sources of lime.
- Integrated coastal resource management plans which address the economic sector in its entirety--which affects and controls the market and distribution for coralline limestone--have not been developed.

Habitat loss due to the many actions of development and use by local residents primarily results from a lack of involvement, at the local level, in planning for sustainable resources management. This is true for most renewable coastal resources such as fish, mangroves, use of space, etc. Sand mining--which impacts on beaches and causes erosion--is a problem of regulation and local government surveillance and control with the participation of communities, which is lacking in most areas. Also, national government agencies, such as the Coast Conservation Department (CCD), do not have the capacity to regulate and enforce the rules for sand mining without much more devolution of authority and active participation of local authorities.

As illustrated by the coral mining example given, the causes behind the overexploitation of coastal resources generally include the following:

- The lack of integrated national and local level planning, which coordinates all government and non-government groups with jurisdiction over and interest in coastal resources.
- Insufficient sources of lucrative employment for those dependent on the resources and landlessness.
- The open access nature of fisheries and other renewable living coastal resources.
- The lack of local level organizations involved in managing these resources.
- The lack of holistic planning at the local level--where effective management occurs--which integrates responsibility for management with appropriate regulation and participation.
- Sporadic enforcement of existing regulations by local officials who are not sufficiently aware of the problems.
- The lack of zonation planning for landuse in coastal areas which have become too densely populated.

The pollution of coastal and marine areas is primarily caused by influences in inland areas such as deforestation, erosion, poor agriculture practices and increasing irrigation use of fresh water. Those influences specifically within the coastal zone which cause pollution and their underlying causes include:

- Construction near the shoreline without guidelines for minimisation of erosion.
- Industrial effluent which goes untreated because of weak Environmental Protection Lisencing enforcement.
- Domestic waste from towns and cities which is dumped directly into the sea because municipalities have not yet made the needed treatment investments.
- Wastewater from hotels and resorts which is not properly treated, because there is little pressure from national government agencies to clean up and because no attempt has been made to recycle tourism revenues into such infrastructure, either for individual companies or for tourism development zones such as Hikkaduwa and Negombo.
- Solid waste dumped into the sea by shoreline residents and ships because of lack of regulation and education.
- Economic incentives for pollution control are not sufficiently developed to be effective for private waste treatment in general.

7.5 EXISTING COASTAL AND MARINE RESOURCES MANAGEMENT PROGRAMMES

Government of Sri Lanka supported programmes for coastal zone management include a number of steps to implement the national Coastal Zone Management (CZM) plan and the master plan for coastal erosion through the CCD. These address setbacks for construction in the immediate coastal strip of 300 meters, shore protection from erosion, implementation of EIA's for large developments in the coastal zone, education of local government in giving permits for coastal development, sand mining and other regulated activities, the prevention of coral mining, and the control of land use near religious and historical sites. The Central Environmental Authority regulates waste water dumping in the coastal zone in coordination with the CCD. The Department of Fisheries regulates fishing activities through various laws.

Current nationally supported programmes focus on south and northwest coasts in reaction to the existing problems. Together they account for roughly one third of the coastline. The support is far from sufficient to implement national programmes and barely touches the surface of most problems. Institutional capacity is lacking in all cases. Summary information on current programmes under the NEAP is given in Figure 7.1.

Figure 7.1

SUMMARY OF CURRENT NEAP ACTIVITIES IN THE COASTAL AND MARINE RESOURCES PROGRAM AREA

There has been considerable activity in this program area since the 1991 NEAP was issued. The most prominent of the current initiatives are as follows:

PROGRAM	MAJOR FUNDING SOURCE	TOTAL FUNDING (US$ Mn)	START -END DATE
▸ NAREPP Coastal Resources Management Project (CRMP) - Assists CCD implement and update the Coastal Zone Management Plan - Assist NARA with research related to CZM planning and implementation through participation in two SAM sites - Special Area Management (SAM) projects in Hikkaduwa and Rekawa Lagoon - Training in Coastal Management for CCD, NARA, DWLC, NGO and other agency personnel.	USAID	2.0	1991-1996
▸ Coast Conservation Project (Phase 2) - Shoreline structures for coastal protection and technical assistance in engineering works.	GTZ	0.75	1994-1996
▸ Fisheries Management Project.	UNDP		
▸ ADB Fisheries Project - Management of offshore fishery resources - Improvement of nearshore fish landing facilities and harbours.	ADB		
▸ Wetlands Conservation Project - 10 site reports and 4 management plans (includes the planning and implementation of the Negombo and Muthurajawela Lagoons which is similar to the SAM approach of CRMP).	Netherlands Government	1.5	1990-1995
▸ Puttalam Lagoon, Kalpitiya Coastal Area and Bar Reef Marine Sanctuary Research Projectt (through NARA) - Data and research information for use in management planning efforts.	SAREC	0.5	1992-1994

7.6 RECOMMENDED NEAP ACTIONS

The actions recommended fall into four categories: policy reforms, institutional reforms, NEAP sub-projects, and applied research.

Policies for Improved Coastal and Marine Resources Management

The policy reforms required to manage the coastal resources of Sri Lanka are described in detail in *Coastal 2000, Volume II.* The six policies which have been accepted by the national government are as follows:

Policy 1. The coastal management programme 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.

Policy 2. Implement a programme 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.

Policy 3. Implement a research programme 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 CRM plans.

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

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

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

More specific policy reforms recommendations include:

- Give CCD a broader mandate to manage coastal zone.
- Revise the national CZM plan.
- Accept a mechanism to institutionalise "Special Area Management" (SAM) planning for coastal zones and implementation at the national and local levels.
- Improve guidelines for tourism development in the coastal zone.
- Obtain better acceptance of decentralized mechanisms for CZM.
- Mandate implementation of more SAM projects in the Coastal Zone;
- Mandate appropriate agencies to join practical monitoring with SAM project sites.
- Adopt the proposed Fisheries and Aquatic Resources Act.
- Improve the rôle of NGOs in CZM.
- Use economic policy and market-based incentives as tools for CRM.

Institutions to Improve Coastal and Marine Resources Management

The institutional reforms required to better manage the nation's coastal and marine resources should focus on:

Capacity Building: Institutional reforms should mostly be concerned with building capacity in the existing institutions and the provision of more support for managing coastal resources. The task is beyond the present national government capacity to handle. Thus, decentralization is crucial to long-term success. But, institutions such as CCD, CEA, NARA, DWLC, and UDA must be able

to provide the needed technical guidance for CZM at the local levels. This is not yet the case. Adequate incentives must be provided for those involved, including the opportunity for advanced training.

Coordination: The key to effective CZM is coordination. No one agency or institution will ever have total control over coastal and marine resources. It is a shared and collaborative venture to manage these resources. Although some coordination occurs among the key agencies, there is no efficient and generally accepted means for all agencies concerned with a particular coastal site to coordinate and reach consensus for management. The SAM process is working towards this end on a limited scale, but an institutional mechanism to make this happen more efficiently and national-wide is needed. The Coast Conservation Advisory Council could play this role, provided CCD as a lead agency is provided with sufficient support and mandate.

Recommended NEAP Sub-projects

The key to sustainable coastal resources management will be the successful implementation of pilot projects which are integrated into the fabric of national and local institutions and which provide the needed experience with integrated resources management to develop such programmes nationally. Potential projects which will help provide this experience between 1995 and 1998 are as follows:

- **Special Area Management (SAM) Projects:** SAM projects have been started at Negombo Lagoon (with support from the Netherlands) and on the south coast (under the NAREPP/CRMP) with the participation of CCD, DWLC, NARA, CTB, CEA, local government, and non-governmental and community groups. These projects will lead the way for integrated management of coastal resources for special geographical and resource rich use areas. Suggested sites for SAM implementation are:

  i **Hikkaduwa Town and Marine Sanctuary**, which includes management of the coral reefs, beaches and water quality through community and government participation.

  ii **Rekawa Lagoon and Tangalle** vicinity, which includes traditional fisheries, agriculture, tourism and agriculture development.

  iii **Unawatuna Bay** and coastal area, which has a large potential for guided tourism development and protection of coral reef resources.

  iv **Bar Reef Marine Sanctuary and the coastal area of Kalpitya** on the north-west coast, which includes coral reef and fishery resources, mangrove forest and lagoons, aquaculture development areas and tourism in a resource rich area.

  v **Negombo and Muthurajawela Lagoons** management plan.

  vi **Tourism development areas**, such as Beruwela, Bentota, Negombo or others which have common problems and need to plan for prevention of coastal degradation.

- **Water Quality Management for Tourism Development Zones:** This project should be developed to address the impacts of tourism development on water quality in coastal areas through the provision of appropriate wastewater treatment facilities and incentives for private support for required investments. The tourism sector in Sri Lanka can afford to pay for prevention of environmental degradation including water pollution. The project should also address the small scale tourism operators who have little economic means to purchase infrastructure for pollution control.

- **Sand Management for the Entire Coastal Zone:** The impact of continued sand mining on coastal areas, which causes increasing coastal erosion and saline infrastructure to ground water needs to be studied and acted upon. CCD needs assistance in efforts to regulate sand mining and better information for developing management strategies. This project should be

action research oriented, so that pilot management projects are started, possibly within SAM project sites.

- **Relocation of Illegal Coastal Inhabitants:** Increasing numbers of migrants are locating on public land in the coastal zone. Provision of proper housing facilities outside of the coastal zone is needed before relocation can be attempted. Past resettlement efforts have suffered many problems derived from low compensation rates for forced migrants and poor choices of new settlements.

Applied Research

Applied research is needed in the following areas (supported by Policy 3 in *Coastal 2000*):

- **Determination of estuarine and beach sand budgets** for the whole country and for local areas.
- **Feasibility studies for alternative sources of lime** need to be developed.
- **Feasibility studies for sewage treatment** and management with special reference to coastal areas are needed.
- **Identification of environmentally harmful shrimp farms**--Increasing numbers of shrimp aquaculture farms are causing environmental problems because of a lack of planning and adequate environmental impact assessments. Guidelines for aquaculture development are needed. Coastal aquaculture needs research guidance before the industry expands too rapidly.
- **Structural shoreline protection** needs to be made more practical and less costly to be effective through research.
- **Management schemes for all open-access resources,** which include coastal and marine habitats, need to be developed through action research programmes such as SAM.
- **Trends in fisheries** catch, production and other factors need to be better documented.
- **Environmental impacts of ornamental fish collection** need to be better documented.
- **Marine and coastal areas need innovative management** approaches, and the areas have poor baseline data on the existing environmental conditions and then bio diversity.

The matrix given at the end of this chapter identifies the proposed NEAP actions together with additional policy and institutional reforms and associated demands for applied research in far greater detail.

ANALYSIS OF COASTAL & MARINE RESOURCES PROGRAMME AREA

Program Area	Environmental Issues	Environmental Impacts	Physical Indicators	Economic Indicators	Proximate and Underlying Causes	Existing Programs, Scale, Extent and Location	Policy Reforms	Institutional Reforms	Sub Projects	Applied Research
Coastal zone, coastal and marine resources.	a. Loss of habitats and nursery grounds which include beaches, coral reefs, seagrass beds, mangroves, estuaries, lagoons and habitable marine waters	a. Loss of habitats is causing a reduction of biodiversity in coastal and marine ecosystems, lowered productivity of fisheries, general ecosystem degradation, and erosion.	a. Loss of habitats is being noted by beach erosion along most of the south and west coasts, reduced beach width, receding coast lines, reduced coral cover on most reefs, reduced coral reef life diversity and abundance, increased nearshore wave action, increased turbidity in the water, reduced mangrove cover, decreased fish and shrimp catch and reduced bird populations.	a. Loss of habitats is being measured by loss of fish and invertebrate catches by fishermen, the cost of coastal protection, the loss of tourism to areas where aesthetic appeal has been destroyed, and the reduction of quantity and diversity of mangrove products.	a. The loss of coastal habitats has many causes, both obvious and profound. The apparent causes are coral mining, sand mining, destruction of mangroves, unauthorized industries, bottom trawling, reclamation of wetlands, lack of appreciation for the ecological functions provided by habitats, increasing population and demand for coastal land and space. Habitat loss due to the many actions of development and use by local residents primarily results from a lack of involvement, at the local level, in planning for resources management. This is true for most renewable coastal resources such as fish, mangroves, use of space, etc. Sand mining which impacts on beaches and causes erosion is a problem of regulation and local government surveillance and control with the participation of communities, which is lacking in most areas. Also, national government agencies, such as the CCD, do not have the capacity to regulate and enforce the rules for sand mining without much more devolution of authority and active participation of local authorities.	a. Government of Sri Lanka supported programs for coastal zone management include: implementation of the national CZM plan and the master plan for coastal erosion through the CCD. Funding is about $400,000/year. The Cental Environmental Authority regulates waste water dumping in the coastal zone in coordination with the CCD. The Department of Fisheries regulates fishing activities through various laws. All the nationally supported programs focus on south and northwest coasts in reaction to the existing problems. Together they account for roughly one third of the coastline. b. Donor programs for CZM are: •CRMP of URI/NAREPP assists the CCD to implement and update the CZM plan through training, technical assistance and participation in most national policy debates and decisions regarding CZM; assist NARA with research which is directed to CZM planning and implementation through participation in two SAM sites on the south coast. Funding is about $400,000/year through 1995. •Wetlands project of CEA supported by the Netherlands is assisting with management planning and implementation for the Negombo and Muthurajawela Lagoons similar to the Special Area Management approach of the CRMP. This project is still in the implementation stage. Funding is about $US 3 million total. •ADB Fisheries project implemented through the Ministry of Fisheries and NARA is primarily concerned with the management of offshore fishery resources and the improvement of nearshore fish landing facilities and harbors. Funding is about ? /year. •SAREC research project through NARA is focusing on baseline research in Puttalam Lagoon, the Kalpitiya coast and Bar Reef Marine Sanctuary. The project has collected much information on the area. Funding is about ? /year. •German (GTZ) program with the CCD to assist with shoreline structures for coastal protection and technical assistance in engineering such works. •DANIDA program to assist with coast protection works and erosion management studies •UNDP Fisheries management project	The six policies in Coastal 2000 which have been accepted by the national government are as follows: 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. 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. Policy 3. Implement a research program of direct relevance to CRM through NARA, national universityies and other insitutions which will provide a better understanding of ecological proceses and social and cultural issues as well as provide information of critical importance to the formulation and implementation of CRM plans. Policy 4. Implement a program to strengthen institutional and human capacity to manage coastal ecosystems. Policy 5. Update and extend the scope of the master plan for coastal erosion management. Policy 6. Implement a program to create awareness, both by national and provincial government personnel and NGO's of the strategies for coastal resources management and the issues they address. More specific policy reforms include: •give CCD broader mandate to manage coastal zone •revise the national CZM plan •formulate mechanism to institutionalize SAM planning and implementation at the national and local levels •improved guidelines for tourism development in the CZ •better acceptance of decentralized mechanisms for CZM •mandate to implement more SAM projects in CZ •a mandate for appropriate agencies to join practical monitoring at SAM project sites •adopt proposed Fisheries and Aquatic Resources legislation •improved role of NGOs in CZM •use economic policy as a tool for CRM	Capacity. Institutional reforms should concentrate on building existing institutional capacity and providing more support for managing coastal resources. The task is beyond the present national government capacity. Decentralization is crucial to long-term success. But, institutions such as CCD, CEA, NARA, DWLC, and UDA must be able to provide the needed technical guidance for CZM at the local levels. This is not yet the case. Coordination. The key to effective CZM is coordination. No one agency or institution will ever have total control over coastal resources. It is a shared and collaborative venture to manage coastal resources. Although some coordination occurs among the key agencies, it is as yet neither efficient nor generally accepted. The SAM process is working towards this end, but an effective institutional mechanism is still not in place. The Coast Conservation Advisory Council could play this role provided CCD as a lead agency is provided with sufficient support and mandate. Incentives for participation. Sri Lankan government departments have little incentive to perform professionally because their staff are so underpaid. Until government is made more professional with sufficient support, their mandate will not be fulfilled. Training of officials is crucial in this regard.	Special Area Management Projects. SAM projects have been started at Negombo Lagoon with support from the Netherlands and on the south coast under the NAREPP/-CRMP with the participation of CCD, DWLC, NARA, CTB, CEA, local government, non-government and community groups. These projects will lead the way for integrated management of coastal resources for special geographical and resource rich use areas. Suggested sites for SAM implementation are: •Hikkaduwa town and Marine Sanctuary (coral reef, beache and water quality management through community and government participation) •Rekawa Lagoon and vicinity, Tangalle which includes traditional fisheries, agriculture, tourism and aquaculture development •Unawatuna Bay and coastal area have large potential for guided tourism development and protection of coral reef resources •Bar Reef Marine Sanctuary and coastal area of Kalpitya (coral reef and fishery resources, mangrove forest and lagoons, aquaculture development areas and tourism in a resource rich area) •Negombo and Muthurajawela Lagoons management plan •tourism development areas (such as Beruwela, Bentota, Negombo or others with common problems and need to plan for prevention of coastal degradation) Water quality management for tourism development zones. This project should be developed to address the impacts of tourism development on water quality in coastal areas through the provision of appropriate treatment facilities and incentives for private support for required investements. Sand management for the entire coastal zone. Continued sand-mining in coastal areas which causes increasing erosion. Its impact needs to be studied and acted upon. CCD needs assistance in efforts to regulate sand mining and better information for developing management strategies is required. This project should be action research oriented so that pilot management projects are started. Rehabilitation of Dutch Canal. Relocation of illegal coastal habitants. Increasing numbers of migrants are locating on public land in the coastal zone. Provision of proper housing facilities outside of the coastal zone is needed for relocation to be effective.	Determination of estuarine and beach sand budgets for the whole country and for local areas Feasibility for alternative sources of lime need to be developed Feasibility studies for sewage treatment and management are needed Identification of environmentally harmful shrimp farms. Increasing numbers of shrimp farms are causing environmental problems because a lack of planning and environmental impact assessment. Structural shoreline protection needs to be made more practical and less costly to be effective through research Management schemes for all open-access resources which includes coastal and marine habitats need to be developed through action research programs such as SAM Trends in fisheries are still not well documented The impacts of the ornamental fish collection are not well documented Marine and coastal areas need innovative management approaches and the areas have poor baselines of data on the existing environmental condition and biodiversity
	b. Overexploitation of coastal resources which include fish and other aquatic fauna, and sand from beaches, limestone, land (space) and vegetation	b. Overexploitation is causing reduced fish catch in nearshore areas, changes in ecosystem composition of fish species especially where aquarium fish are collected. changes in invertebrate and algae abundance, habitat damage and overall reduced productivity of the system.	b. Overexploitation of coastal and marine resources is being noted by drop in catches of fish and commonly exploited marine organisms and also in catch per unit effort for most nearshore fisheries.	b. Overexploitation is being noted through longterm declines in revenue from nearshore fisheries per capita and through changes in catch per unit effort of fishermen. Increases in prices of commonly used coastal resources such as fish, limestone, sand and land is indicating overexploitation and overall loss of economic activity in the sector.	b. The overexploitation of coastal resources is being caused by the following: •the lack of integrated national and local level planning which coordinates all government and non-government groups with jurisdiction over and interest in coastal resources •insufficient sources of lucrative employment for those dependent on the resources and landlessness •the open access nature of the fisheries and other renewable living coastal resources •the lack of local level organizations involved in managing resources •the lack of holistic planning at the local level where effective management occurs which integrates responsibility for management with appropriate regulation and participation •sporadic enforcement of existing regulations by local officials who are not sufficiently aware of the problems •the lack of zonation planning for landuse in coastal areas which have become too densely populated					
	c. Marine pollution caused by upland erosion, deforestation, industry, human settlements (sewage), tourism development and coastal infrastructure	c. Marine pollution is causing reduced growth rates for coral reefs and other living organisms in the marine environment, health hazards for recreational users of polluted waters, reduced fish production is certain areas and unsightly conditions in some nearshore waters on the south coast.	c. Marine pollution is being measured by testing water quality for salinity, clarity, dissolved oxygen, pathogens, heavy metals etc. and also noted through changes in patterns of abundance of marine organisms such as certain invertebrates and algae in sites on the south and northwest coast where pollution is a problem.	c. Marine pollution could be measured by the cost of prevention and clean up such as for an oil spill. The loss of a tourist beach to oil pollution could be quantified in terms of tourism revenue lost and complaints of visitors.	c. The pollution of marine areas is primarily caused by influences in upland areas such as deforestation, erosion, poor agriculture practices and increasing irrigation use of fresh water. Those influences within the coastal zone which cause pollution and their underlying causes include: •construction near the shoreline without guidelines for minimization of erosion -industrial effluent which has not been scrutinized through an EIA process and go untreated •domestic waste from towns and cities which is dumped directly into the sea and which requires large investments for infrastructure to address •waste water from hotels and resorts which is not properly treated because there is little pressure from national government agencies to clean up and because no attempt has been made to recycle tourism revenues into such infrastructure, either for individual companies or for tourism development zones such as Hikkaduwa and Negombo •solid waste is dumped into the sea by shoreline residents and ships because of lack of regulation and education •economic incentives for pollution control are not sufficiently developed to be effective for private waste treatment in general					

8: ENERGY AND MINERAL RESOURCES

8.1 ENERGY

8.1.1 ENERGY RELATED ENVIRONMENTAL ISSUE AND TRENDS

All nations, including Sri Lanka, have a need for energy usage in order to conduct economic and social activities. Throughout Asia, countries are rapidly increasing their usage of both commercial fuels (primarily fossil fuels) and biomass fuels. Unfortunately, the production and use of energy has significant environmental impacts on air and water quality, and on land. Both fossil fuel and fuelwood burning to generate energy result in air pollution. Unsustainable fuelwood collection can result in forest depletion, and hydropower generation--though inherently clean--has the negative side-effect of forest and agricultural areas inundation.

Sri Lanka's energy usage patterns are typical of other countries in Asia. However, the lack of any domestic fossil fuel resources makes Sri Lanka heavily dependant upon hydropower, fuel wood, and imported petroleum products. This argues for an energy policy which strongly favours efficiency of use.

Energy usage in the country is expanding to meet demands for basic services for the population and to respond to the growing economic base of the country. The key energy policy questions revolve around how to develop future energy options which are both economically and environmentally sustainable.

Energy Demands: There is a need to significantly increase energy services for a variety of uses. Some of the major demands are as follows:

- *Electricity:* Approximately half of the population has access to electricity. There is a growing demand for rural electrification efforts in order to provide basic electrical services to the remainder of the rural population.

- *Transportation:* Sri Lanka is experiencing rapid growth in transportation energy usage. As more vehicles are imported, and as population increases and economic expansion occurs, the country is experiencing an increase in the usage of petroleum for transportation, especially diesel fuel.

- *Commerce/Industry:* As commercial and industrial expansion take place in Sri Lanka's economic development, there will be increasing demand for energy supplies for these new industries. The fuels utilized will be either biomass or petroleum (directly or converted to), or electricity.

- *Home Energy Usage:* As the population grows and the economy develops, there is an increasing demand for energy services in the home, principally electricity, which is discussed above. Other energy usage includes increasing use of kerosene and propane for cooking and lighting, and expanding volumes of biomass in the rural and urban lower-income households.

Energy Sources: Sri Lanka currently utilises three main sources of energy: biomass, petroleum and hydro-electricity. The use patterns of these energy resources are as follows:

- *Biomass:* Primarily consumed in the form of fuelwood, this represents approximately 70% of the total energy usage in the country. Biomass is utilised for domestic cooking purposes as well as for industrial applications (e.g., drying, heating, etc.).

- *Petroleum:* Representing approximately 20% of the energy usage in the country, petroleum fuel products are used for motor vehicles, industrial purposes, residential lighting and cooking, and electrical power generation. As mentioned, Sri Lanka has no indigenous fossil-

fuel resources, and all petroleum used for fuel must be imported from other countries (primarily the Middle East).

- *Hydro-electricity:* Hydro power accounts for approximately 10% of the overall energy needs of the country. At the present time, hydropower is the source for over 90% of the electrical generation in the country, with the remainder coming from petroleum-fired plants.

Environmental Impacts: All of the energy producing and using activities described above create environmental burdens on the country. The fact that energy production and use is increasing, should raise considerable concern about future adverse impacts on environmental quality.

The main impacts--based on the following energy sources--include the following:

- *Biomass:* Deforestation, soil erosion, loss of habitat, and air pollution relating to biomass combustion in residential and industrial applications.

- *Hydro-electricity:* Loss of habitat, changes to surface and ground water regimes, salinity problems, soil erosion relating to building and use of hydro-electric facilities, and resettlement.

- *Thermal Electricity:* Increased air pollution, water pollution (including heat from cooling), damage to agriculture, and spills of hazardous materials relating to use of fossil-fuels (coal, oil, gas) for electricity generation. Significant increases in adverse environmental impacts are possible should there be extensive future expansion of thermal generating stations.

- *Petroleum Usage in Transport:* Air pollution, water pollution, urban congestion from use of petroleum fuel burning vehicles, and health hazards relating to increased use of petroleum for transportation.

Energy Use and Production Projections: Up to now, Sri Lanka has suffered relatively little environmental damage from energy production and use. This appears to be changing, as the country increases its overall energy usage particularly its use of fossil fuels for transportation, industries and electrical generation. The current trends for increasing energy usage are as follows:

- *Biomass:* Usage is continuing to increase at around 1.4% per year (i.e. at approximately the overall population growth rate). Use of fuelwood by commercial and industrial users is increasing at a rate of between 3% and 4% per year. There are already local fuelwood shortages in certain parts of the country, and a national fuelwood shortage is predicted by the year 2000. Unlike other goods, fuelwood does not tend to reach an equilibrium where demand equals supply. What occurs as prices rise is that more fuelwood is cut for sale, but private economic forces generally are not sufficient to encourage reforestation. One major reason for the lack of economic incentive for reforestation is the long time (7-50 years) for tree crops to mature. Another common constraint is secure land tenure. In extreme cases, this can lead to extensive deforestation and eventual severe fuelwood shortages, even at relatively high prices.

- *Petroleum:* Usage is growing rapidly, particularly for transportation fuels such as diesel and petrol. Overall petroleum usage is projected to increase by over 50% between 1994 and the year 2000. This forecast is based on the assumption that oil prices will not rise dramatically in the coming years.

- *Electricity:* Usage is growing at a very rapid pace, with electrical demand increasing between 8 to 10% per year. The one year rate of increase during 1993 was over 10%. Future plans for electrical generation include significant expansion of capacity during the next ten years, with most of the new capacity coming from fossil fueled power plants. The result of following this path will be that the electricity sector will become the largest contributor of nitrogen oxide and sulfur oxide emissions within Sri Lanka, and a major contributor of atmospheric carbon dioxide.

8.1.2 CAUSES OF ENERGY-RELATED ENVIRONMENTAL PROBLEMS

The causes of environmental degradation related to energy use stem from the type of energy resource being utilized. This section describes the causes of environmental degradation from the three largest energy sources within Sri Lanka: biomass, electricity, and petroleum.

Biomass provides the largest share of energy in the country--over two-thirds--and is the main energy source available locally. It is not practical to prevent the growth in its demand or its gradual establishment as a significant source of commercial energy. Efficient use of sustainably produced biomass has only limited adverse impacts on the environment. Carbon dioxide (CO_2), released into the atmosphere in burning biomass is drawn from carbon absorbed during plant growth, making a zero net addition to the environment. Growing trees for biomass energy enhances the quality of the environment and can protect soil productivity and improve watershed management. The principal adverse impact is on air quality from particulate matter emissions. This can be minimized through efficient stoves, kilns, and furnaces.

Increasing demand for biomass energy which could lead to its unsustainable use is a matter of concern. The efficiency of biomass use is as low as 5% to 10% at present, and this affects both the effective supply as well as the level of air pollution emissions. The Forestry Master Plan for Sri Lanka prepared in 1986 estimated the supply and demand scenario for fuelwood presented in Table 8.1.

Availability and Demand for Fuelwood: 1984 - 2000 (In 1000 tons/year)

Table 8.1

SOURCE	1984-1985	1986-1990	1991-1995	1996-2000
Available Resources:				
Non-forest wood resources	7100	9363	9335	9068
Natural forests	1770	1273	1205	1137
Forest industry residues	250	271	319	361
Existing forest plantation	50	468	770	393
Total Availability	9170	11375	11629	10959
Demand:				
Household energy	7900	8360	8957	9472
Industrial energy	1130	1160	1220	1270
Poles and posts (non-energy)	140	155	182	208
Total Demand	9170	9675	10359	10950
BALANCE	-	**1700**	**1270**	**9**

A national shortage of fuelwood has been forecast beyond the year 2000 if the present trend of demand growth continues. This would inevitably lead to encroachment of the forest reserves.

The underlying causes for this critical situation in the biomass supply and demand balance are: (a) low thermal efficiency (<10%) of traditional hearths used in a majority of households; (b) fuelwood still being an unpriced good in rural areas (i.e. many people collect their fuelwood from nearby wooded areas or forests); (c) log volumes from homestead gardens, which owners are using as fuelwood and which forms a substantial portion of biomass, are untraded; and (d) low quality energy provided by biomass preferred to other alternatives, since it is adequate to meet day-to-day cooking needs of households and heating needs of many local industries.

The rapidly increasing demand for electrical energy is the major potential cause of adverse energy related environmental impacts, mainly due to a projected shift from hydro to thermal generation. Table 8.2 gives the hydro and thermal components of generation from 1981 to 1990 and the projection for the year 2012 shows the sharp contrast in the future supply sources versus the present.

Annual Hydro and Thermal Components of National Electricity Generation

Table 8.2

Year	Hydro		Thermal	
Unit:	GWh	%	GWh	%
1981	1572	84.0	300	16.0
1982	1608	77.8	458	22.2
1983	1217	57.6	897	42.4
1984	2091	92.5	170	7.5
1985	2395	97.2	69	2.8
1986	2645	99.7	7	0.3
1987	2177	80.4	530	19.6
1988	2597	92.8	202	7.2
1989	2801	98.0	57	2.0
1990	3144	99.8	5	0.2
Projected:				
2012	5000	27.8	13000	72.2

The reasons for this projection are simple. The major part of the feasible hydro-power potential has already been developed. A combined installed capacity of 1115 MW generates about 4000 GWh/year under average rainfall conditions. The remaining technically feasible potential for additional development of large dams and hydro-power supplies is of almost the same magnitude, but only a minor fraction of this is economically viable at present (see note on mini-hydro below). This steers the generation plan towards the use of fossil fuels.

In a rapidly industrializing country like Sri Lanka, eliminating future electricity expansion is not feasible--there is inevitable demand for more generating capacity to fuel industrial expansion. With the limitations of available hydro-power sites, there also is a need to expand to other forms of electricity generation. Though there is some potential for wind energy and solar power (see below), these generally remain more expensive alternatives compared to the use of fossil fuels for thermal generation. Likewise, only limited substitution of biomass energy for fossil fuel-based electricity is likely to occur (e.g., the use of bagasse by sugar mills). With increased thermal generation come significant environmental threats relating mainly to air pollution (carbon dioxide, nitrogen and sulfur oxides and particulates). The most effective way to reduce these impacts is to limit its expanded use by reducing the growth in demand for electricity through:

a) reduction of system losses, and
b) energy conservation, including influencing future energy consumption patterns.

But, demand management is not only the best alternative from an environmental standpoint, it represents the most economically efficient means for expanding the effective "supply" of electricity. However, present efforts to improve energy efficiency are inadequate and should be

expanded to reduce both the country's total electricity bill and adverse future environmental impacts from electricity generation.

This environmental economic analysis extends to the question of expanding electricity generation through construction of coal-fired power plants--including the proposed large plant on the East Coast. The need for these--or any other fossil-fueled power plants can be reduced--and this type of capacity expansion delayed through the use of demand-side management, energy loss reduction, and the pursuit of other energy alternatives.

Sri Lanka also lacks a vigorous programme to support the development of alternative renewable energy sources. It is estimated that 200 GWh/year may be available in small hydro-power sites, which, if developed, could save a significant amount of environmental damage compared to alternative sources. There is also considerable potential for harnessing wind for energy generation in certain parts of the island. Solar power has considerable potential for providing electricity to rural areas, far from the existing electrical "grid". It has already proven to be less costly than extending the grid to the far reaches of the island. Solar power's attractiveness for such areas is due to the high cost of extending the grid and the low revenues from rural customers who use only small amounts of electricity.

Adequate transport is an essential building block to support economic development, and energy usage in the transportation sector has increased significantly in the last ten years, as more and more vehicles have been imported and placed on the road. But little has been done to expand the highway system or--more importantly from the energy efficiency and environmental standpoint--to develop urban public transport systems. The result is that existing roads are jammed with vehicles, air pollution in parts of Colombo has been measured at dangerous levels, and emissions are increasing as more vehicles are added. The efficiency of existing vehicles is very low due to poor maintenance and extensive use of two-stroke engines. Future growth projections for transportation, based on stable oil prices, show a continued net increase in the number of vehicles and resulting pollution. Development of a vehicular energy efficiency improvement programme--combined with public transport--would be very helpful in reducing future emissions and resulting air pollution.

8.1.3 EXISTING ENVIRONMENTALLY-RELATED ENERGY PROGRAMMES

Since the NEAP was prepared in 1991, several environmentally-related energy programmes have been initiated. These provide a firm basis for expanded activity in this programme area. A summary of the existing programmes under the NEAP is as follows:

- **National Fuelwood Conservation Programme (NFCP):** Energy-efficient wood stoves have been developed, disseminated and installed in over 300,000 households as part of the NFCP. These stoves increase efficiency by more than 20% and reduce average household fuel consumption from 2.3 MT/yr to 1.7 MT per year. The NFCP effort, begun in 1984, has involved the participation of the Ceylon Electricity Board, Ministry of Power and Energy, Ministry of Energy Conservation and several NGOs. A recent survey by the CEB showed that over 90% of the stoves were still operating after three years. Despite the success and importance of the NFCP, the CEB is planning to end its participation in the project at the end of 1994 due to corporate reasons. Additional efforts are required to maintain and expand this valuable programme.

- **Environmental Impact Assessments:** As part of Sri Lanka's efforts to expand project-specific environmental analysis, several Environmental Impact assessments have been undertaken for proposed energy facilities. These EIAs include: Trincomalee Coal Plant, Sapugaskanda diesel extension, Kukule Ganga Hydro-project, Samanalawewa Clay Blanketing, and several transmission projects.

- **Development of a Demand-Side Management Action Plan:** This is meant to implement efficiency improvements and encourage conservation in the electricity sector. This plan describes the actions required to reduce overall energy demand including those which can be implemented immediately to ensure timely benefits to the environment.

While these existing programmes and actions include important efforts to reduce the environmental impacts from energy usage, they fall far short of meeting the overall need. They are insufficient for several reasons, including: insufficient funding to expand successful programme elements; lack of effective policies to incorporate environmental issues and mitigation into energy decision-making; lack of staff who are trained in energy conservation and environmental aspects of energy usage; and, weak pricing incentives to encourage consumers to conserve fuel resources.

8.1.4 RECOMMENDED NEAP ACTIONS

A series of proposed actions were developed during the NEAP updating exercise in collaboration with potential executing/implementing agencies such as the CEB, the Ministry of Energy Conservation and participating NGOs. Four types of actions are described in this section including: policy reforms, institutional reforms, NEAP sub-projects, and applied research. Many of the actions serve to reinforce or complement those proposed by the other programme areas of the NEAP. The proposed actions provide important, cost-effective methods to reduce the environmental impacts or capture environmental opportunities in the energy sector. The proposed actions are briefly discussed below:

Policy Reforms

From the discussion on the causes of environmental impacts related to the energy sector, there emerges the need for updating the National Energy Policy and formulating an action plan to implement it. In 1985, the Government approved the "Energy Policy Guidelines", a set of goals for energy policy prepared by the Ministry of Power and Energy (M\P&E) and reviewed by NARESA as follows:

- Providing the basic human energy needs.
- Choosing the optimum mix of energy resources to meet energy requirements at the minimum cost to the national economy.
- Optimisation of available energy resources (hydro, biomass, solar, wind and petroleum) to promote socio-economic development.
- Conserving energy resources and eliminating wasteful consumption in the production of energy and the use of energy.
- Developing and managing forest and non-forest wood fuel resources.
- Reducing dependence on foreign energy resources and diversifying the sources of energy imports.
- Adopting a pricing policy which enables the financing of energy sector development.
- Ensuring continuity of energy supply and price stability.
- Establishing the capability to develop and manage the energy sector.

Though they do not explicitly deal with environmental aspects of energy production and use, these existing policy guidelines provide ample basis for protecting the environment in meeting energy demands. The optimum mix of energy resources can be chosen in such a way as to minimise the use of fossil fuel, which would simultaneously meet both the environmental objectives and requirement for minimum cost to the economy. At the same time it would reduce the country's dependence on energy imports. The policies also could encourage sustainable use of biomass as a commercial source of energy. Sustainable management of forest and non-forest fuelwood source is not only essential in a national economic context, but it also would enhance and protect the quality of the environment.

To move forward with an environmentally--as well as economically--sensible and sensitive policy, two policy reforms are recommended:

Energy Policy Update: The existing Energy Policy Guidelines date from 1985. An update is needed to meet the demands of national development in the most economically efficient manner, while incorporating appropriate environmental safeguards. This exercise could be executed by the M\P&E in collaboration with NARESA and MEPA, in two phases. The first phase would be in the form of a study which would also cover the formulation of an action plan, and the second phase, covering an appropriate time period of 5 to 10 years, would implement and monitor the action plan. The process should be continuous with the updating of policies and the implementation of action plans at regular intervals.

Energy and Environmentally Sensitive Transport Policy: The other policy action recommended is a review of the Transportation Policy, primarily with a view to reduce per-capita energy usage for transport. As in the case of the Energy Policy Update, this can be executed in two phases of study and action, in this case by the Ministry of Transport and Highways (M\TH). The study could also provide recommendations for an incentive scheme to encourage: (a) the import of high energy efficiency and low polluting vehicles; (b) maintenance of vehicles in the optimum engine condition; and (c) the import/production of pollution reduction equipment.

Institutional Reforms

In addition to the two policy reforms suggested above, there is a need to implement several institutional reforms. These complementary reforms are meant to assist the implementing agencies in better aligning their proposed and existing policies with the actions undertaken by these agencies. Institutional reforms are required in four main areas:

- National Energy Planning Capacity at MP&E
- Implementation of the Integrated Resource Planning process within the CEB;
- Coordination of the supply and conservation of biomass resources; and
- Strengthening of the pollution prevention capabilities within the Ministry of Transport and Highways.

Each of these institutional reforms are discussed below:

National Energy Planning Capacity at MP&E: An integrated national energy planning capability was established in the M\P&E in 1984. Policy makers have made little use of this valuable and essential tool, and the capability has fallen into disuse. There is a need to reorganise the decision-making process to take cognition of such planning tools and to extend its functions to include the evaluation of energy-environment interactions, which would make it necessary, *inter alia*, consider action of environmental impacts in energy planning.

Integrated Resource Planning at CEB: As a complementary measure to the policy reform proposed in connection with the national energy planning, the Integrated Resource Planning (IRP) Process should be implemented within the CEB. Strengthening the institutional capabilities for environmental analysis and monitoring within the CEB and the M\P&E is also needed. Specifically, the Environmental Cell in the CEB should be strengthened to fulfil the following functions: (a) to carry out scoping for new projects; (b) to engage, coordinate and supervise consultants for environmental assessments; and (c) to conduct continuous environmental monitoring of the operation of existing energy projects. The strengthening programme would need to include the necessary training for a selected staff of the CEB.

Biomass Use and Conservation: The above discussion points out the need for a strong well coordinated management for the supply and conservation of biomass. Currently the Forest Department (FD), the State Timber Corporation (STC) and the Ministry of Energy Conservation (M\EC) are the three main institutions involved. It is proposed to establish a coordinating framework under the sponsorship of the M\EC to include the FD, STC and the participating NGOs for the effective implementation of the relevant biomass policies. The potential of

biomass as the main energy supply source for Sri Lanka can not be over-emphasised. The important aspects are how best this source could be developed and made use of while ensuring minimum adverse impacts. It is worth noting that if properly managed a biomass energy programme would be beneficial to the environment. A few years back it was shown that there exists a national surplus in biomass supply up to the year 2000 under the prevailing scenario. Also the Forestry Master Plan proposed forest and fuelwood management programmes which will enable the surplus to be extended up to the year 2020. This surplus situation is considered to be highly fragile in environmental terms since (a) biomass supply from rubber wood amounting to 22% of the total supply is bound to decrease because of its use for furniture manufacture, (b) rate of forest clearing for agricultural development which at present is estimated to yield 19% of the total fuelwood supply has to slow down due to land constraints and (c) commitment to fuelwood plantations is still inadequate.

Pollution Prevention in Transport: For the transport sector, it is proposed that a vehicle pollution control unit in the M\TH to: (a) follow up the realisation of the proposed policy reforms and thereafter to manage and coordinate the implementation of the resulting policies and legislation; and (b) execute the Vehicle Pollution Elimination Project proposed as a NEAP sub-project.

NEAP Sub-projects and Applied Research

The prioritized NEAP sub-projects and applied research which address issues raised under the Energy Resources Programme Area are given in Table 8.3.

Table 8.3

ACTION		OBJECTIVES
SUB-PROJECT	National Fuelwood Conservation Programme 2 (NFCP 2).	Extends the successful programme to supply energy efficient stoves for household use.
	Industrial Biomass Energy Conversion Project 2 (IBECP 2)	Develops potential for substituting of electricity with cogeneration and biomass sources in industry.
	Implement Stage I of the Recently Completed Demand Side Management Action Plan.	Takes important steps toward improving the country's energy efficiency with environmental benefits.
	Replacing Fossil Fuels with Renewable Energy Sources.	
	Training of CEB and Ministry Staff in Environmental Assessment and Related Fields.	Adds environmental analysis skills to cadre of energy professionals.
	Vehicle Pollution Reduction Programme.	Addresses a key interface between energy and environment.
APPLIED RESEARCH	Appropriate Stove Design to Reach the Lowest Income Group.	Complements the NFCP 2 project.
	Identification of Suitable Species for Fuelwood Plantations	Provides information for sustainable biomass energy production.
	Establishment of Norms Appropriate to Sri Lanka for the Accurate Quantification of Environmental Costs Relating to Hydro and Thermal Projects.	Fills information gap concerning energy policy options.
	Estimating Health Impacts due to Energy-related Air Pollution.	Provides information needed to evaluate energy and environmental policy options.
	Improving Technology for Fuelwood Gasifiers.	Provides information on a potentially valuable alternative energy source.

Some of the identified research could be conveniently included in the relevant NEAP sub-projects as components. Others would more appropriately stand alone, such as the research and development work on the fuelwood gasifiers, which is a crucial development with regard to the future energy/environmental situation. Experienced institutions such as the NERD have been recommended to undertake such important research work.

The matrix given at the end of this chapter identifies the proposed energy related NEAP sub-projects together with additional policy and institutional reforms and associated demands for applied research in far greater detail.

8.2 MINERALS

Introduction: Sri Lanka is reasonably well endowed with mineral resources when compared to its size. From ancient times, minerals have been extracted and put to a variety of uses. The Mineralogical survey established in 1903 and its successor, the Geological Survey Department, which has been renamed recently as the Geological Survey and Mining Bureau (GSMB), has been responsible for carrying out systematic surveys to locate mineral resources and reserves, such as, thorium, iron ore, ilmanite, dolomite, zirconium, monazite, brick/tile/ceramic clays, quartz, feldspar, graphite, mica, gems, rock phosphate, sand, gravel and salt.

The country's most important minerals are gems, which account for around five percent of export earnings. The State Gem Corporation (SGC), now the National Gem and Jewelry Authority (NGJA), was established by the government in 1971 for regulating and controlling the gem industry and trade.

8.2.1 ENVIRONMENTAL ISSUES AND IMPACTS

Environmental Issues: The mining industry can be broadly classified into two categories, namely, artisanal mining and large scale organised and or mechanised mining. Some minerals such as gems have been extracted since ancient times through artisanal mining, which are still strongly practiced, while certain minerals such as graphite are extracted in a more organised manner, and other minerals such as clay are mined employing both practices. Environmental issues in the mineral programme area can logically be identified with the mining methods, discussed in the sections that follow. The general environmental issues associated with the minerals programme area are water quality, sedimentation, land degradation, land deformation, effects on habitats, health and stream flows.

- **Artisanal Mining:** Artisanal mining is carried out by small groups of miners, mostly traditional miners, and is done on small scale extractions. Because of the (a) large number of individuals employed, (b) wide distribution over a vast area, (c) varied and often crude techniques of extraction, and (d) ease of illicit practice, artisanal mining is more environmentally damaging and logistically difficult to control. Minerals that are usually extracted by artisanal mining are gems, mica, feldspar, construction aggregates through small scale rock quarries, and clay through small open pits. Of these, gem mining is the most predominant, both with respect to the number of individuals and pits involved, and its environmental implications. Therefore, the discussion on artisinal mining in the policy and programme analysis matrix which appears at the end of this chapter is directly related to gem mining, but most of it is equally applicable to other artisanal mining methods.

- **Mining Activities Prescribed by the National Environmental Act (NEA):** All large scale organised mining is prescribed under the NEA and requires a mandatory environmental impact assessment (EIA) prior to the granting of approval and commencement of any field mining activity. These mining operations are generally handled by large and stable organisations, and therefore are easier to regulate, provided there is sufficient institutional

capacity within the regulator namely, GSMB, to effectively monitor and control the islandwide mining operations.

- **Clay Mining Inland and Coral Mining in Coastal Areas:** In theory, there should have been no necessity to enumerate clay and coral mining separately for their environmental issues, since they either fall into the artisanal or prescribed category. However, it is worth recording clay and coral mining separately, (a) for the purpose of highlighting certain specific impacts associated with them, (b) due to the wide extent of these practices, and (c) due to the sensitivity of their locations and/or the sites.

- **Sand Mining:** Sand mining involves beaches, dunes, off-shore locations, beds of rivers and streams and other inland deposits. The discussion above is equally applicable to sand mining. Since sand mining involves sensitive areas, certain unique types of impacts and solutions, it warrants separate mention. Before 1988, the Central Environmental Authority (CEA) in collaboration with the Coast Conservation Department (CCD) initiated a National Sand Study (NSS) to investigate the environmental implications of present sand mining practices. The study was planned to be conducted in three phases. Funding for Phase 1 (1991-1992) was provided by the Netherlands Government. Phases 2 and 3 are yet to be implemented. At present, sand mining extracts sand from active natural systems of rivers and coasts. The developing economy creates an increasing demand for sand and dictates the annual volume of sand taken from the rivers and beaches. Sand mining from morphodynamically active rivers and beaches diverts sand from the natural flow and causes erosion of the river beds, banks and beaches, adversely affecting the environment in these areas.

Environmental Impacts: From initial field exploration activities up to the stage where products are ready for end use, the mining and mineral industries entail various kinds and levels of environmental impacts. The adverse environmental impacts due to mining include loss of fertile top soil, erosion, landslides, land subsidence, destruction of natural vegetation and agricultural lands, damage to bed and banks of water courses, siltation of streams/rivers and reservoirs, surface and ground water pollution, hazardous unclosed abandoned pits and loss of habitats.

Gem mining in and close to streams/rivers, agriculturally productive valleys, and uncontrolled extraction of sand from river beds cause damage to banks and lead to severe erosion problems. If proper care and control are exercised, these minerals--which are of considerable value to the economy--can be extracted without being as harmful as at present. Gem mining unearths a large quantity of soil annually, and a significant amount of soil is left around the mines even after the activity is completed. The soil finds its way into the streams, rivers and reservoirs and causes heavy siltation which creates detrimental effects on the aquatic ecosystems and stream flows.

The NGJA issues around 3,400 gemming licenses each year, according to 1991 figures. Each licensee can operate up to four gem pits at a time. The NGJA collects a refundable security deposit from a licensee for each gem pit he is allowed to operate at a given time. The licensee is expected to fill back the exploited pits and reinstate the surface to an acceptable condition. The security deposit is confiscated on failure to comply with this requirement stipulated during the licensing process. In most regular mining, the licensee adheres to the requirement by closing the pits. In the case of deep mines with horizontal tunnels, the tunnels are never filled. Pits dug for illicit gemming are also never covered and leave behind an eye-sore and other consequences of erosion and water table changes.

In the case of gem mining, the excavated material is always stockpiled by the pit and can be used to fill back the pits, provided the operation is not delayed or the excavations are not washed away before backfilling. Clay mining differs from gemming, as all the clay excavated is exported from the location, leaving an open pit with no material to fill back. Coral mining, to a large extent also has the same problem.

When excessively large quantities of sand are extracted from river beds, it interferes with the natural river dynamics and the process of beach replenishment. This results in increased erosion of the beds, banks and beaches. Recession and depletion of sand in the river beds and along the coast will allow the sea water to intrude farther into the coastal plain and the estuaries. Intruding sea water could affect water intakes during dry seasons and influence ground water quality. Sand mining has a reducing effect on floods caused by rivers and an opposite reaction on floods caused by the sea.

8.2.2 STATUS AND TRENDS RELATING TO MINING AND THE ENVIRONMENT

The physical indicators of the environmental impacts attributed to mineral resources exploitation are decreases in vegetation cover, loss of agricultural production, increased occurrence and intensity of floods, increased incidence of vector borne diseases and increased coastal erosion. Sufficient studies have not yet been carried out to identify and quantify the extent of these physical indicators, and hence economic indicators of environmental damage that can be attributed solely to mining operations are not available. More applied research is a necessity in this area.

To provide an indication of the current trends, an attempt was made to utilize limited data available for gem and sand mining. The estimated number of mines in operation in 1988 was 20,000 to 30,000. This provided employment for around 135,000 people. On an average, each pit is estimated to unearth $50m^3$ of soil and to destroy about $60m^2$ of vegetation, amounting 1.0 to 1.5 million cubic metres of soil unearthed and 120 to 150 ha of vegetation destroyed annually. Similar magnitudes may be involved in clay and coral mining. About half of the land which is directly affected by the mining operations is permanently lost for future agricultural use, and the rest needs to be rehabilitated.

The NSS estimate for sand abstracted in 1991 from the river basins Maha Oya, Kelani and Kalu Ganga amounted to a little over 3.0 million cubic metres, and about 0.1 million cubic metres from the related coasts. The estimated loss of land due to deepening of the rivers and consequent bank erosion was about 12 ha per year, and the effect of river sand mining on beach replenishment and the direct abstraction from the coast was estimated to cause an additional net average recession of 0.4 to 0.5 m/year, equivalent to a land loss of about 5 to 6 ha annually. This amounts to some 150 ha of highly valuable land lost over a 10-year period. If the present trend of abstraction rate and growth continues, the NSS estimated that the sand contained in these river beds and the coastal barrier would be exhausted in about 25 years. Table 8.4 on the following page shows some estimates based on the limited available data.

8.2.3 CAUSES OF ENVIRONMENTAL DEGRADATION

All mining operations are carried out as income generating activities. Through the important new mining regulations that were recently enacted, most of the adverse impacts caused by the mining industry can be brought under control and minimised, provided that (a) adequate supervision is exercised and (b) miners are made aware of the environmental costs of their activities, while making the proper incentives available to them for environmental conservation.

The main cause for inadequate supervision of the mining industry is due to lack of institutional capacity at GMSB and NGJA. Gem prospecting can some times spread like wild fire in various areas which come under the administrative control of different agencies. In such areas, including reservations, natural forests, sanctuaries, state plantations and other government owned lands, the active and timely co-operation from the relevant authorities become essential for the effective enforcement of mining laws. The NGJA field officers would need the fullest backing of the police, Grama Niladharis and other law enforcement agencies for efficient discharge of their duties. In relation to the regulatory role of GMSB, similar comments apply for the mining of clay, coral and sand. The time required for effective implementation of regulatory measures would be relatively longer for the issues to be addressed. Considering the above need for a unified approach, the prevailing insufficient co-ordination, especially at the local

(provincial and divisional) level, among involved agencies and local power blocks, as one of the underlying causes for the proliferation of adverse impacts due to artisanal mining.

Tradition and poverty are other underlying causes for the continuing artisanal mining in its present form. People in the areas concerned have been engaged in this form of mining for generations, and they naturally feel that it is their right to do the mining. Any regulatory measures are unwelcome rules restricting the freedom they have enjoyed traditionally.

Table 8.4

DESCRIPTION	PHYSICAL INDICATORS	QTY.	ECONOMIC INDICATOR	Rs. Mn.
Extent of legally carried out gem mining.	Estimated number of mines.	10,000 to 15,000		
Estimated total extent of gem mining.	Estimated number of mines.	20,000 to 30,000		
Estimated total extent of artisanal mining.	Estimated number of mines.	30,000 to 45,000		
	Unearthing of soil	Approx. 2 mill. cu.metres. annually		
	Estimated annual loss of land	150 ha.	Cost of:	
	-Temporary	75 ha.	-Rehabilitation	2.0
	-Permanent	225 ha.	-Land	20.0
	-Total		-Rehab.+ Land	22.0
Sand mining	Sand abstracted from: Mahaoya, Kelani and Kalu basins	3.0 mill. cu meters		
	-Rivers	0.1 mill. cu meters		
	-Coast			
	Estimated annual loss of land from Maha Oya,Kelani and Kalu basins			
	-River banks	12 ha.	Cost of:	25 to 30
	-Coast	5 ha.	-Land	
	-Total	17 ha.		
	Estimated annual loss of land islandwide	28 ha.	Cost of: -Land	28 to 34

8.2.4 EXISTING ENVIRONMENTAL PROGRAMMES RELATING TO MINING

Existing NEAP programmes aiming at the removal of the above discussed causes are limited due to current practicalities. In 1993, the NGJA conducted some ad hoc awareness programmes for gem miners in Ratnapura, Eheliyagoda and Matale areas and plans to continue at the same level in 1994. It also uses confiscated security deposits to rehabilitate, on a limited scale, abandoned open mines and damaged river banks.

The GSMB will soon commence recruiting additional staff, but the new recruits will require training and experience. It is currently executing a World Bank funded project, Mineral Inventory Data Base Preparation. A comprehensive mineralogical/geological data base is a prerequisite for environmental assessment studies, not only of mineral extraction projects but of many projects coming within other programme areas. A reliable comprehensive data base on gem deposits will prevent "wildcat" prospecting leading to unwanted environmental damage. There is no explicit environmental component to the project's data collection effort, though it could be considered.

8.2.5 RECOMMENDED NEAP ACTIONS

Policy Reforms

The programme area policy analysis has indicated the need for better environmental guidelines and coordination for the mining industry. It is therefore proposed to undertake a study to review the new Mines and Minerals Act (MMA) in conjunction with the National Environmental Act (NEA), with the objective of proposing amendments, if necessary, to the MMA to incorporate appropriate environmental safeguards. This same study could be extended to reformulate environmental guidelines for the mining industry. The gaps which may exist among the different levels of administration, legislation, by-laws and the co-ordination mechanism must be identified and remedial measures formulated. This could be a short study to be executed by the GSMB with participation from the NGJA.

The building industry is heavily dependent on clay production. Sri Lanka must come to terms with the reality that clay is not a renewable resource and neither it is unlimited. Introducing alternative materials must begin someday, and the earlier the better for the environment. It is therefore suggested that policies regarding construction codes and other regulatory and incentives be formulated, aimed at shifting the building industry towards alternative materials for minimising the use of clay.

Institutional Reforms

Institutional reforms suggested by the NEAP updating analysis are directed towards strengthening the GSMB and NGJA enforcement divisions to ensure effective supervision of the industry.

In order to (a) select projects, in the first instance, which are environmentally sound, (b) design and direct such projects to minimise adverse impacts, (c) incorporate mitigatory measures at early stages of the project and (d) implement such projects in the way intended to minimise environmental damages, it is necessary for the GSMB and the NGJA to maintain a high degree of environmental awareness. Establishing environmental cells and training of staff are proposed for this purpose.

Establishment/Strengthening of District Environmental Councils is a strong institutional reform proposed for ensuring co-ordination at local level. Such councils must also have the participation of local political authorities. They can act as a Scoping Bodies for planning minerals extraction activities in the area of their authority and function as a facilitators for the field operations of the GSMB and the NGJA.

NEAP Sub-projects

The need for a strong GSMB cannot be over-emphasised with respect to regulating the mining industry. The GSMB needs not only institutional support but also infrastructure development, both of which should go hand in hand if any development is to be effective and meaningful. It is expected that the Government would make timely and appropriate arrangements to provide the necessary infrastructural facilities to the GSMB. Such projects are currently considered to be not within the scope of NEAP.

A more regular and wider awareness programme should be conducted for the gem miners, which should also be extended to include other artisanal miners. This is proposed as a NEAP sub-project for implementation by the NGJA with NGO participation and the GSMB assistance.

It is proposed to continue with the Phase 2 of the on-going mineral data base development currently executed as a World Bank funded project by the GSMB. A comprehensive data base giving accurate and detailed information on all mineral deposits including gems, is a

prerequisite for (a) organising conservation measures through zoning of the areas, (b) environmental impact analyses of mineral projects as well as other projects coming in the areas concerned and (c) preventing "wildcat" mining which results in both economic failures and environmental damages. The Phase 2 is called the Mineral Titles Computerisation Programme. An explicit environmental component examining potentially adverse environmental impacts from mining -- should be added to the project.

The need to educate children from the gemming areas of the environmental implications of artisanal mining has been identified as important to provide them with an early appreciation of the problem. This suggestion is referred to the Environmental Education Programme Area for inclusion in the relevant curricula.

Whatever regulatory measures are planned and however best they are implemented, the gem industry, due to its very artisanal and widespread nature, will leave behind annual rehabilitation needs. A special Fund is proposed to be established at the NGJA to undertake such rehabilitations. The Fund can have as its sources confiscated security deposits, a mandatory percentage from the licensing fees, voluntary contributions from miners and traders, and contributions from the government and the international funding agencies.

Applied Research

A strong case exists for research to accurately quantify the environmental costs of mining operations, to fill the existing void of information. At present, due to the lack of focused data, the NGJA and the GSMB are unable to realistically analyse the potential environmental impacts of projects in calculating their economic viability. These studies can be executed by the NGJA and the GSMB through universities.

The gem mining industry has not changed much from the traditional practices that have been adopted in early times. The most common method of mining is by small pits, sometimes deep with lateral tunnelling. Both mines and tunnels are lined and propped with timber framework, primarily arecanut (a tree of palm family) verticals and Kekille (a fern), and rubber wood for the timber framework. The time is fast approaching when the timber supply will be very scarce. Already arecanut has become very difficult to find, and rubber is increasingly becoming so. Furthermore, lighting, ventilating and gas testing techniques adopted are very crude and often do not conform to safety standards. Research on new and more environmentally appropriate mining methods is an urgent necessity which can be executed by the NGJA through a university in combination with a Miners' Association.

Research on alternative building materials and matching the quality of raw material to end products, has been identified as beneficial for supporting the policy proposed for shifting the building industry needs from clay, sand and coral and effective conservation.

The matrix given at the end of this chapter provides a more detailed analysis of the mineral programme area.

ANALYSIS OF ENERGY AND MINERALS PROGRAMME AREA

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACTS	PHYSICAL INDICATORS	ECONOMIC INDICATORS	PROXIMATE CAUSES	UNDERLYING CAUSES	EXSISTING PROGRAMS	SCALE AND EXTENT OF LOCATION	OPTIONS FOR NEAP ACTIONS				REMAINING UNMET NEEDS
								POLICY REFORMS	INSTITUTIONAL REFORMS	SUB PROJECTS	APPLIED RESEARCH	
ENERGY												
-Issues relating to electrical generation from fossil fuel -Air Quality -Water Quality	-Air Pollution -Water Pollution from cooling water -Noise Pollution	-Estimated increases in (a) CO2 emissions from less than 1 MMT in 1995,to 11 MMT in 2012 (b) NOx emissions from less than 3000 MT in 1993 to 45,000 MT in 2012 (c) SOx emissions from less than 5,000 MT in 1995 to 60,000 MT in 2012 (d) Particulate emissions from 250 MT in 1995 to 4500 MT in 2012 These may contribute to Global warming and increased incidence of diseases.	Long-term average economic generation cost for 20 yrs ahead is estimated as Rs 2.69/KWh in 1993 prices Estimated annual monetary value of the electrical energy conservation potential in the industrial sector alone is Rs 300 m per year in 1993 prices	-Increasing demand for electrical energy	-Majority of the economically exploitable hydropower systems has been already developed. -High losses in power transmission and distribution systems -Inadequate demand side management. -Lack of programs to support developing alternative energy in Sri Lanka.	-Power T & D system Loss Reduction program (CEB) -Preperation of DSM Action Plan (CEB) -Pilot study on Energy efficient lighting. -Industrial Energy Conservation Program (MEC/UNDP) -Proposed Sri Lanka Alternative Energy Development project (MPE/WB)	-Island wide -Island wide Recently completed -600 house holds -Pilot project in Ceramic and Cement industries -Countrywide study on solar pv systems viability. 10MW micro hydro study 5 MW wind farm DSM Component Study of cogeneration in 2 textile factories and 1 FTZ	-Extend the national energy planning function to include the evaluation of energy / environment interaction and reorganize the decision making process to take cognition of such evaluations, specially,the environmental costs associated with energy projects	-Implement the Integrated Resource planning (IRP) process within the CEB which will include National Energy – Environmental linkages -Strengthening existing forums to coordinate energy initiatives.	-Implement the Demand Side management Action plan -Project for Replacing fossil fuel with Renewable Energy -Training for CEB staff in environmental aspects, particularly of thermal power generation	-Research on quantifying environmental costs of fossil fuel use in Sri Lanka (CISIR) -(Refer to Research on Fuel wood)	-Improved program for power T & D system Loss Reduction (CEB)

ANALYSIS OF ENERGY AND MINERALS PROGRAM AREA

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACTS	PHYSICAL INDECATORS	ECONOMIC INDECATORS	PROXIMATE CAUSES	UNDERLYING CAUSES	EXSISTING PROGRAMS	SCALE AND EXTENT OF LOCATION	OPTIONS FOR NEAP ACTIONS				REMAINING UNMET NEEDS
								POLICY REFORMS	INSTITUTIONAL REFORMS	SUB PROJECTS	APPLIED RESEARCH	
ENERGY -Environmental issues relating to increasing demand for Electricity– Hydro * humen settlements * habitats * forestry * water regimes * land deformation * land use	-Loss of Habitat -Threat to biodiversity -Large scale resettlement -Rasing / Lowering of water table. -Increased Land slides -Large scale movement of earth and rock.	-Area of Inundation -Number of resettlements -Increased incidence of earth slips.	-Insufficient data for fully quantifying environmental cost of major hydro projects (see Research Needs)	-Increasing demand for electrical energy.	-Uncertain ties in fully identifying the environmental costs of power projects. -Means of incorporating mitigatory measures into project designs in a timely manner are inadequate.			-Policy review for inclusion of Environmental cost Considerations in Energy planning (This is relevent to both thermal and hydro)	-Set up an Environmental cell in CEB for new projects & to monitor existing projects. -Develop selected staff capability to carry out scoping for environmental assessment of new projects and to co–ordinate work by Environmental specialists. (The above are relevent to both thermal and hydro)		-Research on fully quantifying on economic terms, environmental costs of major hydro projects (Universities)	

ANALYSIS OF ENERGY AND MINERALS PROGRAM AREA

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACTS	PHYSICAL INDECATORS	ECONOMIC INDECATORS	PROXIMATE CAUSES	UNDERLYING CAUSES	EXSISTING PROGRAMS	SCALE AND EXTENT OF LOCATION	OPTIONS FOR NEAP ACTIONS				REMAINING UNMET NEEDS
								POLICY REFORMS	INSTITUTIONAL REFORMS	SUB PROJECTS	APPLIED RESEARCH	
ENERGY												
-Environmental issues relating to increasing demand for petroleum products in Transport sector * air quality. * health.	Air Pollution -Local -Global	-Air quality measurements in Colombo -Anomolous Lead levels in blood of city dwellers -Increased incidence of air quality related diseases.	-Economic implications of related health problems (See Research Needs)	-Use of low-grade diesel and petrol -Use of outdated vehicle engines. -Inadequate Vehicle tuning -Poor enforcement of existing laws	-Inadequate process at the Refinery for removal of pollutants (sulphur, Lead, particulate) -Lack of policy aimed at minimising fossil fuel/ Passenger ratio.	-Air quality 2000 (MBP) -Monitoring of Air Quality (MOT) -Proposed Review of transport policy (MOT) -Fuel wood gasifier R & D program (NERD)	-Metropoliton Colombo -Metropoliton Colombo -Metropoliton Colombo. -A few vehicles were run on an experimental basis	-Formulate legislation to provide for control of illegal emissions -Incentives for equipment reducing emissions and for low polluting vehicles -Review of transport policy with a view to minimise per capita use of fossil fuel.	-Establish a vehicle pollution control unit in the Dept. of Motor Traffic. -Train Traffic police officers in detection of polluting vehicles and prosecution of their owners/ drivers. -Provide pollutant Detectors to Traffic police.	-Vehicle Pollution Elimination Project (MOT). * Master Testing Centre at DMT * Equipment & training for private tuning garages. * Training & awareness programs for public.	-Research on estimating in economic terms, health impacts due to air pollution (MOH). -R & D work for improving technology for fuelwood gasifiers to run Vehicles (NERD)	-Equip the Refinery to produce low – polluting petroleum products (CPC).
Meeting Co2 conventions	(Refer to policy program area matrix/sub-project)							-Reinforce policies and actions which help to meet Co2 convention targets		-Country study to address climate change	-Greenhouse gas emissions Inventory	

ANALYSIS OF ENERGY AND MINERALS PROGRAMME AREA

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACTS	PHYSICAL INDICATORS	ECONOMIC INDICATORS	PROXIMATE CAUSES	UNDERLYING CAUSES	EXSISTING PROGRAMS	SCALE AND EXTENT OF LOCATION	OPTIONS FOR NEAP ACTIONS				REMAINING UNMET NEEDS
								POLICY REFORMS	INSTITUTIONAL REFORMS	SUB PROJECTS	APPLIED RESEARCH	
ENERGY												
-Issues relating to Biomass Energy -Forestry -Vegetation cover -Soils -Combustion emissions	-Reduction in vegetation cover. -Encroachment on natural forest. -Threat to bio diversity -Soil Erosion -Indoor Pollution	-Present total demand is estimated at 10.4 million tons per Year. Of this around 20% is estimated to come from natural forests. -Demand growth is estimated as 1.4%. per year -Present efficiency of biomass use is between 5 to 10%	-Price of fuel wood is in the range of Rs.250/- per cubic metre in urban and semi-urban areas -In rural areas fuel wood is still untraded. -Economic losses from soil erosion and deforestation are described in other matrices	-Increasing demand for biomass energy. -Inefficient techniques employed in the use of Biomass in hoseholds and in industries -Biomass is providing the largest share of energy in Sri Lanka it is the main energy source locally available in Sri Lanka Therefore it is not possible to prevent its demand growth	-Low quality energy provided by biomass is adequate for day to day cooking needs of households -A substantial portion of biomass is untraded -In rural areas fuel wood is still a free good. -Low thermal efficiency (<10%) of traditional hearths used in a majority of households.	-National Fuel wood conservation project (CEB) Introduction of Improved Fuelwood stoves (CEB in rural areas and NGos in Urban areas) -Reforestation and forest plantation programs (See forestry and Land Resources Matrices) -Research on Calorific Values of wood from different species (CISIR/ NORAD) -Industrial Biomass Energy Conversion Project (MPE/Dutch Funding. Completed in 1992)	-500,000 stoves in the period 1985 to 1993. -Island wide -Regional survey and two demostrational activities.	-Prepare and implement an action plan based on the National Energy Policy Guidelines accepted by the Government. in 1985. -Fromulate policies to encourage sustainable use of biomass and its gradual promotion in to a commercial source of energy.	-Establish a Co-ordinating frame work for effective implementation of the relevent policies, under the sponsorship of MEC and including - FD - MEC - TC - Participating NGOs.	-National Fuel Wood conservation Project 2 (1995 on wards) MEC/ ECF/NGOs. -Fuel wood supply and mangement program (see Forestry and Land Resources Matrices). -Industrial Biomass Energy Conversion Project 2 (MEC/ NERD/ NGOs).	-Research for an appropriate stove design to reach the lowest income group. (estimated to be 40% of the poorer segment) and developing dissemmination strategy. -Identify suitable species for fuel wood plantations (FD/CISIR)	

ANALYSIS OF ENERGY AND MINERALS PROGRAMME AREA

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACTS	PHYSICAL INDICATORS	ECONOMIC INDICATORS	PROXIMATE CAUSES	UNDERLYING CAUSES	EXSISTING PROGRAMS	SCALE AND EXTENT LOCATION	OPTIONS FOR NEAP ACTIONS				REMAINING UNMET NEEDS
								POLICY REFORMS	INSTITUTIONAL REFORMS	SUB PROJECTS	APPLIED RESEARCH	
MINERALS												
-Environmental issues *arising* from Artisanal *mining:* * Water Quality * Sedimetation * Land degradation * Land deformation * *Effects on* Habitats * Effects on Health * *Effects on* Stream Flows (Minerals that usually come under artisanal mining are. – Gems – Mica – Feldspar – Rock aggregate (small quarries) – *Clay* (small mines).)	-Loss of top soil, and erosion -Land slides -Land subsidence. -Destruction of natural vegetation. -Destruction of agricultural land -*Damage* to water courses,beds and banks -Siltation of streams *rivers* and reservoirs. -Surface and ground water pollution -Hazardous unclosed abandoned pits -Adverse effects on habitats	Decrease in vegetation cover. around 200 ha annually -Loss of agricultural production -Increased occurance and intensity of floods. -Increased incidence of vector borne deseases, specially malaria and bowel diseases -Estimated 20,000 to 30,000 gem pits operated in 1988 employing 135,000 people Each pit in average unearths 50 m3 of soil -Estimated loss of 12 ha/year from Maha Oya,Kelani, Kalu basins alone due to sand ming. No data for Island	-More research is needed to quantify environmental costs of mining (see research needs) -some indirect indicators may be drawn from studies on other sectors	-Artisanal mining is a traditional income generating activity. -Lack of awareness by mining community. -Lack of supervision -Lack of incentives for conservation.	-Insufficient Co-ordination among involved agencies and local power blocks -Inadequate institutional capability for adequate supervision -Tradition -Lack of environmental guidlines to provide a *clear basis for* supervision. -Poverty.	-Awareness programs for gem miners 1993 & 94 -Closing of gem pits using confiscated Security deposits and Replanting of river banks.	-Ratnapura, Ehelliyagoda, Matale, Scale – Inadequate. -Ratnapura, Ehelliyagoda, Matale, Scale – Inadequate.	-Review the new Mines and Minerals Act in conjunction *with NEA* and relevent local authority by-laws to include appropriate environmental safeguards. -Reformulate Environmental Guidelines for mining industry. (GSMB/NGJA/ CCD/CEA).	-There shall be provision for the establishment of Divisional Environmental *Units* by drawing from relevent government agencies These must be strengthened and should have the participation of local authorities. DEU must become a Scoping and Co-ordinating Body at Local Level for planning minerals exploitation in the area -Strengthening the institutional capability of the enforcement departments of all mining permitting authorities and educating the enforcement and field officers on environmental aspects. -Establish Environmental cells in all such permitting authorities.	-Awareness programme for Gem mining community NGJA -Educating children in *relevant* areas,on the environmental implications (This is tolered to Environmental Education Program Area) -Carry out necessary studies and establish an Environmental Fund at NGJA, for rehabilitation purposes.	-Research for quantifying environmental costs of artisanal mining. -Research *on new* appropriate mining methods to minimize environmental damages. -Establish and keep up-dated a comprehensive Data Base on Existing and potential Gem Deposits. This will help to prevent "wildcat" mining	

ANALYSIS OF ENERGY AND MINERALS PROGRAMME AREA

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACTS	PHYSICAL INDICATORS	ECONOMIC INDICATORS	PROXIMATE CAUSES	UNDERLYING CAUSES	EXSISTING PROGRAMS	SCALE AND EXTENT LOCATION	OPTIONS FOR NEAP ACTIONS				REMAINING UNMET NEEDS
								POLICY REFORMS	INSTITUTIONAL REFORMS	SUB PROJECTS	APPLIED RESEARCH	
<u>MINERALS</u> -Environmental Issues arising from Prescribed mining' • Water Quality • Sedimetation • Land degradation • Land deformation • Effects on Habitats • Effects on Health • Effects on Stream Flows (Mining activities prescribed by the National Environmental Act are large scale, more organized operations,limited in number and requiring EIAs These are relatively easier to control).	-Similar to Arbsanal mining But on larger scale per location	-Same applies.	-Same applies But easier to quantity under EIA process.	-Insufficient enforcement of existing laws lead to malpractices by the industries	-Inadequate institutional capacity (Staff and training) at the GSMB. A comprehensive Minerals Data Base is needed for Environmental Assessment and planned use of natural resources	-Process of recruiting additional staff to GSMB has commenced. Mineral Inventory Data Base preparation (GSMB/WB)	-Islandwide	-Similar to artisanal mining	-Organized mining activities are effectively controllable through NEA and MMA if the GSMB is adequately staffed and equipped -Training program for newly recruited GSMB staff on Environmental Aspects. -Establish an Environmental cell in GSMB.	-Mineral Titles computeriz-tion (phase 2 of ongong Data Base) Leading to zonation	-Matching quality of raw material to end product to ensure proper use of quality resources and prevent wasteful use.	-GSMB Infrastructure Development

ANALYSIS OF ENERGY AND MINERALS PROGRAMME AREA

ENVIRONMENTAL ISSUES	ENVIRONMENTAL IMPACTS	PHYSICAL INDICATORS	ECONOMIC INDICATORS	PROXIMATE CAUSES	UNDERLYING CAUSES	EXSISTING PROGRAMS	SCALE AND EXTENT LOCATION	OPTIONS FOR NEAP ACTIONS				REMAINING UNMET NEEDS
								POLICY REFORMS	INSTITUTIONAL REFORMS	SUB PROJECTS	APPLIED RESEARCH	
-Clay mining Inland and Coral mining in coastal areas.These activities are practiced both as artisanal and large scale mining.	-Similar to Artisanal mining, sometimes on larger scale per location. -It is not practically feasible to close open abandoned pits	-Decrease in vegetation cover. -Decrease in agricultural productivity. -Increased incidence of diseases.	-Similar to artisanal mining	-Income generating activity -Inadequate supervision.	-Inadequate institutional capacity at the GSMB -Large scale use of clay products in building industry.	-Environmental auditing of clay mining (UOM/CEA)	-Dankotuwa	-Widespred use of clay in the building industry should be reviewd and possible alternative material should be popularised	-Similar to above	-Alternative employment project for coral Miners	-Research on alternative building materials. (NBRO)	
-Sand mining Uncontrolled extraction from river beds	-River bank erosion -Sea water intrusion -Coastal erosion	-Increased coastal erosion due to interference with natural process of beach replenishment	-Research needed	-Income generating activity -Inadequate supervision	-Inadequate institubonal capacity at the GSMB -Large scale use of sand in building industry.	-National sand study		(Refer to Coastal Resources program)			-Research on Environmental cost of river sand mining (GSMB)	

PART 3

SUPPORTING MEASURES

9: POLICY, INSTITUTIONS, EDUCATION AND CULTURE

9.1 POLICY AND INSTITUTIONS

9.1.1 EXISTING ENVIRONMENTAL POLICY AND INSTITUTIONAL FRAMEWORK

Sri Lanka is still in its early stages of environmental policy formulation. The minister of the Ministry of Environment and Parliamentary Affairs (MEPA) has been assigned the responsibility "to provide guidance and policy direction in relation to all activities concerning the protection and control of the environment". However, MEPA, as well as the project Ministry of Environment (MOE) which was established in 1990, had to first battle with the problems of inadequate institutional capacity and capability to effectively deliver this mandate. The MOE, which began with only one full time staff, in addition to the Minister and Secretary, has now increased its professional staff to around 12 officers. The only current statutory body of MEPA is the Central Environmental Authority (CEA) which was established under the National Environmental Act of 1980 as amended in 1988. The Act sets out CEA's role in environmental policy formulation. The establishment of a separate Ministry for Environment (MEPA) has brought into focus the need to clearly define the nature and scope of CEA's mandate in environmental policy formulation and implementation, especially as the demands on resources at CEA to monitor the EPL and EIA regulations are high.

The Ministry of Policy, Planning and Implementation (MPPI) is the key agency responsible for formulation of national development policy. The National Planning Department (NPD), which is a line agency of MPPI, plays an important role in the development of the medium-term macro-economic framework and sectoral programmes. The NPD draws up national programmes in close liaison with the different ministries and agencies concerned. A 5-year rolling investment plan is put out in a Public Investment Programme. This programme attempts to take into account existing environmental concerns. There is some attention to sectoral environmental issues, but currently these concerns are virtually restricted to general references to the NEAP and to projects relating to pollution control.

There are more than thirty government agencies involved in the management and protection of the environment and natural resources. The institutional framework for environmental policy formulation and implementation in these agencies is not effective as a result of the diverse responsibilities and lack of inter-agency coordination. In order to improve environmental coordination and establish an effective institutional framework for environmental policy making, the National Environmental Steering Committee (NESC) was set up in 1991. This committee provides policy guidance and direction to monitor environmental initiatives, programmes and projects. The NESC is co-chaired by the Secretaries of MPPI and MEPA and comprises high-level government officials. However, the NESC has become more involved in *ad hoc* operational activities than policy guidance.

There is also a trend towards decentralization of responsibility for environmental management towards provincial and local bodies. Under the 13th Amendment of the Constitution, the Provincial Councils also have the power to enact provincial statutes and formulate policies on environment. These statutes should be under the framework of the national law or any law made by Parliament. The first Provincial Council to enact a Provincial Environmental Act was the North Western Provincial Council (NWPC), in 1993. In addition, Local Authorities (Municipal Councils, Urban Councils and Pradeshiya Sabhas) have been given the power to enforce environmental laws, mainly related to pollution. The Local Authorities, however, do not yet have adequate institutional capacity resulting in poor enforcement of the law. The CEA also is planning to delegate its powers under the Environmental Protection Licensing Scheme, in relation to small and medium scale industries, to Local Authorities.

9.1.2 CURRENT TRENDS & PROGRAMMES

The Government, private sector, NGOs and the public are becoming increasingly aware of environmental issues and have realised the need for an effective institutional and policy framework. Recently the Minister of Environment and Parliamentary Affairs appointed a committee to make recommendations on environmental policy and to prepare an environmental policy statement. MEPA is also in the process of setting up a Legal Unit at the Ministry. The Legal Unit will provide better coordination on enforcement and other matters between the Ministry, other government agencies and international organizations, and review all legislation related to environment.

Although more discussions are being held between the Government and the donor community on environmentally related issues, the relationship between the country's economic development strategy and environmental concerns were not recognised until recently. This NEAP Updating exercise and the design of the proposed Environmental Action 1 Project set out the priorities for environmental programmes and projects and will make it easier for the government and donor community to focus on the more pressing environmental problems of the country. The National Planning Department has also taken the initiative to establish a procedure which will incorporate environmental concerns in the earliest stages of the project development cycle. This will enable them to identify environmentally friendly or harmful projects in the initial design stages of project formulation, which will complement the EIA process.

The key policy initiative taken since preparation of NEAP 1992-1996 is the gazetting of the Environmental Impact Assessment (EIA) regulations in June 1993. The implementation of the EIA regulations, as stipulated in the NEA, is to be carried out by 15 government ministries and agencies--called Project Approving Agencies (PAA). At present around 6 PAAs have formed environmental units to assist in monitoring and reviewing EIAs. As a part of this, the Natural Resources and Environmental Policy Project (NAREPP) is providing assistance to some four PAAs in areas of training and institutional strengthening. NAREPP also has been working closely with MEPA, CEA, NPD and other government agencies to better incorporate environmental concerns into the decision making process. Since 1992, NAREPP has provided training to more than one thousand participants drawn from government, private sector, university, and NGOs covering EIAs, environmental economics and pollution control.

As mentioned, the North Western PC has enacted a provincial Environmental Act similar to the National Environmental Act of 1988. The NWPC also established a Provincial Environmental Authority which has developed an environmental conservation strategy plan for the North Western province. The Western Provincial Council is in the formative stages of enacting similar legislations and is setting up an environmental unit. CEA has commenced training of Local Authority officials in EPL implementation and monitoring to aid the devolution process.

There are more than 275 NGOs involved in environmental work, and some are becoming increasingly important as both community-based environmental project facilitators and as pressure groups. With USAID/NAREPP support, the Asia Foundation has an environmental NGO strengthening programme providing small grants to some twelve environmental NGOs for both institutional strengthening and community-based projects.

As a signatory to all major international environmental conventions, Sri Lanka is paying close attention to its role in the global community. MEPA is taking increasing responsibility for overseeing Sri Lanka's obligations under global environmental programmes and conventions. MEPA and NGO officials have participated in many meetings associated with global environmental management and conventions such as UNCED, Commission on Sustainable Development, Biodiversity, and Hazardous Wastes (Basel). Under the capacity building component of Agenda 21, a terms of reference has been prepared to create an Agenda 21 Cell at MEPA and a National Agenda 21 report, which will be a supplement to NEAP 1995-1998. However, suitable mechanisms still need to be formed to link global environmental programmes into national environmental policies.

A summary of the initiatives taken to address issues related to environmental policy and institutional strengthening, since NEAP 1992-1996 was prepared, is given in Figure 9.1.

Figure 9.1

SUMMARY OF CURRENT NEAP ACTIVITIES IN THE POLICY AND INSTITUTIONS PROGRAM AREA

The most prominent of the current initiatives are as follows:

PROGRAM	MAJOR FUNDING SOURCE	TOTAL FUNDING (US$ Mn)	START-END DATE
► Natural Resources and Environmental Policy Project (NAREPP)--Policy, Institutions and NGO Components - Apply Environmental Economics to Environmental Policy - Develop Legal and Regulatory Framework - Analyze and Improve Management at MEPA/CEA and Other Key Agencies - Review and Revise CEA Corporate Plan and MEPA Management Plan - Development of Environmental Cells at Key Agencies - Environmental Impact Assessment - The Asia Foundation Environmental NGO Strengthening Program	USAID	7.0	1991-1996
► Metropolitan Environmental Improvement Programme (MEIP)--Policy & Institutions Components - NESC Administrative Support - Geographic Management Information System (GMIS) at UDA - Laboratory Accreditation Scheme - Development of Environmental Cells at UDA, WPC, and Private Sector - Industrial Pollution Management Policy Statement - Enforcement Strategy Task Force	World Bank/UNDP	0.5	1990-1995
► Environmental Cooperation Programme--Policies and Institutions Components - Institutional Support to MEPA and CEA - Institutional Support to Divisional Environmental Authorities - Human Resource Development Training - Policy Studies--Updating of Environmental Legislation	NORAD	0.5	1989-1996
► UNDP/RMU Restructuring Programme	UNDP	0.5	1991-1995

9.1.3 POLICY AND INSTITUTIONAL CONSTRAINTS

The key constraints identified in the NEAP exercise in regard to formulation, monitoring and implementation of policies at the global level are: inadequate attention to global environmental initiatives and lack of an effective mechanism for development policy linkages; inadequate dialogue among policy making bodies on environment-development issues; and lack of resources at MEPA for taking a fully effective policy-making role.

Although MEPA and other agencies have shown interest in environmental policy formulation at the national and sectoral levels, there are many institutional constraints that need to be addressed: lack of an effective policy-making process; institutional capacity weakness at MEPA, CEA, PAAs and other environmental agencies, including shortage of skilled manpower and other resources; lack of clear policy and institutional mandates; multiplicity of agencies with overlapping mandates and responsibilities. These seem to be the most prominent impediments that undermine the effective control and management of the environment. In addition, there is also a need for a practical national environmental database, improved monitoring, evaluating and coordinating mechanisms, good laboratory facilities, and strong environmental mediation mechanisms and practices.

While the above constraints are more than evident at the national and sectoral levels, effective institutional mechanisms and capacity for environmental action are virtually non-existent at the regional and local government levels. Although some initiatives have been taken to set up environmental units at the North Western and Western Provisional Councils, inadequate involvement of other PCs, LAs and DS in environmental management, lack of clear-cut policy on devolution of environmental responsibilities, and weak institutional provisions for environmental devolution are major impediments.

Thus far, environmental policies and programmes have achieved limited success in involving the private sector in national environmental management initiatives. Reasons indicate: failure of environmental authorities to include and/or promote private sector participation; lack of incentives and commitment; and insufficient interest and motivation to participate. While NGOs are playing greater roles in environmental management, weak institutional mechanisms and capacity are the underlying causes for more productive participation of NGOs in environmental protection and conservation.

9.1.4 RECOMMENDED NEAP ACTIONS

As seen in Chapters 4 to 8, a common underlying constraint inhibiting more productive environmental management is inadequate institutional capacity and capability within government and private sector agencies and NGOs. A proper policy and institutional framework needs to be in place to effectively implement NEAP sub-projects which address the country's most critical environmental problems. In addition, the programme area policy analysis exercise has recommended several reforms aimed at overcoming or eliminating these policy and institutional constraints relating to global, national and sectoral environmental challenges.

As the public is becoming more aware of global environmental concerns and Sri Lanka's participation in global conventions becomes more active, it is necessary to effectively integrate relevant global environmental initiatives into national policy. In order to improve coordination of global environmental programmes and to improve national responses to global initiatives applicable to Sri Lanka, it is recommended that MEPA establish a policy coordinating and technical support unit specific to this task. In addition, other key agencies involved in global initiatives should also set up units or focal points to improve coordination of global programmes. A sub-project to establish a database and information system at MEPA will help narrow information gaps, and improve MEPA's dialogue with policy making bodies. A research study to review and analyse key global environmental problems and their national impacts and responses, will provide more information to the policy makers and identify areas where further work needs to be done.

Since there is no clear mechanism for development of environmental policies, it is important to clarify MEPA's, CEA's and other relevant agencies' roles in environmental policy formulation and implementation, as well as their key responsibilities relating to environmental management. MEPA is a relatively new but important ministry, and should be strengthened to meet the demands of the country's environmental challenges. A sub-project to analyse MEPA's current organisational structure and formulate an institutional strengthening programme has been proposed. Through this NEAP sub-project, additional manpower and other resources are expected to be recommended to improve MEPA's capability in environmental coordination and management. MEPA will be responsible for implementing NEAP, and a NEAP unit will be established to monitor and coordinate NEAP actions, and to formally update it every two to three years.

Attempts have been made to link environmental priorities with the country's economic development strategy (see Chapter 3), and it is recommendated that strong consideration be given to formation of a Cabinet on Environment to provide further direction and leadership in integrating environmental issues with economic policies at the national and sectoral levels (sector specific policy and institutional reforms recommended for action have been identified under the relevant programme areas in Chapters 4 to 8), and also to assist MEPA in overseeing its environmental policy development and implementation. Through the establishment of environmental units at PAAs and PCs, institutional mechanisms to improve environmental policy coordination and monitoring will be strengthened. In addition, a NEAP sub-project is recommended to prepare a proposal to establish a fund (or expand an existing fund), to provide long-term resources for policy analysis.

CEA is now firmly established under MEPA, and it also requires significant capacity strengthening, especially in its implementation of its regulatory and supervisory functions. Although much effort had gone into the formulation of CEA's maiden Corporate Plan of 1992-1996, the numerous actions recommended including organisational restructuring, have not been implemented. There must be reformulated in the context of the new MEPA-CEA relationship. Therefore, a sub-project to update, revise, and implement the CEA Plan has been proposed.

In order to facilitate productive NGO and private sector involvement in environmental management and policy development, a proposal to develop and implement a strategy to expand involvement of NGOs and the private sector has been recommended. A research project to review existing programmes and present recommendations to strengthen environmental NGO capabilities has also been proposed. The establishment of a forum, and/or Conciliation Board under MEPA leadership has been recommended to improve private and public sector dialogue on environmental issues.

9.2 ENVIRONMENTAL EDUCATION AND CULTURE

9.2.1 INTRODUCTION

The high literacy rate in Sri Lanka is a reflection of successive governments' commitment in providing public funded formal education throughout the country. In the 1970s, the school curricula was revised and included a significant component on environmental education. However, a major shortcoming of school level education is the total emphasis on examination-oriented teaching-learning. Therefore, teaching-learning for development of skills and attitudes receives little attention because these are not examined. This shortcoming is more grave in formal environmental education as it has not been adequately agreed towards disseminating environmental knowledge and developing skills and attitudes favourable for environmental conservation and management. Preschool education in the country has not come under the purview of the state education system and therefore is not subject to monitoring by educational authorities. It is functioning without proper direction and control and under different types of management. Consequently, preschool education is being conducted without an environmental component in the curricula. Work of introducing an environmental component at preschool level has already being undertaken with NORAD assistance by the CEA.

Sri Lanka has taken action early to include environmentally related concepts in the school curricula. The primary curriculum is built around environmental themes and the environmental education conceptual development is quite comprehensive in the science and social studies subjects of the secondary school curriculum. The biology related subjects are taught with an ecological approach at the secondary and pre-university levels. The only, but serious, shortcoming is the deleterious effect of the restricted examination system which discourages teaching-learning concerned with skills and attitude development. The students are also discouraged from participating in environmental improvement programmes as part of their formal learning process. The universities have recognized the need to expand their environmental education curricula, and environmental studies have been made a compulsory core subject in the recently established Affiliated University Colleges.

At present, non-formal education is confined to the development of employment related skills of early school leavers. Although much awareness has been created on environmental issues, mainly by the schooling system and NGOs, there is still a lack of environmental awareness that leads to public participation. The acute shortage of trained human resources in environmental management suggest that accelerated interventions are required to augment training capacities and promote awareness, understanding and commitment.

Sri Lanka's traditional and cultural practices have played a great role in management of the country's environment. The country's history is largely based on the hydraulic civilization of the ancient kings who contributed to the development of numerous reservoirs and irrigations systems. Culture, through religious and other beliefs, has influenced the attitude of the people to respect the life of other living beings which in consequence has played a significant role in preserving the diversity of the plant and animal species of the island. The recent emphasis on industrialisation and development and the spread of settlements and tourism to culturally sensitive locations and regions, can hinder the preservation of environmentally friendly and desirable aspects of the culture that deserve to be fostered.

Culture encompasses the material as well as the non-material heritage of man which rightfully forms a part of the environment that needs to be protected and preserved. Apart from archaeological monuments which are being preserved and cared for by the Department of Archaeology, non-material heritage artifacts such as traditional arts and crafts and medicinal practices, drama, music and folklore etc., do not seem to receive adequate support for preservation and presentation. The lack of a coherent policy and coordination among the responsible ministries and agencies act as constraints to the efficient management of the cultural dimension of the environment.

9.2.2 ENVIRONMENTAL ISSUES

The main issues and constraints in formal education through schools and universities can be summarized as deficiencies in skills and attitude development and discouragement of participatory environment improvement activities caused by a restrictive examination system. In the case of the universities, it concerns the inadequacy of multidisciplinary subjects in the undergraduate and graduate programmes. Shortage of trained environmental professionals, trainers and resource personnel are the main impediments to professional educational practices. Non-formal and continued life long learning has not been recognised as a pervasive means of broad-based education including professional training. Lack of widespread public awareness, consciousness and understanding of environmental issues, especially poor participation, are recognised as major issues of the public awareness dimension of environmental education and culture.

The main constraints relating to the cultural aspects are: the lack of understanding of the linkage between culture and environmental protection; insufficient understanding and appreciation of participatory techniques and socio-religious aspects of environment; dearth of trained expertise to preserve the cultural heritage; and lack of recognition of the crucial role of women in environment.

9.2.3 CURRENT STATUS AND TRENDS

The educational authorities are showing a visible interest in promoting environmental education at all levels of the schooling system. Both the National Institute of Education and CEA are engaged in environmental text book preparation projects which cater to the needs of schools. The school system has a comprehensive concept-based environmental education programme, notwithstanding the shortcomings identified above. The universities have already begun offering specialised environment related programmes, and Sri Lanka is the first Asian country to offer a MSc programme in environmental economics at the University of Peradeniya. MEPA with the assistance of NORAD is playing a greater role in developing field-based environmental education. Yet, much more needs to be done to strengthen and expand environmental educational and training programmes to meet the growing need for environmental knowledge and skills.

The culture related on-going environmental activities include the UNESCO Cultural Triangle Project and programmes of Sarvodya Women's Environmental Movement and the *Ruk Reka Ganna* Society. Figure 9.2 gives a summary of the existing educational and cultural programmes in NEAP.

9.2.4 CAUSES OF FAILURE IN ENVIRONMENTAL RECOGNITION

The deficiencies in formal environmental education in schools and universities could be attributed to several causes such as educational policy shortcomings outlined above, shortage of competent teachers and other resources, lack of emphasis on environmental education, lack of opportunities for participatory activities and compartmentalisation of related subjects and failure to provide a holistic approach in teaching environment linking it with economics and development. Inadequate professional training has resulted from several factors such as a lack of specialised environmental training institutions and capacity limitations of universities and training units of environmental agencies and lack of an appreciation of the need to provide specialised training in environmental discipline. In regard to public awareness, inadequate participatory mechanisms, absence of a people-centred approach, failure of educational system to impart environmental knowledge, and inadequate promotion of environmental awareness by environmental agencies and the media can be listed among the causes.

Several factors have been identified as causes of environmental degradation in the cultural sector. Among them are an absence of regard for traditional culture, a lack of understanding of

Figure 9.2

SUMMARY OF CURRENT NEAP ACTIVITIES IN EDUCATION & CULTURE PROGRAMME AREA

There has been considerable activity in this program area since the 1991 NEAP was issued. The most prominent of the current initiatives are as follows:

PROGRAM	MAJOR FUNDING SOURCE	TOTAL FUNDING (US$ Mn)	START-END DATE
► Natural Resources and Environmental Policy Project - Development of Masters Environmental Programmes at 4 Universities - Enhance Faculty Training through Policy Research Exchanges - Provide Graduate School Scholarships and Research Support - EIA Training Programmes	USAID	1	1991-1996
► Environmental Cooperation Project - Development of School Curriculum and Resources at all Levels - Primary and Secondary School Participatory Programmes on Environmental Management - Environmental Awareness Programmes - Provide Research Support	NORAD	1	1989-1995
► Cultural Triangle Environmental Project	UNESCO		1992-1995

culture and environment as well as culture and economic development linkages and the harmony that existed between socio-religious values and the environment. Lack of awareness and appreciation of the need to preserve traditional society and culture of indigenous people has been the primary cause of their plight. A lack of sensitivity to and awareness of the role of women in environmental management are seen as the main causes of the failure to recognise their potential worth in environmental conservation and management.

9.2.5 RECOMMENDED NEAP ACTIONS

Among the several options that have been identified as policy and institutional options for NEAP actions are the revision of educational policy to incorporate a wider and comprehensive range of environmental teaching/learning/evaluation components in school curricula and university programmes, the introduction of more environmental degree programmes including inter-disciplinary courses with economic development linkages and biodiversity specializations. Adequate provision should be made for university students to obtain practical application experience in environmental projects. Analysis of environmental training needs, establishment of an Environmental Education and Training Centre, establishing and/or strengthening training capabilities of environmental agencies and incorporating an environmental component in public sector training, promotion of participatory approach, setting up participatory mechanisms in all environmental agencies have also been suggested as important options.

In the culture dimension the issues identified could be addressed by a number of policy and other reforms and by research. Among the suggested options are greater emphasis on culture in the education curriculum and development policies, inclusion of participatory techniques in

development activities and in public sector training, establishing institutional mechanisms to integrate socio-religious values with environment, introduction of cultural aspects of Environmental Impact Assessment process and strengthening of the Archaeological Survey Department and relevant university programmes. In order to help preserve the traditional life styles of indigenous people, the creation of an agency under the Ministry of Education and Cultural Affairs is recommended. The compulsory inclusion of women in environmental activities and the provision of equal rights and opportunities for them to play parallel role with men are suggested as reforms aimed at ensuring active participation of women in environmental protection and management.

The matrix given at the end of this chapter identifies the proposed NEAP actions together with additional policy and institutional reforms and associated demands for applied research in far greater detail for the policy, institutions, education and culture programme area.

ANALYSIS OF POLICY, INSTITUTIONS, EDUCATION & CULTURE PROGRAMME AREA

SUBJECT	CONSTRAINTS OR ISSUES	PROXIMATE CAUSES	UNDERLYING CAUSES	EXISTING, POLICIES PROGRAMS	POLICY REFORMS	OPTIONS FOR NEAP ACTIONS			REMAINING UNMET NEEDS	EXECUTING AGENCIES
						INSTITUTIONAL REFORMS	RESEARCH NEEDS	SUB-PROJECTS		
POLICY										
A GLOBAL	-Lack of reflection of Global Env Policies, Perspectives, Conventions & Programs on National Env. Policies	-Lapses in Env. Policy Formulation -Lack of an effective mechanism for linkage with Global initiatives	-Weaknesses of Policy formulating Agencies -Fragmentary approach to policy formulation & lack of coordination -Inadequate dialogue with policy making bodies and lack of resources at MEPA' for an effective policy making role	-UNCED Conventions on climate change & Biodiversity -RAMSAR Program on wetland management -Montreal Protocol on ozone layer protection. -Agenda 21 global Action plan on Env. improvement. -CITES Actions on trading in wild animals -MARPOL Convention on waste dumping from ships -BASEL convention on hazardous waste	-Pursue action to integrate relevant Global Env. initiatives with National Policy. -Strengthen functions of MEPA & other key agencies thru' a cabinet paper covering responses to global issues	-Establishment of a Policy co-ordination & Technical Support Unit at MEPA to coordinate linkages with Global Env. Initiatives -Establishment of a unit or focal point to deal with global initiatives in each relevant line agency.	-Review & analyse all major Global environmental problems, their impacts on Sri Lanka, and domestic responses and identify gaps	-Develop adequate capacity at MEPA & line agencies to respond to Global initiatives applicable to SL -Establish a Policy Data Base & Information System at MEPA -Undertake special action studies relating to the potential consequances of global climate change	-Need to develop further a strong team at MEPA, CEA & other agencies. dealing with env.	-MPPI, MFA, MEPA

ANALYSIS OF POLICY, INSTITUTIONS, EDUCATION & CULTURE PROGRAMME AREA

SUBJECT	CONSTRAINTS OR ISSUES	PROXIMATE CAUSES	UNDERLYING CAUSES	EXISTING, POLICIES PROGRAMS	OPTIONS FOR NEAP ACTIONS				REMAINING UNMET NEEDS	EXECUTING AGENCIES
					POLICY REFORMS	INSTITUTIONAL REFORMS	RESEARCH NEEDS	SUB-PROJECTS		
POLICY B.NATIONAL	-Absence of a comprehensive and coherent National Env. Policy. -Lack of integration of Env. dimension with economic development at National and Local levels	-Lack of an effective Policy making system/process	-Weak appreciation for the need for independent professional & public inputs resulting in policy analysis deficiencies. -Weaknesses in non governmental / public participatory mechanisms.	-NEAP, (EAIP) update '94 -Agenda 21 -MEIP,/MPPI -RMU -NAREPP	-Clarify roles and strengthen functions of Env. policy making agencies -Maintain NEAP as a living document. -Review Env.Legislation to recognise the roles and responsibilities of all relevant agencies -Develop comprehensive National and Sectoral Env.policies	-Establish a cabinet sub.committee & other mechanisms to integrate Env. with Economic development & provide direction to National & Sectoral policy formulation. -Strengthen policy formulation & implementation capabilities of NESC, MEPA,CEA & other relevant agencies -Establish mechanisms for linkage with independent professionals, NGO's & the public.	-Study the roles of National and International policy analysis institutions and the public in Env. policy formulation to determine a program of action	-Formulate a project proposal to establish a fund or expand an existing fund to encourage and provide resources for policy analysis and pilot projects -Make statutory provisions for PAAs to include a section on env. activity in budgets. -Develop, refine & update database on environmental projects -Provide short term administrative support to NESC.	-Not all macro and sectoral environment -economic linkages can be investigated and acted upon in the short-term	-MPPI, MEPA,/CEA NAREPP, NARESA SLAAS IPS NPD IFS NGO's UNIVERSITIES & Other professional bodies.
C. SECTORAL	(See relevant Programme Area PAPA matrices)									

ANALYSIS OF POLICY, INSTITUTIONS, EDUCATION & CULTURE PROGRAMME AREA

SUBJECT	CONSTRAINTS OR ISSUES	PROXIMATE CAUSES	UNDERLYING CAUSES	EXISTING POLICIES PROGRAMS	OPTIONS FOR NEAP ACTIONS				REMAINING UNMET NEEDS	EXECUTING AGENCIES
					POLICY REFORMS	INSTITUTIONAL REFORMS	RESEARCH NEEDS	SUB-PROJECTS		
INSTITUTIONS										
A. CENTRAL	-Capacity limitations of MEPA, PAA & other ENV. agencies. -Multiplicity of agencies with overlapping mandates & responsibilities -Poor delineation & delegation of Authority -Deficiencies in statutory provisions -Lack of effective monitoring, evaluating & coordinating mechanisms -Lack of a national Env Data base -Inefficiency in enforcement capability	-In adequate man power & other resources -Lack of clear policy & institutional mandates -Difficulties in implementation of CEA Corporate Plan -Absence of dispute resolution mechanisms	-Deficient Legal provisions & unclear mandates of NESC, MEPA, CEA & other Agencies -Absolute shortage of trained env manpower and inadequate env. training capacity. -Poor remuneration and incentives -Inadequate commitment at Top Level of sectoral agencies to implement env action plans and achieve goals -Weaknesses in existing environmental mediation mechanisms and practices -Inadequate public access to information about Environmental pollution -Other limitations in Institutional capacity	-USAID/NAREPP Project on strengthening of MEPA/CEA -UNDP / RMU restructuring program -MEIP/WB -CEA Corporate plan -NORAD Env. Program	-Establish clear inst. mandates & roles of key Env. Agencies including MEPA -Elevate NESC deliberations to Env. policy matters.	-Restructure MEPA providing adequate manpower & other resources to cope with increased responsibilities -Create an institutional mechanism for monitoring, evaluating & coordinating NEAP operational issues -Establish a mechanism under MEPA to monitor and coordinate env. educational activities.	-Further define institutional development needs at national level -Review & recommend public's "Right to know". -Explore the role of third parties in checking accountability of enforcement mechanisms & procedures -Identify information needs & sources for a National Database on Environment	-Analyse MEPA's present Organisation structure & formulate a restructuring program, including an update and revision of CEA Corporate Plan, and implement associated recommendations. -Evaluate & recommend establishment of effective Environmental Mediation mechanisms -Establish Environmental units in PAAs and other relevant Agencies -Assess manpower needs of Env Sector & develop manpower plan -Develop and update a National Env. Database		-MPPI MEPA CEA PAA -MEPA / CEA -CEA
B. SECTORAL (See relevant Programme Area PAPA Matrices)										

ANALYSIS OF POLICY, INSTITUTIONS, EDUCATION & CULTURE PROGRAMME AREA

SUBJECT	CONSTRAINTS OR ISSUES	PROXIMATE CAUSES	UNDERLYING CAUSES	EXISTING, POLICIES PROGRAMS	OPTIONS FOR NEAP ACTIONS				REMAINING UNMET NEEDS	EXECUTING AGENCIES
					POLICY REFORMS	INSTITUTIONAL REFORMS	RESEARCH NEEDS	SUB–PROJECTS		
INSTITUTIONS										
C.PROVINCIAL COUNCILS, LOCAL AUTHORITIES & DIV. SECRETARIATS	–Lack of involvement of PC's LA's & DS's in Env. Management –Lack of clearcut policy on devolution of Env. responsibilities	–Slow devolution process –Lack of institutional provisions for Env. devolution	–Shortcomings in devolution policies –Lack of Top level commitment to devolve Env. Management	–NAREPP Programs –NWPC Env. Authority –CEA' Wetland projects Institutional Developm progr Regional/Local level programs	–Monitor implementation of policy on Env. devolution and adjust as necessary.	–Establish Env. capacities in PC's & LA's with Monitoring functions delegated to DS's	Study institutional and manpower needs for devolution of Env. authority & responsibility –Collect information of how devolution of power to PCs are functioning	–Establish Env. units at PCs & LAs with appropriate mandates –Strengthen CEA capacity to support regional/local programs		MEPA, CEA MHAPC MPA
D. ENVIRONMENTAL NGO'S	–Insufficient productive involvement of Env. NGO's and community organisations in sustainable development activities.	–Limited participation of NGO's in Env. Mgmt.	–Lack of institutional mechanisms for securing involvement –Lack of incentives & capacities	–NAREPP/Asia Foundation Env NGO Strengthening program –NORAD/CEA –UNDP/ NGO grants program	–Determine Policy on NGO participation in Env.	–Strengthen NGO's for enhanced NGO participation through training & other means	Review existing programs & present recommendations to strengthen Env. NGOs' capabilities & capacity	–Develop and implement a strategy to expand involvement of NGOs in the implementation of Dev. and Env. programs		MEPA / CEA NGOs
E PRIVATE SECTOR	–Inadequate participation of multinationals & domestic private sector organisations in Env. arena.	–Insufficient interest & motivation to participate	–Failure of Env. Authorities to induce /promote participation & achieve involvement –Lack of incentives & commitment	–Chamber of Industries training program		–Establish an appropriate forum for private & public sector dialogue on Env. under MEPA leadership.		–Formulate a strategy to promote active participation of private sector in Env.		Chambers of Commerce/ Industy MEPA CEA Universities Line Agencies

ANALYSIS OF POLICY, INSTITUTIONS, EDUCATION & CULTURE PROGRAMME AREA

SUBJECT	CONSTRAINTS OR ISSUES	PROXIMATE CAUSES	UNDERLYING CAUSES	EXISTING, POLICIES PROGRAMS	OPTIONS FOR NEAP ACTIONS				EXECUTING AGENCIES
					POLICY REFORMS	INSTITUTIONAL REFORMS	RESEARCH NEEDS	SUB-PROJECTS	
EDUCATION									
A. FORMAL	-Inadequate understanding of environmental issues provided by education system	-Insufficient environmental teaching equipment and resources -Lack of appropriate evaluation practices in educ system	-Deficiencies in current educational policies -Shortage of teachers trained in env. issues	-NIE Project on Env Text-book preparation CEA project on text-book development (NORAD)	-Revise educational policy to incorporate a wider range of environmental teaching-learning-evaluation component in school curricula at all levels	-Reform and adapt env. evaluation practices appropriate to Env Education	-Analysis of needs for Env.Curriculum Development -Assessment of Env information and resource needs in Env. Education	-Programme for Env. awareness among children and gen public -Programme for Acton Research in school gardens.	-Ministry of Educ CEA, NIE -Prov. Council M/ECA Ministries
B. UNIVERSITY	-Insufficient under-graduate & graduate programmes in environment at universities	-Shortcomings in Univ. curriculum development in Environmental issues -Shortage of qualified resource personnel for higer env. educ -Insufficient inter-disciplinary approach to env & related issues -Inadequacy of practical skills transfer activities -Limited inter-disciplinary fieldwork	-Lack of resources & modalities in universities to address the need for specialized environmental programmes & training -Compartmentalization of subjects such as zoology & botany. -Not able to provide adequate training in a more holistic env. approach, linking env. issues with economic development	-Env. related post-Grad. work mainly as extensions of Degree programs -A limited number of MSc courses (Centre for Env St MSc. Env, Econ. & Nat.Resources at Peradeniya MSc. Env. Science at Colombo MSc. Env Engineering at Mopatuwa	-Introduce environmental Degree programmes including interdisciplinary courses for teaching the interrelationship between env. management and econ. development -Introduce biodiversity degree programmes -Adoption of course-unit credit system in the universities to allow higher course diversification -Provie opportunities for university students to participate in env. protection as course requirements.	-Modify University programme structures to accommodate for env. as a key subject and discipline -Establish institutes to carry out interdisciplinary teaching of env. issues -Increase # of Ph D's with modern env training -Reduce the teacher-student ratio to allow for more integrated and interdisciplinary fieldwork	-Assess the organizational modfications and resources needed to accommodate for policy and institutional reforms	-Support & implement recommendations of the Univ. Environmental Curriculum Development Committee -Strengthen capacity of universities to conduct environmental programmes and teaching	-M/HE Universities UGC CEA

ANALYSIS OF POLICY, INSTITUTIONS, EDUCATION & CULTURE PROGRAMME AREA

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					POLICY REFORMS	INSTITUTIONAL REFORMS	RESEARCH NEEDS	SUB–PROJECTS	
EDUCATION									
C. TRAINING NON–FORMAL/ PROFESSIONAL	–Shortage of trained/skilled manpower to meet institutional needs.	–Inadequate training opportunities and facilities.	–Insufficient capacity at universities to provide sufficient number of Env. specialists	–USAID/NAREPP USAEP		–Establish an Environmental Education and Training Centre	–Analyse environmental training needs in relevant agencies	–Fomulate a project to establish an Environmental Training centre	–MEPA/CEA MPA/SLIDA
		–Inability of Env. sector to develop and attract sufficient number of env. professionals	–Lack of training institutions specializing in env. issues			–Establish/strengthen training capabilities in central & sectoral line agencies		–Strengthen other training institutions to undertake env. training	–MECA/UGC Univ. Grants Comm. Universities MPA
	–Shortage of competent Environmental trainers & resource personnel		–Inadequate training capacity and capability in Env. agencies.			–Broaden university programme structure to meet needs of Env. expertise in all sectors			
			–Inadequate manpower planning within env sector						
			–Low remunertion & poor incentives for employment in Env. sector.			–Incorporate mandatory Env. component in administrative and professional training for public sector			

ANALYSIS OF POLICY, INSTITUTIONS, EDUCATION & CULTURE PROGRAMME AREA

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					POLICY REFORMS	INSTITUTIONAL REFORMS	RESEARCH NEEDS	SUB-PROJECTS	
EDUCATION									
D. PUBLIC AWARENESS	-Lack of widespread public awareness and understanding of Env. issues	-Inadequate participatory mechanisms in env. conservation and management	-Lack of a people centred approach to env management and decision making	-SLRC, SLBC NIE/OUSL Educational Programmes	-Recognition of public awareness as an integral part of env. management and protection	-Establish efficient awareness promotion mechanisms in all env. agencies	-Study the extent and validity of using community participatory techniques in environment.	-Implement public awareness action plans of CEA Corporate plan 1992 – 96 and provide env. training to journalists	-MEPA/CEA
	-Poor participation of people in Env management and protection	-Inefficient organized effort to create awareness and promote public participation	-Failure of education system to adequately incorporate env. educ into general teaching	-Awareness-programmes of MEPA/CEA, FD, CCD, & MH&WA	-Promotion of participatory approach to env. conservation and decision making	-Set up participation devices in all env agencies for involvement of the public in env. management and protection		-Support to NGO public awareness programmes	-MEPA, CEA NGO
			-Inadequate env awareness promotion by env. agencies and mass media				-Assess level of public perception of env. issues	-Design and implement an incentive & reward scheme built around environmental performance awards	-MEPA, CEA NGOs Private sector Municipalities
							-Survey Media effectiveness in promoting env. awarness among the public	-Design & implement Environmental Communication project to ensure Public Awareness & Alertness	MEPA, CEA NGOs Private sector
								-Design env. training programme for Media personnel	M/EPA Media, Private sector

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					POLICY REFORMS	INSTITUTIONAL REFORMS	RESEARCH NEEDS	SUB-PROJECTS		
CULTURE										
A. CULTURAL FACTORS (participatory etc.)	-Lack of understanding of linkages of culture and Environment	-Failure of bureaucracy to conceptualize and initiate action	-Lack of understanding of harmony that existed between traditional society & Envt.		-Changing education curriculum & value systems -Reorient development policies with a focus on value of human life	-MEPA to establish link with Ministry of Education and Cultural Affairs Initiate policies to promote Env. friendly value systems.	-Study tradrtional cultural practices with reference to environment.			-MEPA MECA Higher Edu.
B. PARTICIPATORY MECHANISMS	-Lack of appreciation of participatory techniques and their value.	-Imposition of values of the centre on people in periphery.	-Lack of political support for participatory techniques		-Include participatory techniques in all projects to sustain, development activities.	-Train civil service to value "bottom up" techniques of decision making. -Institute conciliation board for people participation Env. management.	-Evaluate participatory techniques and their success/	-Research into Chipko Movt.in India		-SLIDA CEA Universities. - NGO's Community Groups, Journalists Universities Prof. Associations.
C. SOCIO – RELIGIOUS VALUES	-Lack of understanding or socio religious value in Env issues	-Absence of regard for traditional culture.	-Search for alien values.		-Promote a transperancy in development process	-Institute Agency to interrelate socio religious value in Env. -Incorporate cultural aspects in EIA process to be done by Dept. of Archeology		-A comminications project to instill values on culture, socio religious values in relation to Env. through mass media		-NARESA IFS, NGO's Journalists MECA Dept.of Archaeology
D. MONUMENTS AND ARCHAEO LOGICAL SITES	-Dearth of trained expertise to preserve cultural heritage. -Low priority for cultural patrimony	-Lack of training facities in country	-Philistine attitudes to culture and patrimony	-UNESCO Cultural Triangle Project.	-Establish relevant training courses in Universities. -Strengthen Archaeological Department with trained personnel. -Create an agency under Ministry of Education & cultural Affairs for traditional Culture of Indigenous people.	-Training of staff in cultural impact assesment.	-Assesment of loss of cultural patrimony in development schemes	-Training of Archeaological Dept. staff for cultural impact assessment		-Ministry of Ed Cultural Affars, Department of Archaeology & Universities Inst. of Aesthetic Studies, IFS
E. INDIGENOUS PEOPLE	-Absence of fundamental rights to practise choice of livelihood.	-Lack of awareness of traditional society and Indigenous peoples	-Neglect of existing problems of indigenous peoples				-Document Existing situation of indiegnous people & traditional cultural attributes relevent to Env.			-Min. of Ed. & Cultural Affairs Dept. of Archaeology, Universities. IFS, NARESA, NGO'S

ANALYSIS OF POLICY, INSTITUTIONS, EDUCATION & CULTURE PROGRAMME AREA

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F GENDER ISSUES	-Potential role of women on Env. issues not recognized.	-Absence of awareness of womens' role in Env. conservation issues.	-Lack of sensitivity to women in these Issues	-Sarvodaya Women's Env. Movement Women & Env. (Ruk Raka Ganno)	-Compulsory inclusion of women in env. actions. -Equal rights for women with men (Joint ownership of land in settlement schemes) for Env. Conservation -Empowerment of women in decision-making	-Inclusion of women in greater numbers in Env. protection programmes.	-Assess contribution of women to economic activites	-Assesment of womens role in participatory projects	-Time use Research on women's contribution to Agri- and forestry conservation.	-Ministry of Health and Womens' Affairs NGO's, Sarvodaya. Research Institutes Universities.

APPENDIX A

SUMMARY OF CURRENT/ONGOING PROJECTS UNDER NEAP 1992-1996

Appendix A

SUMMARY OF CURRENT ONGOING ACTIVITIES IN NEAP 1992-1996

(Note: √ indicates that the activity is underway or proposed)

ACTIVITY	IMPLEMENTING AGENCY	COST (US $)	MAIN DONOR AGENCY	STATUS/REMARKS
■ LAND RESOURCES				
1. Loss of Productivity of Agricultural Lands through Soil Erosion				
1. Draft a new Soil Conservation Act	M/EPA, CEA	3 Mn	-	
2. Increase incentives to small farmers for soil conservation; implement scheme through NGO farmer organizations	TSHDA, Prov Min of Ag	250,000	-	1.2 Received concept paper (CP) from SLEC, Hadabima " To organize farmers on adopting soil conservation methods" NORAD is funding part of the project. Partial funding is required.
3. Provide assistance to PCs in 'Erodible Areas' for soil conservation purposes	PCs of Central, Uva & Sabaragamuwa prov	-	-	
4. Re-locate & provide alternative lands & employment opportunities for farmers cultivating seasonal crops on encroached erosion land	Provincial Mins, M/LIMD	1 Mn	-	
5. Ensure that tobacco companies & other private enterprises operating in erosion prone areas re-invest their profits on soil conservation	M/EPA, M/LIMD	100,000	-	1.5 Submitted proposal to ODA. Waiting response
2. Continuing Practices of Chena Cultivation				
1. As an interim measure, permit chena cultivation to continue on certain identified lands...	AD (Maha ilupallama), Mass media	100,000	-	2.1 IUCN prepared concept paper which was given to donor agencies
2. Develop a forest rehabilitation strategy with community participation for those forests degraded due to chena farming	NGOs, Farmer Orgns, FD	1 Mn	- (NORAD)	
3. Map out selected areas of existing degraded forest lands with high agricultural potential and convert them for agric'l use.....	M/LIMD, LUPPD, FD	2.5 Mn	-	
3. Encroachment of Hydrologically Critical Areas				
1. Up to 10% of the land area of the country comes under hydrological reservations in terms of existing laws..				
i. Preparation of an inventory of all reservations prescribed by law, separately identifying those which have not been encroached on	WRB, Universities	100,000	-	*[FYI - ADB is sponsoring a comprehensive water resources policies & institutions assessment to develop a water resources plan. IIMI has a few projects: SCOR, Monitoring & Evaln of Participatory Approach to Irrigation Mgmt. that may address some NEAP activities]*
ii. the undertaking of a review of the prevailing legal & inst'l provisions for the protection of reservations	CEA, EFL	50,000	-	
iii. the devpmt. & implementation of a program of action to restore reservations encroached on, where feasible	GAs & Regional Dir. of Irrigation	100,000	-	
iv. Creation of "green belts" on reservoir reservations	ID, NGOs	1 Mn	-	

4. Degraded Tea Land				
1. Mapping of marginal tea lands, identifying & classifying lands that can be and cannot be rehabilitated	LUPPD, MASL	100,000	-	
2. Developing a program of action that would encourage the return of uneconomical tea lands to natural forests, plantation forestry,etc.	NADSA, NGO	500,000	-	
3. Develop a strategy to support the two major Plantation Corps to undertake crop diversification	JEDB, SLSPC	100,000	-	4.3 Received CP from Plantation Ministry "To undertake soil conservation & rehabilitation prog. for degraded tea lands in the mid-country"
4. Provide adequate incentives for the small holders to invest more on soil conservation	TSHDA, AD	1 Mn	-	
5. Land Tenure & Land Degradation				
√ 1. Immediate action aimed at bringing LDO permits closer to free titles on an experimental basis	M/LIMD, Land Commissioner	100,000	USAID	5.1 USAID funding for Galle & Polonnaruwa districts. (Rs. 54 Mn)
2. Introduce a strategy for encouraging voluntary land consolidation as a solution to land fragmentation	Commissioner of Agrarian Services, NGO	250,000	-	
3. On short term basis organize farmers in critical catchment areas	NADSA, NGOs	200,000	-	5.3 Recd. CP from M/ADR "Land Productivity & Resource Conservation"
4. Develop a mechanism to induce commercial banks to accept LDO land as security on credit for land development	Central Bank	100,000	-	
6. Problems in Land Use Planning				
√ 1. Establish a National Land Use Plan Project	M/LIMD, LUPPD	100,000	ADB	6.1 Underway - Project underway to strengthen LUPPD. 6.2 Recd. CP from LUPPD "Formulate National Land Use Policy & Implement Strategy"
2. Implementation of the National Land Use Plan	LUPPD, PCs	2 Mn	-	
7. Land at High Elevations (above 1500 m)				
√ 1. Map out existing land use above an elevation of 1500m	LUPPD, MASL	25,000	ADB	7.1 Underway - under the Land Use Planning Project. 7.2 Underway
√ 2. Preparation of the final land use plan and its implementation with the co-operation of the provincial & district administration	LUPPD, PC, DEA/N'Eliya	1 Mn	ADB	
8. Natural Hazard Management				
1. Establishment of a Natural Disaster Relief Fund, and ensuring its efficient management	M/SS, M/EPA	2.5 Mn	-	
2. Extension of the on-going Landslide and Hazard Mapping Project by the NBRO to Kegalle District	NBRO	1 Mn	-	
3. Development of long-term plans and inst'l mechanisms for rehabilitation of people affected by natural disasters	M/SS, M/LIMD	2.5 Mn	-	

9. Multiplicity of Institutions & Weak Enforcement of Legislation				
1. Launch a study which would examine the issue of multiplicity of institutions in the land sector	SLIDA, Universities	50,000	-	
2. Promote efforts at re-organizing & effecting better co-ordination of existing institutions	M/PPI & M/EPA	250,000	-	
3. Enhance the inst'l capability in the area of watershed mgmt.	MASL	1 Mn	-	

■ **WATER RESOURCES**				
1. Water Management & Conservation				
√ 1. Water Resources Master Plan to be prepared and implemented	M/LIMD	150,000	ADB	1.1 Proposed - ADB has initiated TA towards devpmt. of a Water Resource Master Plan
2. Undertake awareness and educational programs on water mgmt measures.... Establish appropriate units within the PCs and AGA offices in support of the monitoring program	PCs, AGA/DS	200,000	-	
3. Establish and promote FOO covering about the 22,000 irrigation schemes. Implement the participatory mgmt policy of the govt ...	Commissioner of Agrarian Services, NGOs	250,000	-	
4. Research should be carried out to address issues in the establishment of FOO	IMPSA, Universities	200,000	-	
2. Alleviation of Water Quality Problems				
1 i. Monitoring on a continuous basis of the nature and extent of on-going agro-chemical pollution of selected rivers and other waterbodies	FOO, Com. of Ag. Services	250,000	-	
√ ii. Progressive devpmt of the inst'l system	IMPSA, Com of Ag. Ser	100,000	USAID (partly)	2.ii Underway - USAID sponsoring IFS activity to develop national ambient water qlty monitoring system
iii. Training of officers and farmers to carry out the water mgmt task	-do-	100,000	-	
iv. Reporting of data on the nature of pollution and its causes	-do-	50,000	-	
v. Undertaking of research studies as required	Universities, IIMI	100,000	-	
vi. Education of the public on the adverse effects of pollutant build up in water	CEA, NIE	100,000	-	
3. Prevention of Adverse Env'l Impacts due to Irrigation				
1. Assess the nature of env'l problems through a study covering several important irrigation schemes....	Universities	400,000	-	3.1 Recd. CP from IIMI "Assessing agro-chemical pollution from irrigated agriculture" (also related to 2.1.i)
2. Undertake a study to: a. Identify env'l parameters for monitoring b. Determine methods to monitor	Universities, NBRO	250,000	-	3.2a Recd. CP from M/ADR "Develop parameters for exploitation of ground water resources for agriculture"
3. Train and educate people, especially members of FOO on the adverse effects and ways of alleviating problems	CEA, NIE	100,000	NORAD?	
4. Launch research studies to alleviate adverse effects and to strengthen beneficial env'l effects	Universities	100,000	-	

■ MINERAL RESOURCES				
1. Existing Legislation on Mineral Resources Does not Address Environmental Protection/Issues Adequately				
1. Review amend or change existing laws to accommodate env'l considerations.	Ministry in charge of the project of mineral res.	20,000	-	
2. Weak Institutional Structure for Servicing the Mineral Sector in Assisting, Monitoring and Guiding Mineral Industry			-	
1. Strengthen and improve the GSD and its Mines & Minerals branch	-do-	200,000		
3. No Comprehensive Data Base giving Mineral Information for the Industry				
1. Collate and compile comprehensive Mineral information data base	GSD	100,000	-	
4. No Env'l Assessment is done in Mineral Based Activities				
√ 1. Undertake an assessment of currently exploited mineral species. Prepare guidelines, issue & coordinate monitoring action	GSD	450,000	Dutch (only sand mining)	4.1 Dutch are assisting CEA to prepare guidelines for sand mining. Recd. CP from CEA "Develop env'l guidelines for the gem mining industry"
5.Inadequate Research in Mineral Based Activities				
1. Publicize, offer and promote research: (i. to vi.)	M/EPA, CEA. GSD	500,000	-	5.1 Recd. 3 CPs from CEA "(a) National sand study phase II; (b)Nat'l clay study; (c)Awareness & training programs on gem mining ... "
6. Gem Mining				
1. Strengthen the capacity of the SGC or successor organization to carry out its env'l responsibilities more effectively	-	300,000	-	6.1 Recd. CP from SGC "Establishment of an Env'l Cell in the SGC"
2. Integrate the location of gem sources with future land use plans prepared for gem mining areas		100,000	-	
3. The financial bond deposit for deep mining projects should be increased substantially,, and refund issued only after satisfactory ...			-	
4. The pros and cons of mechanized versus traditional pit mining should be evaluated in the context of SL's high man-land ratio, ...			-	
5. In addition to gem mining, govt. should asses the extent to which the mining sector (and the draft Mining Law) is provided with env'l guidelines			-	

■ COASTAL RESOURCES				
1. Control of Coral Mining				
√ 1. Implement a planned program to provide alternate employment and land to those engaged in coral mining in the Southern province	Southern Provincial Council	100,000	CRMP/USAID	1.1 Study underway. ($12,000)
2. Implement a program to develop dolomite resources as a source of lime required for the construction industry, & to make it available at a competitive price	M/H&C	200,000	-	
2. Sea Level Rise				
1. Prepare an initial report which identifies: [(a) to (d)]	CCD, M/EPA	75,000	-	2.1 CCD and UDA initiating studies
2. Conduct priority research activities investigations and surveys on critical sites	CCD, M/EPA, Universities	500,000	-	
3. Prepare a strategy for minimizing adverse impacts of sea level rise	CCD, M/EPA	75,000	-	
3. Coastal Pollution				
1. Conduct feasibility studies for central sewage treatment/disposal facilities in key tourist development areas along the coast	CEA	100,000	-	3.1 Recd. CP from CEA "Control of pollution of coastal areas from tourist devpmt project"
2. Establish water quality monitoring and risk assessment programs in critical estuary/lagoon systems and develop cost effective recomds ..	CEA	100,000	-	3.2 CRMP/USAID - establishing Water Qlty & Research Unit at NARA
4. Relocation of Persons Away from Erosion Prone Coastal Areas				
1. Conduct a survey to obtain information on (a) the nature and magnitude of the problem, (b) to identify the more critical areas ..(c) identify suitable alternative lands and infrastructure facilities	CCD, Universities	300,000	-	
2. Implementation of relocation program	M/HC and Land Com.	1 Mn	-	
3. Implementation of a program in one or two areas, including establishment of green belts in the vacated coastal areas	NGO	250,000	-	
				[FYI - GTZ is supporting CCD and some of their programs may address some NEAP coastal resource activities]

■ **FORESTRY**				*[FYI - this section should be covered by WB and Finnida support for new Forestry Master Plan]*
1. Lack of Community Development Programs based on Forestry				
1. Develop and implement a community devepmt program emphasizing forestry in a few demonstration locations adjacent to natural forests in conservation areas.	FD, NGO	25,000	-	1.1, 2.1-3, 3.1 Recd. CP from FD, M/LIMD "Agenda 21 component on creating capacity for national forest". This CP covers almost all activities under Forestry. M/LIMD has submitted this proposal to UNDP for funding. (Check status)
2. Inadequacy of Institutional Capacity for Forestry Protection				
1. Establish a special Forest Protection Division in the Forest Dept	FD	30,000	-	
2. Revise the existing arrangements of Forest Ranges and Beat based on the availability and distribution of Natural Forests	FD	15,000	-	
3. Improve mobility of territorial staff of the Forest Dept by providing Motor Cycles	FD	12,500	-	
3. Inadequate Capacity for Timber Utilization Research				
√ 1. Timber Utilization Research Branch should be strengthened by providing necessary staff and equipmt. and preferably relocated in FD	M/LIMD, FD, STC	35,000	-	3.1 Underway - Timber Research Branch of STC has been shifted to FD

■ **BIODIVERSITY & WILDLIFE**				
1. Coverage and Mgmt of Protected Areas				
√ 1. Improve the representation of Wet Zone and coastal habits in the protected area systems.	DWLC	100,000	ODA	1.1 Underway/Proposed - FD inventory of terrestrial areas w/ IUCN
√ 2. Prepare and implement conservation mgmt plans for the following seven protected area clusters, including adjacent forest reserves	DWLC/FD + PC/LA, NGOs, CCD, NARA	14 Mn	FAO, NORAD, & USAID	1.2 Underway - FAO/GEF financed prog. USAID assistance thru USF&WS
√ 3. Prepare a plan to develop and test buffer zone protection models, and to implement several pilot programs in community based Mgmt	DWLC/FD with PC/LA etc	800,000	NORAD	1.3 Devpmt & Evaluation of Mixed Species Plantation - Hantana Watershed Catchment Area; Planting multiple use species in Pinus Plant
2. Mobilization of Resources to Support Conservation				
1. Develop specific strategies and work plans to meet the objectives of the Wildlife Trust, including staffing needs, resources, time frame	Wildlife Trust	25,000	-	
2. Commission a team of local and expatriate tourism specialists to prepare feasibility studies for nature oriented tourism development	DWLC, FD, CTB, CEA, CCD, NGOs	100,000	-	
3. Prepare and implement mgmt plans emphasizing public-private collaboration in resource mgmt in two test sites	DWLC, CCD, NARA etc	200,000	-	
3. Plan for the Conservation and Mgmt of the Elephant				
1. Plan and implement a comprehensive elephant mgmt program for Sri Lanka emphasizing on-site mgmt, captive mgmt and outreach... [A .. C]	DWLC with FD, PC/LA, ED	3 Mn	—	
4. Wetland Conservation				
√ 1. Compile a national inventory of wetland resources which would, inter alia, provide information on the nature, extent, etc	NWSC & Universities, NGOs	50,000	Dutch	4.1 Underway (CEA)
√ 2. Prepare a National Wetland Master Plan which would incorporate the coastal marine and inland freshwater wetlands.	NWSC with CCD, CEA, etc	200;000	Dutch	4.2 Underway. Dutch Wetlands project (CEA)
√ 3. Develop private-public partnerships for sustainable mgmt of critical wetland sites...	NWSC with CCD, NARA, etc	200,000	USAID/CRMP	4.3 Underway - Rekawa & Hikkaduwa lagoons
√ 4. To design and plan SAMs, the following steps must be taken initially: ...	NWSC with Universities, NGOs	50,000	USAID/CRMP	4.4 & 4.5 Underway - Promoting integrated CRM through SAM & community involvement at the local level
√ 5. Identification, formulation, and implementation of coastal Special Area Mgmt (SAM) plans should be the responsibility of CCD and DWLC...	NWSC with NARA, CEA, CTB, etc	1 Mn	USAID/CRMP & NORAD	

■ <u>URBAN POLLUTION</u>				
1. Inadequate Domestic and Solid Waste Disposal				
1. Conduct a CBA of Colombo's two sewage disposal options..	CMC/NWSDB	100,000	-	
√ 2. Prepare a strategic plan for solid waste mgmt in the Colombo urban area, including technical, planning & administrative aspects	CMC/UPU	100,000	MEIP/WB/UNDP	1.2 Underway - Strategy including innovative approaches for integrated SWM & public, pvt partnerships has been developed.
3. Conduct a study to determine existing water pollution levels in selected urban centers outside Colombo, such as Kandy & Jaffna	CEA	150,000	--	
4. Identify: (a) priority sewerage and solid waste development needs in faster-growing urban centers.. (b) costs of recommended sewerage and solid waste mgmt.. (c) an inst'l strategy for developing sewerage..	UDA	-	-	1.3 Recd. CP from CEA "Monitoring of pollution levels in Kandy & N'Eliya)
2. Loss of Low-Lying Urban Wetlands and Stormwater Basins				
√ 1. Design & implement a program for rehabilitation of Colombo's natural drainage system, focusing on restoration of Beira Lake ...	MEIP/CEA	1.5 Mn	MEIP/WB/UNDP & CIDA	2.1 Underway
√ 2. Prepare and implement a demonstration project to promote env'l improvements in low income settlements along selected canal banks ..	MEIP	20,000/s	MEIP/WB/UNDP & NORAD	2.2 Underway - (under clean settlements program)
√ 3. Prepare restoration plans for urban water bodies subject to deteriorating water qlty in cities other than Colombo.....	Kandy MC	500,000	NORAD for Galle (Rs. 200,000)	2.3 Underway. (Proposed - Lunawa lagoon proposal received by JICA; MEIP & NAREPP economic valuation study)
3. Lack of Inst'l Capacity to Incorporate Env'l Parameters into Urban Planning and O + M				
√ 1. Prepare an inst'l strategy for development of an urban env'l planning & O+M capability in UDA and other relevant agencies ...	UDA	300,000	MEIP/WB/UNDP	3.1 & 3.2 Underway - Env'l Mgmt. Strategy is being developed
√ 2. Implement the urban env'l inst'l strategy, including establishment and preparations of a work plan for an env'l cell in UDA, a study of..	UDA	150,000	MEIP/WB/UNDP	

■ **INDUSTRIAL POLLUTION**				
1. Tools for Environmentally-sensitive Siting are poorly Developed				
1. Commission a study to assess the env'l suitability of sites identified under the Ind'l Promotion Act (1990) and rank them in order	M/IST	100,000	-	
√ 2. Develop EIA guidelines and criteria for ind'l development projects including estates. Such guidelines should supplement the ind'l estate..	CEA	NAREP	USAID/NAREPP & MEIP/WB/UNDP	1.2 Underway - NAREPP prepared Ind'l Siting Guidelines
√ 3. Ensure that NBRO's Env'l Assessment Manual is used by project proponents and UDA in preparation and review of EIAs.	UDA	-	MEIP/WB/UNDP	
2. Industrial Pollution Management				
1. Review & update existing discharge standards and pollution control guidelines for all sector of industry, incorporating a best achievable ..	M/EPA/CEA	40;000	Dutch & MEIP	2.1 CEA is requesting for funding. Dutch proj - Preparation of Operational Guidelines & Stds for CEA.
√ 2. Study and propose mechanisms -- linked with CEA enforcement -- for financing pollution abatement through subsidies, incentives, loans..	M/PPI	TBD	MEIP/WB/UNDP & USAID/NAREPP	2.2 Underway - Establishment of PCAF at NDB
3. Waste Abatement Expertise Facilities				
√ 1. Conduct an assessment of the requirements for pollution control technologies for the worst polluting industries in Sri Lanka. ..	CEA	150,000	MEIP/WB/UNDP	3.1 Underway. Recd. CP from CEA "Pollution control technology for high polluting industries in Sri Lanka"
√ 2. Strengthen the research capabilities of CISIR on appropriate waste treatment technologies and process improvements and its capacity	CISIR	100,000	MEIP/WB/UNDP	3.2 Proposed - Under MEIPs program for CISIR and NBRO for air qlty monitoring equipment. Recd. CP from CISIR "Strengthening the env'l research capabilities of CISIR"
√ 3. Provide designs of pre-treatment facilities for at least 20 major polluting industries in the Colombo metropolis	MEIP	100,000	MEIP/WB/UNDP	
4. Study and implement the feasibility of constructing a pipeline from Biyagama to Kelani River	GCEC	150,000	NORAD, Dutch??	3.3 Underway - Ind'l Estates WWT Facilities at Ekala, Ja-Ela)
4. Water Quality Monitoring & Related Issues				
1. Identify sampling points in key areas where ind'l development is planned, and collect, analyze and publish quarterly water quality data..	CEA	25,000	USAID/NAREPP (partly)	4.1 Underway (partly)- IFS monitoring of 12 water bodies (Kelaniya river, Koggala..) Recd. CP from CEA "Monitoring of env'l qlty in areas where major ind'l devpmt is being planned"
2. Prepare and implement a workplan for development of a water quality mgmt model for the Kelani River based on designated uses,..	M/LIMD	1 Mn	-	
3. Expand designation of beneficial uses and the water qlty monitoring network to other priority water bodies in Sri Lanka.	M/LIMD	N/A	-	*[FYI - ADB sponsored Water Resources Master Plan may address some of these issues]*

■ ENERGY				
1. Domestic Fuelwood Consumption				
1. Extend the stove dissemination program by about 250,000 for 1991 -1993 while, at the same time, initiating an evaluation of past experience which would include the following	M/EC, CEB	340,000	-	1.1 Recd. CP from Society for People Centered Devpmt "Low energy consuming stoves as an instrument to (i) reduce domestic firewood consumption..
2. Industrial Energy Management				
1. Conduct a study to (a) review ind'l energy conservation experience..(b) assess constraints on and results of implementation of audit ...(c) recommend financial packages to implement identified ..	M/PE	250,000	-	
2. A study to analyze price and other incentives for oil-to-fuelwood substitution, & where fuelwood consumers are getting their fuelwood..	M/PE	250,000	-	
3. Assist large fuelwood and electricity users to implement audit recommendations & target groups of small & medium-scale industries	M/PE, FD	250,000	-	
3. Conservation: Institutional Capacity				
1. Develop an Energy Advisory Service to assist industries (& household sector) to: (a) - (c)	M/PE	125,000 75,000 recurrent	-	
4. Power System Expansion and EIA/Env'l Mgmt Capability				
1. Set up an Env'l Cell in CEB, with responsibilities for (a) development of an organizational structure within CEB ...(b) a study to estimate the present siltation rates, the total accumulated silt in ..	CEB	195,000	-	4.1 EIA cell established
2. Develop staff capability to undertake detailed assessment of env'l impacts of new projects, & coordination of work of subject specialists	CEB		-	
5. Integrated National Energy - Env'l Planning				
1. Re-establish the Integrated National Energy Planning capability within the M/PE with the govt's commitment to use the tools available	M/PE	50,000		
2. Extend the national energy planning function to include the evaluation of energy environment interactions & to advise the ...	M/PE	25,000	-	
6. Energy in Transport and the Environment				6.1 Recd. modified CP from M/TH "Elimination of vehicle pollution - establishing a vehicle testing center"
1. Develop a practical program to assist the improvement of efficiency and more complete combustion of vehicles. ..	M/TH, CEA, M/PE	25,000	-	6.2 Recd. CP from CEA "Monitoring of ambient air qlty islandwide (10 locations)
2. Continue & expand air pollution monitoring in Colombo and other..	CEA, M/TH, M/PE	25,000	-	

7. Wind Energy				
1. On the basis of the on-going wind resource study, prepare plans for immediate installation of a pilot wind generation plant ...	CEB	750,000	-	
2. Study the feasibility of long-term development of wind resources for power generation on a larger, national scale.	CEB	25,000	-	

■ <u>ENVIRONMENTAL EDUCATION</u>				
1. Environmental Components have to be introduced to the Teaching at Pre-schools Level ..				
1. Compile a register of pre-schools and arrange for a comprehensive program of teacher training. ..	CEA, DEA	50,000	-	1.1 Recd. CP from CEA " Enhancement of env'l education at pre-school"
2. Strengthen Teaching of Env'l Components in the School Syllabi				
√ 1. Prepare a package of teaching aids for schools and conduct training program for Master teachers.	CEA, NIE	250,000	NORAD (partly)	2.1 Partly funded by NORAD. Recd. CPs from CEA & NIE
3. Manpower Needs in the Env'l Sector has to be ascertained				
1. Conduct a survey on manpower needs in the env'l sector	CEA	200,000	-	
4. Acute Shortage of Data and Knowledge on many Env'l Subjects				
1. A system of research grants should be developed to encourage research on env'l topics by the universities	UGC	250,000	-	
√ 2. Strengthen the core-course on Env'l Studies at regional Universities	UGC	250,000	USAID/NAREPP	4.2 Underway (NAREPP)
5. A Central Institution to Collate & Disseminate Env'l Information				
√ 1. Establish a Center for Env'l Studies with facilities for retrieval and audio visual aids.	M/EPA	1 Mn	USAID/NAREPP & JICA	5.1 Underway/Proposed - Established U. of Peradeniya Center of Env'l Studies. Recd. CP from U.of P to strengthen Env'l Center.
6. Improvement of Public Participation in Env'l Conservation and Enhancement				
1. Involve the traditional elite and the clergy by a series of educational programs in env'l awareness program.	M/EPA	100,000	-	
2. Use the traditional communication media like puppetry, folk music and theatre to disseminate env'l knowledge	M/EPA	50,000	NORAD	
3. Enhance the capacity of media personnel in communicating env'l knowledge by seminars and literature	M/EPA	50,000	NORAD	
4. Use the regional radio network to encourage a two-way exchange of info on env. by virtue of their proximity to the grass roots level.	M/EPA	25,000	NORAD	

■ <u>CULTURE</u> **1. Some aspects of culture which are environment-friendly are facing the threat of drastic change in the facet of modern development**				
1. Planning and implementation of a program for harnessing of cultural resources for env'l conservation	M/CAI, M/EPA	250,000	-	
2. Keeping adequate records of a culture of community that is being disrupted should be considered imperative ...	M/CAI, PCs	50,000	-	
3. In re-settlement planning, measures adopted to re-settle homogenous cultural groups with least disruption of their life...	M/CAI, M/EPA		-	
4. Development of tourist industry should be subjected to EIA procedure which takes into account the cultural heritage of the country	M/CAI, M/EPA		-	

■ <u>INSTITUTIONAL CAPACITY</u>				
1. Environmental Policy-making				
√ 1. Provide short-term administrative support for NESC to (a) review proposed env'l strategies..(b) identify next steps in implementation of approved strategies... (c) ensure coordination of donor assistance for env.	M/EPA with M/PPI	30,000	MEIP/WB/UNDP & USAID/NAREPP	1.1 Underway
2. Govt. should provide precise policy guidelines and clear organizational mandates to address the following national level env'l policy making issues: (a) & (b)	M/EPA with M/PPI	100,000	USAID/NAREPP & MEIP/WB/UNDP	
2. Natural Resources Management				
1. Strengthen the capability of LUPPD to provide land use planning data and other assistance to the following agencies : (a) - (d)	LUPPD	300,000	-	
√ 2. Strengthen the capability of DWLC (a) - (d)	DWLC	220,000	USAID/NAREP(partly	2.1 Underway (partly) - Mgmt
3. Strengthen the capability of FD (a) - (d)	FD	310,000	-	Analysis of DWLC being
4. Establish an Env'l Cell with a staff of two professionals that would review gem mining permit procedures ...	SGC	50,000	-	prepared
5. Strengthen the coordinating and policy capabilities of M/LIMD in the priority areas: (a) - (c)	M/LIMD	110,000	-	
3. Pollution Control				
1. Identification of the CEAs priority objectives and provision of adequate resources to achieve those objectives .... (a) - (e)	M/EPA with CEA		USAID/NAREPP (partly)	3.1 Recd. CP from CEA to update the Corporate Plan
2. Upon adoption of a corporate plan for CEA, prepare and implement a staffing and training program for CEA, to enable CEA to (a) - (b)	M/EPA with CEA		USAID/NAREP (partly)	
√ 3. Establish an Env'l Cell in CEB. Prepare and implement a two-year workplan, including staffing and training, for the CEB Env'l Cell. ..	CEB with CEA		-	3.3 Env'l cell established at CEB
4. Establish an Env'l Planning Cell in UDA. Prepare a two-year workplan, including staffing and training, ...	UDA (MPPI with M/EPA & CEA)		-	

ABBREVIATIONS

AD	Agriculture, Department of
ADB	Asian Development Bank
AGA	Assistant Government Agency
CCD	Coast Conservation Department
CEA	Central Environmental Authority
CISIR	Ceylon Institute of Scientific and Industrial Research
CP	Concept Paper
DWLC	Department of Wildlife & Conservation
EIA	Environmental Impact Assessment
FAO	Food and Agricultural Organization
FD	Forest Department
GOSL	Government of Sri Lanka
ID	Irrigation Department
IDA	International Development Agency
IEE	Initial Environmental Examination
IIMI	International Irrigation Management Institute
IUCN	International Union for the Conservation of Nature
LUPPD	Land Use Policy Planning Division
MEIP	Metropolitan Environment Improvement Program
MADR	Ministry of Agricultural Development and Research
M/CA	Ministry of Cultural Affairs
M/EPA	Ministry of Environment & Parliamentary Affairs
M/IST	Ministry of Industries Science & Technology
M/LIMD	Ministry of Lands Irrigation & Mahaweli Development
M/SS	Ministry of Social Services
M/PPI	Ministry of Policy Planning & Implementation
NARA	National Aquatic Resources Agency
NAREPP	Natural Resources & Environmental Policy Project
NARESA	National Resources, Energy and Science Authority
NBRO	National Building Research Organization
NESC	National Environment Steering Committee
NGO	Non-Governmental Organization
NWSC	National Wetland Steering Committee
ODA	Overseas Development Agency
PAA	Project Approving Agency
PIP	Public Investment Program
SAM	Special Area Management
SGC	State Gem Corporation
SLIDA	Sri Lanka Institute for Development Administration
SLSPC	Sri Lanka State Plantations Corporation
STC	State Timber Corporation
TSHDA	Tea Small Holdings Development Authority
UDA	Urban Development Authority
UNCED	United Nations Conference for Environment & Development
UNDP	United Nations Development Program
USAID	United States Agency for International Development
WB	World Bank

APPENDIX B

SUMMARY OF EA1P

GOVERNMENT OF SRI LANKA
Ministry of Environment
and Parliamentary Affairs

THE WORLD BANK

SRI LANKA
Environmental Action 1 Project

Revised Draft
Project Preparation Document

SUMMARY

Sandvika, Norway

15 May 1994

Norconsult
Norconsult International A.S.

in association with

Engineering Consultants Ltd.

SUMMARY

1. INTRODUCTION

Radical economic reforms since the late 1980s have liberalized many economic sectors in Sri Lanka, improved the overall efficiency of resource use in the economy and increased economic growth rates. But there are increasing signs that environmental degradation is jeopardizing the country's prospects for economic development. Many of the reforms being implemented at the national level (such as industrialization, privatization, monetary and market liberalization) will have substantial impacts on the environment and on the management and use of natural resources. The costs associated with degrading natural or environmental capital are not reflected in the national economic accounting system, and have largely been ignored in the design and implementation of macroeconomic and sectoral development policies.

The government has adopted an environmental planning process which included the preparation of a National Environmental Action Plan (NEAP) in 1991, to begin to integrate national economic development with environmental conservation. A substantially-revised update to the NEAP has been in process since late 1993, and GOSL plans to periodically update this plan as a 'living document'. The EA1P recommended in this report represents the first four-year implementation phase of the evolving NEAP planning process.

The most significant environmental problems in Sri Lanka are deforestation, land degradation, freshwater depletion, coastal zone degradation, urban and industrial pollution, and energy use. The environmental impacts of energy use are not severe but will escalate rapidly as urban and industrial development intensifies. There is an acute lack of reliable information on the state of the environment and the relationship between natural resource management and the national economic development process.

Many factors have contributed to these problems, including the resource demands of a growing but largely impoverished population lacking employment opportunities; long-standing and violent civil conflicts; inappropriate land use practices; sectoral and macro-economic development policies which have ignored environmental sustainability; uncontrolled urban and industrial development; an inadequate and fragmented environmental policy, institutional and regulatory framework; and a lack of political concern.

2. INSTITUTIONAL AND POLICY FRAMEWORK FOR THE ENVIRONMENT

The major institutional constraints include: (a) capacity limitations of MEPA, CEA, the PAAs and the other agencies involved in environmental management and protection; (b) the large number of agencies working with overlapping mandates and responsibilities; (c) unclear delineation and delegation of authority; (d) a lack of efficient monitoring and evaluation mechanisms; (e) poor coordination between agencies and ministries; (f) inadequate enforcement capacity; (g) a lack of relevant and timely environmental information. These problems are compounded by an acute lack of skilled technical manpower in the environmental field, a shortage of adequate training facilities, and inadequate attention to environmental education in the school and university systems.

The National Environmental Act of 1980 (and a 1988 Amendment) established and empowered the Central Environmental Authority (CEA), to formulate policies and programmes for environmental protection and management. But implementation has so far proved disappointing. Laws prohibiting or regulating activities such as shifting cultivation, soil erosion, coral reef mining, and gem mining, have proved rather ineffective, while experience with alternative incentive mechanisms, including private land ownership, has been very limited. Significant gaps thus exist between laws and their enforcement. Past failures of regulatory or enforcement approaches are at least partially attributable to a lack of trained personnel to enforce regulations and to a lack of political will to impose penalties which can act as a deterrent against illegal activities.

The emphasis on regulatory approaches in Sri Lanka has had relatively high administrative costs as well as relatively low efficiency. There now appears to be some willingness to explore the development of market-based and extra-regulatory policy reforms, although the necessary analytical work has barely begun in most sectors. The impact of the policy framework on the use of natural resources also has to be considered in relation to the structure of ownership of and access to these resources, an extremely complex, controversial and politically-sensitive topic in Sri Lanka.

3. ECONOMIC COSTS OF ENVIRONMENTAL DEGRADATION

Available data can be used to suggest possible orders of magnitude for certain economic costs associated with environmental degradation:

a) Soil erosion on tea lands may be responsible for annual gross revenue losses in the range of Rs. 613 - 4,283 million.

b) The value of sustainable timber, fuelwood and non-timber forest product revenues foregone as a result of deforestation may be Rs. 6,690 million annually.

c) The annual foreign exchange earnings from tourism which are dependent on the state of the coastal environment, and therefore potentially at risk from coastal and marine pollution, may be Rs. 3,603 million.

d) The potential annual savings from energy conservation measures already identified may be Rs. 771 million.

These are the costs of inaction, of doing nothing to mitigate environmental problems, and are a useful proxy for the benefits from investments in improving the environment in the respective environmental sectors.

3.1 Project Rationale and Formulation

The main objectives of the recommended project are to assist GOSL in implementing sectoral policies, strategies and plans aimed at: (a) strengthening the institutional and policy framework to develop environment protection and conservation of natural resources; and (b) supporting NEAP priority operations, especially in natural resources development. A central project goal is to assist GOSL in translating NEAP objectives and strategy into action. The project is multi-sectoral, including priority policy and investment issues across the entire spectrum of environmental concerns.

EA1P represents the first four-year phase of a longer term NEAP implementation process. Priorities for this first phase are to (a) strengthen the institutional framework, (b) address policy reform needs, (c) support operations (investment sub-projects) of an urgent nature, and (d) support studies that are potentially relevant for understanding the implications of economic policy for resources management.

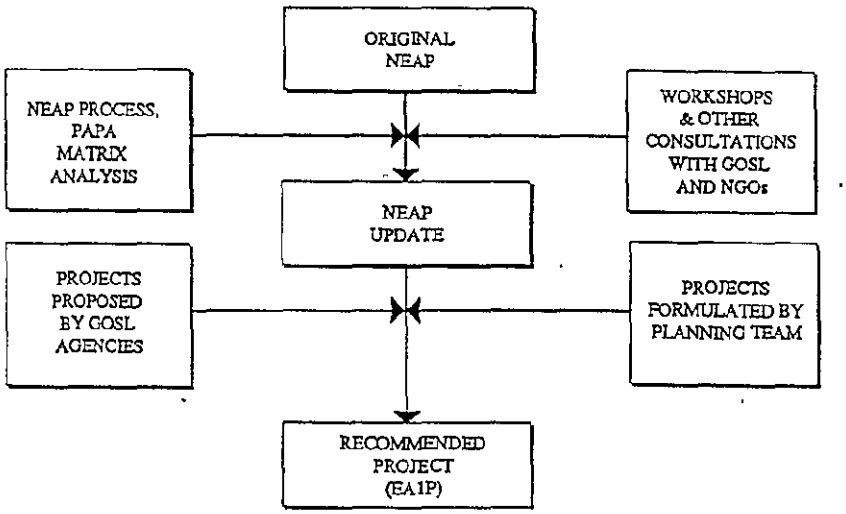
The major constraints to Sri Lanka's realisation of environmental objectives which the project will address, include: (i) weak institutions transferring the integration of environmental issues into national and sectoral development plans; (ii) inadequate policy and legislative framework; (iii) weak enforcement of existing environmental legislation; (iv) inadequate resources to invest in environmental priority areas, especially those related to natural resources protection; and (v) limited access to technologies that promote economic development and safeguard the environment.

The starting point for the selection of activities to be recommended as components of EA1P included the 1991 NEAP, the 1994 NEAP Update process, two high-level NEAP/EA1P workshops, and a set of EA1P sub-project proposals solicited from GOSL agencies and NGOs by MEPA during 1993 (Figure next page).

Not surprisingly, the rich and valuable inputs from these diverse sources were sometimes incomplete and occasionally contradictory. Significant gaps in understanding and information became apparent, as well as fundamental differences of opinion regarding national environmental priorities and how they should be addressed. The sum total of suggested actions across the entire spectrum of environmental concern also far exceeded the financial resources likely to be available for environmental programs as well as existing implementation capacities. In response, specific methodologies were developed and applied during project preparation to identify high priority and feasible activities for EA1P, as follows:

Task/Objective	Methodology
Identification, analysis and prioritisation of action steps within environmental programme areas as part of NEAP Update '94	Programme Area Policy Analysis (PAPA) matrix approach
Macro-level allocation of financial resources between project components	Economic-Environmental Assessment Matrix (EEAM)
Criteria for screening project investment activities	Activity Screening Matrix (ASM)

Predictably, none of these various approaches lead to firm conclusions or even the same conclusions. But their combined results, even at very early stages of development and testing, do seem to provide some overall comfort that NEAP implementation can be launched in the right direction.



4. REALITIES OF THE PROJECT PREPARATION

Recommended project activities, including policy and institutional reforms as well as applied research needs, would ideally have been identified as an end-product of the coherent and reasonably participatory NEAP Update process (which continues), based on the PAPA matrix approach. The PAPA matrix approach provides the most solid analytical methodology for supporting the continuing NEAP concept and its periodic implementation phases. But the EA1P timetable required project activities to be identified, prioritized, planned and costed while working groups were still carrying out the NEAP Update, and consequently still grappling with some very basic policy, institutional and jurisdictional issues which remain unresolved. The valuable and promising analytical process underlying the NEAP Update therefore had to be substantially cut short so that the project preparation document and the NEAP Update could be finalized simultaneously.

It then became necessary to select potential sub-project activities from an enormous list of complex and competing projects encompassing the entire spectrum of environmental concerns. Many of these proposals were only at very early stages of planning at the time they were submitted during project preparation, generally with little consideration having been given to cost-effectiveness, implementation capacity, sustainability, and so on. Inevitably, choices had to be made based on professional judgement and intuition as to which of these proposals could be developed into sound projects using the limited resources available during project preparation - with no guarantee that they would eventually be selected and recommended for project financing. Project preparation was therefore forced to put the cart (sub-project selection) before the horse (underlying identification and analysis of options, plus dialogue and consultation).

This logical contradiction was compounded by two forces attempting to pull the project preparation in two opposite directions: on one side, the Bank's view that the project be simple and consist of very few elements, with an emphasis on establishing the policy and institutional framework; and, on the other, GOSL officials' desire that project funding be broadly spread to diverse investment activities across all environmental sectors, and their implied position that explicit policy reform conditions would be unwelcome and could jeopardize GOSL's ability to implement EA1P. In these less-than-optimal circumstances, the recommended project is an attempt to reconcile these positions.

5. RECOMMENDED PROJECT

The recommended project consists of three principal parts, including one "funds facility", see Table:

1. Investment Components, Policy Reforms & Studies
   (a) Linked Land and Water Management
   (b) Energy Conservation
   (c) Coastal Resources Management

2. Capacity Building Component

3. Sri Lanka Environment Facility (SLEF)
   (a) Biodiversity Fund
   (b) Small Grants Fund
   (c) New Projects Fund

	Rs. Million				USD Million			
	Invest-ment	Technical Assistance	SLEF Funds	Total	Invest-ment	Technical Assist-ance	SLEF Funds	Total
Investment Components, Policy Reforms & Studies								
- Linked Land and Water	1792	288		2080	36	6		42
Management	101	136		237	2	3		5
- Energy Conservation	279	255		534	6	5		11
- Coastal Resources Management								
Capacity Building Component	277	467		744	5	9		14
Sri Lanka Environment Facility			100	100			2	2
- Biodiversity Fund			100	100			2	2
- Small Grants Fund			1005	1005			20	20
- New Projects Fund								
	2449	1146	1205	4800	49	23	24	96

5.1 Linked Land and Water Management

This project Component will:

1. Invest in land rehabilitation and associated water management in several categories of degraded areas to improve productivity and arrest environmental deterioration.
2. Support capacity building and implementation of on-site application of legislated soil conservation measures.
3. Prepare plans, policies and institutional set-ups for improved national water resources management procedures.
4. Conduct studies and research on water resources with emphasis on data, appropriate technology, pollution and water allocation issues including the preparation of groundwater management and utilisation guidelines in the dry zone.

This component emphasizes the importance of not separating the land and water issues in an environmental management context and applies such principles in a participatory framework to some of the most acutely degraded lands and water scarce areas. It builds on past success by the *Hadabima* Authority and the ADB TA on Institutional Assessment for Comprehensive Water Resources Management.

5.2 Energy Conservation

This project Component will:

1. Invest in actions to disseminate fuel efficient wood stoves;
2. Implement major parts of the Demand Side Management Action Plan;
3. Invest in facilities and equipment for reduction of vehicle pollution;

4. Promote the use of renewable energy sources for electricity production;
5. Establish framework for institutional cooperation for the energy-environment interaction;
6. Conduct policy reviews in energy and transport sectors and research on fuel wood gasifiers.

This project component will build on the success of the previous National Fuel wood Conservation Programme, the results of the ADB supported Demand site Management Action Plan, efforts by the World Bank funded Alternative Energy Project, and follow up on activities scheduled by the Ministry of Energy Conservation, Ceylon Electricity Board (CEB) and the Ministry of Transportation and Highways.

5.3 Coastal Resources Management

This project Component will:
1. Implement Special Area Management Plans
2. Prepare waste management plans and build facilities for coastal resort towns
3. Strengthen coastal resources management institutions.
4. Conduct studies of: mitigating the impacts of sand mining; alternate employment opportunities for coral miners; new lime sources to replace coral; and the socio-economics of illegal fishing.

This component will implement some of the key recommendations of "Coastal 2000: a Resource Management Strategy for Sri Lanka's Coastal Region", prepared in 1992, and continue work initiated by the Ceylon Tourist Board and the Central Environment Authority for coastal waste management.

5.4 Capacity Building

This project Component will:
1. Strengthen MEPA, CEA and other central government environmental functions, including policy analysis;
2. Establish provincial environment units and local training;
3. Support NGO, public awareness, environmental education and archaeology training programmes;
4. Launch state of the environment reporting.

Activities supplement support by USAID funded NAREPP and lending by World Bank to Colombo Environmental Improvement Programme.

5.5 Sri Lanka Environment Facilities (SLEF)

SLEF will consist of three sub-funds:
1. Biodiversity Fund
2. Small Grants Fund
3. New Projects Fund

The SLEF has been established to satisfy funding needs in three critical areas not included in the four major components of the recommended project: biodiversity conservation grants to NGOs and to university; small grants to NGOs and local communities for environmental

conservation and sustainable economic development activities; and financing for additional projects developed or finalised during the implementation phase of EA1P.

6. IMPLEMENTATION

Implementation and coordination will be the responsibility of MEPA, where a Project Management Unit (PMU) will be established. The NESC will act as Steering Committee, and the existing NEAP Working Group will take on an expanded role as SLEF Management Committee and EA1P Advisory Group. Different bodies will be established to manage each of the three SLEF funds. Responsibility for sub-projects will be delegated to line ministries or other GOSL funds. Responsibility for sub-projects will be delegated to line ministries or other GOSL units, who will implement the sub-projects using agencies, NGOs or private sector for execution.

7. RISKS AND UNCERTAINTIES

A certain level of risk is inherent in a project involving a variety of activities in several different sectors, which is managed by an untried and reorganised government agency, and which a variety of organisations will implement. There is a risk that MEPA's overall project coordination and leadership role may prove beyond their capacity. There is also a risk that already well-established ministries in the natural resource sectors may not collaborate and work effectively with MEPA under the umbrella of the NEAP and the proposed project.

Further risks include: (a) the availability of key GOSL officials for hand-on participation in project preparation has been very limited, with a few exceptions. As a result, there is a risk that the project be perceived as a set of externally-imposed "blueprint" activities which lack a sense of ownership and commitment from those who will be responsible for implementation; (b) many of the proposed sub-projects include support for policy or institutional studies. Failure to carry out these studies effectively and to begin the process of necessary reforms would undermine the benefits expected to result form the sub-project investments; and (c) the absorptive capacities of project implementing agencies may have been overestimated or they may take longer than anticipated to be strengthened.