

**NATIONAL ENVIRONMENTAL  
ACTION PLAN  
(1998 - 2001)**

## Message of the Hon. Minister of Forestry & Environment

I am pleased to send a message to the National Environment Action Plan 1998 - 2001. It is an important document which would offer guidance to us in the pursuit of the path of sustainable development.

A few decades ago environment was viewed as a natural science based discipline. Today it has become a multi faceted discipline and Economists, Social Scientists and others play an important role in the environment protection process. Resource Economists advise us that environment has a monetary value and a few attempts have already been made in Sri Lanka to estimate the cost of environmental degradation such as soil erosion, water pollution, etc. We are fully convinced today that economic growth that leads to unabated environmental degradation can be self defeating. The pace of growth cannot possibly be maintained over a reasonable period of time if the natural resource base on which the growth depends, starts depleting fast.

The Ministry of Forestry and Environment adopted a holistic approach to environmental protection taking into account not only the protection of natural resources, but also the social and economic dimensions such as poverty, unemployment, etc. As much as protection of resources for future generations is important, we should not try to achieve that goal by depriving present generations.

In the present context it is not possible for a country to plan its resources in isolation of the global development. Globalisation and regionalisation have their impact on our natural resources.

Sri Lanka is a signatory to a number of environment related Conventions and the Ministry is the focal point for such conventions. These Conventions create obligations not only for the environment authorities, but for the whole Government system.

National and sectoral policies and programmes have a strong impact on environment and natural resources. A clear understanding of this impact is needed in order to plan out the environmental protection strategies.

All these dimensions were taken into account in the formulation of NEAP. It was completed through a highly consultative and participatory process and wide opportunities were offered to the sectoral agencies to participate in the process. We have taken into account the policies and programmes of development sectors and have made every attempt to ensure that environmental protection programmes are in consonance with the other development programmes.

I commend the NEAP and earnestly wish that it will be used innovatively by concerned in pursuit of the future path of sustainable development.

**Nandimithra Ekanayake**  
Minister of Forestry & Environment

## Message of the Secretary, Ministry of Forestry & Environment

I am very pleased that the National Environment Action Plan (NEAP) has been updated by the Ministry of Forestry and Environment, keeping in mind the close inter-relationships that exist between economic development and environment management. Both these are dynamic concepts that should be used to meet the emerging economic and social demands of the people, whilst protecting the natural resource base of the country.

Environmentalists constantly remind us of the need to protect the natural resources for the benefit of future generations. While endorsing this as a laudable long term objective, we should not lose sight of the fact that some of the resources are renewable and therefore could be used for the benefit of present generations without undermining the interest of future generations, if they are managed prudently.

At times, some of us, through our limited understanding, tend to object to every development project on environmental grounds. Whoever stalls or slows down the economic development process which generates employment, does more injustice than justice to environment as the unemployed will be compelled to fall back on natural resources for their sustenance. The experience in many countries shows us that poverty is the biggest enemy of environment.

I must emphasize in the same breath that it is not possible to condone the indiscriminate pollution of land, water and air by those who generate employment and by others who do not even generate employment. Environment economists advise us that environmental pollution adds a huge cost to the economy. A recent study has estimated the annual loss of soil at 3420 ml rupees and cost of water pollution at 2700 ml. Add to that a polluted environment dissipates the energy of the people leading to low productivity. The government has to bear a heavy health bill when the health of the people suffer due to a polluted environment.

I am delighted to note that a process of mutual understanding and appreciation has commenced between the development practitioners both of public and private sectors and the environmentalists. While it is not possible to dispense with 'command and control' measures, the Ministry pays heavier emphasis on other instruments like policy interventions, economic incentives and public awareness as well as self-regulation for environment protection.

It is important that we develop a clear vision of our directions and of the path we hope to tread in the next century, in order to ensure the sustained well being of our people. Having developed that vision it is important to evolve the institutional mechanisms that are capable of translating the vision to a reality.

I will be pleased if the economic development and environment management concepts are comprehended in great depth by all agencies of government, the private sector and the Non-governmental organizations. This will enable us to reach laudable goals of sustainable development. I trust that this publication of NEAP will form the basis for all environment related activities in the near future and that it will facilitate a continuing dialogue among those committed to environment, development and the well being of the community.

**K. A. S. Gunasekara**  
Secretary, Ministry of Forestry & Environment

## Message of the Hon. Deputy Minister of Forestry & Environment

I am pleased to be associated with the National Environment Action Plan which was formulated through a highly consultative process. Much of the ideas contained in the Action Plan came from other agencies and the Ministry of Forestry and Environment facilitated the preparation of the Plan with the participation of Government Agencies, Private Sector Agencies and NGOs.

Although many countries have viewed environmental protection as a strategy adopted for the well being of human beings, we in Sri Lanka have given a wider meaning to the subject. Our ancient kings have protected not only the rights of human beings, but also recognized the right of life of animals. This thinking should get reflected in Sri Lanka's environment protection strategies.

Our culture and traditions have been very soft on environment. The paddy field, the reservoir, the village forest and the human settlement were treated as part of an eco-system. The ancient people were aware that if we disturb one component we will be disturbing the entire eco-system. It would be appropriate to apply the same concept in a wider context to the City of Colombo. The Muthurajawela and Bellanwila/Attidiya wetlands, the marshes surrounding the Colombo City and the human settlements in Colombo are all part of an eco-system. We have witnessed severe disturbance of this eco-system by filling of marshes and wetlands leading to flash floods and damage to properties etc. National Environment Action Plan should also create a discipline in all development sectors to address the sustainability aspects of their development programmes. A programme which results in heavy environmental damage cannot possibly sustain itself in terms of time and space. The Ministry of Forestry and Environment should share this thinking with other government and private agencies.

We must also be conscious that poverty can take a heavy toll on the natural resource base of the country. Environment protection should not come in the way of development programmes. The Ministry has to take a balanced view of environment protection and economic development.

In drawing up environmental protection programmes based on the Action Plan, it is necessary that we draw from the wisdom of the people. Our Ministry is involving the communities strongly in forestry programmes and environmental protection programmes. I also have great faith in the school children for the protection of environment, judging from the response shown by them to the programmes launched by our Ministry. They can influence the minds of the elders and convince them of the advantage of protecting environment.

The Action Plan has looked at global, regional and national issues impacting on our environment. It should give us a lead to develop our grass root programmes. I earnestly hope that the National Environment Action Plan will become the blueprint for balanced economic development and environmental protection in years to come.

**Munidasa Premachandra**  
Deputy Minister of Forestry & Environment

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## Executive Summary

The National Environmental Action Plan (NEAP) 1998-2001, is the third in the NEAP series. This NEAP is important because it will set the national environmental agenda for the 21<sup>st</sup> century. The key national and global trends of privatisation, trade liberalisation, public sector reform, decentralisation and increased public participation are reviewed to identify their role in promoting sustainable development.

The NEAP 1998- 2001 is presented in two sections. Section 1 is a **Strategy to Pursue Sustainable Development** and defines the policies, institutional shifts and actions needed to meet the environmental challenges that will confront the country in the short and long term. The section II, **Sector Perspectives** is an analysis of nine key sectors: 1. Land; 2. Water; 3. Biological Resources; 4. Coastal and Marine Resources; 5. Industry; 6. Minerals; 7. Energy; 8. Built Environment; and 9. Environment and Health.

Section 1 includes a review of the elements of a Vision for Sustainable Development (Part 1), and recommends implementation actions Implementation of the National Environmental Action Plan (Part II). It submits the following broad recommendations for longer-term actions to be carried out in six key areas (Economic, Institutional, Policy, Regulatory, Knowledge based and International) in the pursuit of sustainable development.

- **Economic:** A stable macro-economy must be in place and must be complemented by the removal of environmentally damaging sectoral policies and by the introduction of incentives and innovative financing mechanisms that promote environmental conservation.
- **Institutional:** The central governmental institutions must each have a clear mandate. Inter-agency co-operation must be strong and must be promoted. Sub-national agencies must be supported by the centre and co-operative mechanisms installed for managing resources that lie across provincial borders. Non-governmental organisations must be supported by the government. The private sector, particularly the banking and financial sectors, must play a more proactive role in environmental management.
- **Policy:** Policies and plans must have clear ownership. They must be implemented through more strategically focused instruments. Greater reliance should be placed on local communities and the private sector.
- **Regulatory:** Environmental legislation must be rationalised; regulations made more consistent and uniformly enforced; standards made more appropriate / meaningful through wider consultation; enforcement mechanisms made easier to operate; and deterrent penalties imposed.
- **Knowledge-based :** Environmental information must be increased in scope, depth, and volume. Local training opportunities must be improved and expanded, the formal education system and the mass media strengthened, and awareness programmes more clearly targeted. All these actions should be aimed at bringing about meaningful change.
- **International** To benefit from the country's international commitment to sustainable development, the appropriate technical, legal, political and negotiating skills need to be developed.

The Section I, also identifies actions for implementation during the short and the medium term. Chapter 5 presents a summary of actions recommended in the NEAP sector papers in terms of policy, technical and management capacity, research, extension and education and institutional and legal structures. Chapter 6 focuses on key recommendations for actions relating to the private sector (including NGO sector) and the public sector, and mechanisms for co-ordination, monitoring and review of the progress made in implementation.

**The important recommendations relating to the private sector are:**

- Make concessionary finance available to smallholder farmers.
- Encourage private sector investment in forest plantations;
- Formulate a policy to promote private sector investment in renewable energy projects;
- Issue environmental licences through certified private licensed institutions;
- Establish a fund to finance private sector investment in environmental management activities/projects;
- Encourage private sector involvement in environmental insurance and financial guarantee activities;
- Make privatisation programme environmentally compatible;
- Institute Environmental Entrepreneur of the Year awards; and
- Involve community organisations in land alienation decisions.

**The recommendations for the public sector are:**

- Restructure CEA to meet the change in needs brought about by devolution, decentralisation and privatisation;
- Establish an Environmental and Natural Resource Data Base Centre;
- Institute policies to mandate rehabilitation and restoration of degraded land;
- Institute national environmental monitoring and environmental performance indicators;
- Improve policy analytical capacity of the Ministry of Forestry and Environment, particularly of its Environment Division;
- Promote the establishment of internationally accredited Association for Environmental Professionals;
- Create an Environmental Issues Mediation Board;
- Establish a Trade and Environment Committee;
- Establish a regulatory frame work to manage bio-safety, bio-technology and bio-prospecting;
- Help Sri Lanka Standards Institution to promote compliance with ISO 14000 standards in Sri Lanka.



**The following high-priority projects are identified in Chapter 7 for inclusion in the Public Investment Programme (PIP).**

- Introduction of land use policy and preparation and issue of guidelines for land use practices in development programs;
- Implementation of economic and technical programs to encourage farmers to practise conservation farming;
- Development of institutional structures at national and sub-national levels for Land Use Planning;
- Implementation of Coastal Zone Management Plan of 1997 and revised Fisheries Act with emphasis on community participation;
- Establishment of a single body to restructure and manage institutions concerned with the supply and use of water;
- Identification and use of alternative materials for use in place of river sand and sea coral lime;
- Preparation and implementation of management plans for protected areas through a participatory approach;
- Formulation and implementation of a National Wildlife Strategy;
- Formulation and implementation of model integrated natural resource management projects in selected watersheds;
- Strengthening of sub-national agencies to implement pollution control regulations;
- Institutional support to upgrade environmental conditions in low income settlements;
- Promoting the location of high polluting industries in industrial estates;
- Developing and implementing a National Solid Waste Management Strategy;
- Designing and implementing a Western Area Flood Control and Drainage Strategy.

**Section II: Sector Perspectives,** of the National Environmental Action Plan presents an analysis of the key issues relating to nine key sectors and the recommendations for addressing these issues. The nine sectors are: Land, Water Resources, Biological Resources, Coastal and Marine Resources, Industry, Minerals, Energy, Built Environment, Environment and Health. This analysis is based on the findings of and review by the sector committees appointed by the then Ministry of Transport, Environment and Women's Affairs. The key recommendations are given below for each sector.

#### **1. Land**

- Formulate a land use policy which provides guidelines for identifying appropriate land use practices in development programs;
- Develop an institutional structure at national and sub-national levels for land use planning;
- Design and implement innovative economic and institutional incentives to encourage the practice of conservation oriented farming;
- Establish integrated natural resource management model projects in selected watersheds that involve local communities and local authorities;

#### **2. Water Resources**

- Create a single authority to guide and coordinate the activities of the institutions involved in water management;
- Obtain agreement on national principles for water allocation and implement them in major river basins;
- Introduce reforms to improve efficiency of water use;
- Implement a monitoring program for assessing the level of pollution in water bodies;
- Develop and implement a strategy for managing groundwater that addresses the issues of groundwater extraction and ground water pollution.

### **3. Biological Resources**

- Prepare and implement a National Wildlife Strategy;
- Prepare and implement management plans for all protected areas through an approach involving community participation;
- Design and implement economic incentives to promote activities such as
- eco-tourism or nature tourism which will help to conserve and maintain national parks and other protected areas;
- Introduce incentives for establishing and maintaining mixed home-gardens with high species diversity.

### **4. Coastal and Marine Resources**

- Implement the Coast Conservation Act and Fisheries and Aquatic Resources Development Act, placing emphasis on community participation;
- Promote the production and use of lime from limestone sources other than sea coral;
- Promote the identification of sources of sand other than river beds and sea beaches;
- Promote the use of sand substitutes by the construction industry;
- Develop and implement national strategies for sustainable culture and for harvesting from natural sources, of shrimp and ornamental fish for export.
- Design and implement a strategy for reducing marine pollution;
- Promote the development of environmentally sensitive tourism in coastal areas.

### **5. Industry**

- Encourage location of high polluting industries in industrial estates;
- Strengthen capability of national and sub-national agencies to implement pollution control regulations more effectively;
- Promote the establishment of a fund financed by industry for private sector management of environmental pollution by industrial effluents;
- Promote private sector self regulation and motivation through measures such as environmental audits, ISO 14000-Environmental Management Systems and Environmental Entrepreneur of the year award;
- Assist the private sector in identifying sources of clean technology.
- Streamline the EIA process by promoting other processes such as strategic environmental assessment;

### **6. Minerals**

- Design and implement a strategy for promoting sustainable sand mining from rivers and beaches;
- Set up a Fund for the rehabilitation of lands degraded during prospecting for gems (gem mining);
- Revise the Mines and Minerals Act to include environmental guidelines for the conduct of mining operations that would provide safeguards against environmental (especially land and water) degradation.

### **7. Energy**

- Review energy policy and electricity generation plans to address environmental concerns;
- Conduct a feasibility study on use of alternative fuels for power generation, industry and transport;
- improve efficiency of bio-mass utilization through use of fuel-wood gasifiers and energy efficient fuel-wood stoves;

## **8. Built Environment**

- Provide institutional support to upgrade environmental conditions in low income urban settlements;
- Design and implement a Colombo Metropolitan Flood Control and Drainage Strategy;
- Develop and implement a National Solid Waste Management Strategy;
- Formulate and implement a Revised Clean Air 2000 Action Plan, focusing on environmentally sound public transport systems;
- Improve urban planning and zoning processes and effectively implement urban plans and zoning regulations.

## **9. Environment and Health**

- Upgrade and focus activities of Public Health services;
- Review vector control programs to focus on cost effective preventive interventions;
- Reduce incidence of pesticide poisoning through promotion of integrated pest management, better education, and responsible marketing;
- Implement interventions to reduce air pollution and noise pollution;
- Introduce a National Sanitation Week to ensure that a coordinated participatory program is launched to provide toilets for all dwellings.

## SECTION : 1

### **PURSUING SUSTAINABLE DEVELOPMENT**

## PART 1. A VISION FOR SUSTAINABLE DEVELOPMENT

### 1 A Strategy for Environmental Planning and Management

#### 1.1 Introduction

The environmental challenges, the political priorities, administrative support systems and the macro economic objectives in Sri Lanka are radically different today from what they were in 1990 when the National Environmental Action Plan was first elaborated and the subject of Environment was first recognised by being placed under a cabinet level Ministry, the Ministry of Environment and Parliamentary Affairs. The important events during this period, included the establishment of a separate Ministry for Environment, proposed constitutional changes that placed environment as a devolved subject, privatisation of state industries some of them high polluting, increasing role of the private sector in national investment including infrastructure development, a greater national commitment to pursue sustainable development and an enhanced national responsibilities and obligations arising from being a signatory to a number of international treaties relating to the environment/environmental conservation.

Resource demands of a growing agrarian population, sectoral and macroeconomic policies that often conflict with sustainable development, and lack of infrastructure to support rapid industrial and urban growth continue to be the major contributors to environmental disruption. At a time when Sri Lanka has been rapidly removing controls and regulations to improve economic efficiency and increase economic output, the government's policy, institutional and regulatory frameworks remain inadequate to implement the

country's commitment to sustainable development.

Sri Lanka is a partner in the globalisation process and sees the private sector as the engine of growth. More and more growth but of a different kind is required to meet the aspirations of the people. That is sustainable development achieved in an environmentally sound manner. Deregulation without social and environmental safeguards will not make development sustainable.

The environmental challenges of the future will therefore have to be different. With the increasing role of the private sector in national investment and its management, the role of the state sector will be different but far more important. Considerable administrative reforms to meet this change are already underway. The proposed devolutionary arrangements will have significant implications on environmental regulation and management both at national and sub national levels. Privatisation will result in the state sector contributing less to the total pollution generated but will increase the responsibility of the private sector to be self regulatory.

The enforcement, implementation and regulatory role of CEA will need to be redefined. The Ministry of Forestry and Environment (MFE) will need to gain public trust and respect to succeed in its policy formulation and co-ordination roles. The non government sector (Private/NGO/

Community) will have to face responsibilities that will be different from now.

## **1.2 NEAP - A framework to pursue sustainable development**

The National Environmental Action Plan (NEAP) sets national priorities for environmental planning and management. This is the second update of the National Environmental Action Plan. It will cover the period 1998-2001 and will therefore be setting the national environmental agenda for the Twenty-first century. The NEAP first published in 1991 covered the period 1992-1996 and the first update published in 1993 covered the period 1995-1998.

Strategic planning for environment commenced in the early 1980s with the formulation of the National Conservation Strategy. This update coming nearly twenty years after Sri Lanka made the first visible intervention towards developing a national focus towards the management of the country's considerable environmental resources is therefore an appropriate time to reflect on the opportunities and challenges of the future. As NEAP 1998 will be ushering the country towards a new century, it also provides an opportunity to build on the achievements of the past and to look to the future.

Considerable progress has been made during the past twenty years, in the areas of policy and institutional development, and of legal and regulatory mechanisms for environmental management. National awareness of environment issues and support for conservation have grown among all segments of society. Alongside them has been increased participation in

global and regional environmental processes including conventions and treaties. There has also been a marked shift of emphasis from narrow sectoral concerns towards a more integrated approach, while the public and national concern with environment now includes the brown issues such as pollution, sewage and solid waste.

Among the country's most significant achievements are the enactment of the National Environmental Act No.47 of 1980, which established the CEA and regulations published under the Act making EIAs mandatory for designated projects and undertakings, the creation of a separate Ministry charged with responsibility for Environment, and the elaboration of a National Policy Framework starting from a modest NCS towards a comprehensive intersector oriented NEAP. During the same period, more than US dollars 60 million have been provided as grants for sectoral environmental programmes including large scale programmes like the NAREPP and the EAIP. The latter project marks the first comprehensive intersectoral environmental project and it is significant, that the project is financed through an IDA loan, again reaffirming the government's deep commitment to the environment.

At the sector level, a variety of innovative programmes have been directed at ecosystem management focusing especially on forests, and coastal and fresh water ecosystems. Inter-sectoral programmes have been implemented focusing on biodiversity conservation, pollution control and clean air. Nevertheless, environmental degradation continues at an alarming rate. The most significant features of such degradation are deforestation, land

degradation mainly through soil erosion, increased solid waste generation, water pollution from households and industry, and air pollution from motor vehicles.

The complex range of environmental problems facing Sri Lanka demands solutions based on multisectoral actions. A National Environmental **Framework** has to be developed and applied to all sectors. It must be based on policies, institutions, regulations, alternatives, information, awareness and investments that address the root causes of these problems. Then only will the framework be able to support to national aspirations on sustainable development.

### 1.3 NEAP Process : A review

Systematic planning for Environmental Management started with the National Conservation Strategy (NCS) process in 1982. The NCS was approved by the Cabinet of Ministers in December 1988. An Environmental Action Plan (EAP) was prepared in 1990 on the initiative of the World Bank. These two documents were combined with the Sri Lanka Report to the 1992 UN Conference on Environment and Development (UNCED) to produce a comprehensive National Environmental Action Plan (NEAP). This document laid out an agenda for environmental activities in Sri Lanka during the five year period 1992-1996. It specified actions to be undertaken in 14 sectors and indicated the time frame and the level of investment required.

Several of the actions and projects recommended in NEAP 1995-1998 have been implemented. World Bank projects include the Colombo Environmental Improvement Project, and assistance for the Forestry Sector Masterplan, the Biodiversity Action Plan and the Energy Services Delivery project. ADB

has provided assistance for preparing the Water Resources Masterplan, for strengthening the EIA process and for promoting the use of renewable sources of energy in the Plantation Sector. JICA has provided assistance for the Colombo Flood Control and Drainage programme and also donated vehicles for solid waste collection. The United Nations system has provided assistance for wildlife management (GEF), for reducing ozone-depleting substances (UNDP) and for industrial pollution control (UNIDO). Bilateral assistance includes the Natural Resources and Environmental Policy Project (NAREPP) funded by USAID, assistance for Wetland Management (Netherlands), Environmental Education (Norway), Upper Mahaweli Watershed Management (Germany and UK), Coast Conservation (Germany) and the Colombo Sewerage System (UK).

A number of sector specific actions have also been put in place under the umbrella of the NEAP, to produce masterplans and strategies. These include the Biodiversity Action Plan, the Water Resources Masterplan, the Coastal Zone Management Plan, Clean Air 2000 Action Plan, the Forestry Sector Masterplan, and the Colombo Regional Structure Plan (with a large environmental component). These reports have been extensively referred to in the preparation of this updated NEAP.

NEAP has gradually evolved over the years to be a planning process for Sri Lanka's environmental agenda. It has played a valuable role in conceptualising the numerous environmental problems facing the country and helped significantly to draw the attention of national development planners towards the environmental and economic linkages. It has also provided a

valuable guideline to donors to identify environmental priorities of the government albeit in a rather disjointed manner. Most importantly, the NEAP process has promoted the much-needed cross-sector consultation and provided a mechanism for the non-governmental sector to participate in formulating national environmental policy.

NEAP both as a process and as a planning tool needs further improvement to respond to the new environmental challenges referred to earlier, and to fulfil the role expected from a National Environmental Framework. Among the major weaknesses of the existing NEAP is its lack of ownership. This has resulted in the lack of a mechanism to make regular updates more coherent, and focused. Actions identified in the NEAP are rarely defined in a policy implementation context. Neither does it provide an institutional framework for implementation, follow up and monitoring. To a great extent these institutional shortcomings could be remedied by locating the NEAP process in the proposed Policy Planning Unit of the MFE or by establishing a separate NEAP secretariat.

#### **1.4 NEAP Update 1998-2001**

This NEAP update, although focused on the future, is based on past experience. It is a framework to articulate a vision for the

future and to identify policy and institutional gaps and the needed sectoral and intersectoral co-ordination mechanisms to pursue sustainable development. It is implementation-oriented; it identifies priority issues and recommends actions that have the best chance of implementation in the context of the current socio economic and political thinking. The update is presented in two sections.

Section I, "**A Strategy to Pursue Sustainable Development**" is a multi-sectoral analysis that identifies policies, institutional shifts as well as actions needed to meet the environmental challenges both in the short and the long term and also presents a strategy or implementation. The Section II, "**Sectoral Perspectives**", is a sector-wide analysis of environmental issues in the following nine key sectors that are of increasing environmental concern to Sri Lanka.

- 1 Land Resources
- 2 Water Resources
- 3 Biological Diversity
- 4 Coastal and Marine Resources
- 5 Industry
- 6 Minerals
- 7 Energy
- 8 Built Environment
- 9 Environment and Health



## SECTION : 1

### **PURSUING SUSTAINABLE DEVELOPMENT**

## PART 1. A VISION FOR SUSTAINABLE DEVELOPMENT

### 1 A Strategy for Environmental Planning and Management

#### 1.1 Introduction

The environmental challenges, the political priorities, administrative support systems and the macro economic objectives in Sri Lanka are radically different today from what they were in 1990 when the National Environmental Action Plan was first elaborated and the subject of Environment was first recognised by being placed under a cabinet level Ministry, the Ministry of Environment and Parliamentary Affairs. The important events during this period, included the establishment of a separate Ministry for Environment, proposed constitutional changes that placed environment as a devolved subject, privatisation of state industries some of them high polluting, increasing role of the private sector in national investment including infrastructure development, a greater national commitment to pursue sustainable development and an enhanced national responsibilities and obligations arising from being a signatory to a number of international treaties relating to the environment/environmental conservation.

Resource demands of a growing agrarian population, sectoral and macroeconomic policies that often conflict with sustainable development, and lack of infrastructure to support rapid industrial and urban growth continue to be the major contributors to environmental disruption. At a time when Sri Lanka has been rapidly removing controls and regulations to improve economic efficiency and increase economic output, the government's policy, institutional and regulatory frameworks remain inadequate to implement the

country's commitment to sustainable development.

Sri Lanka is a partner in the globalisation process and sees the private sector as the engine of growth. More and more growth but of a different kind is required to meet the aspirations of the people. That is sustainable development achieved in an environmentally sound manner. Deregulation without social and environmental safeguards will not make development sustainable.

The environmental challenges of the future will therefore have to be different. With the increasing role of the private sector in national investment and its management, the role of the state sector will be different but far more important. Considerable administrative reforms to meet this change are already underway. The proposed devolutionary arrangements will have significant implications on environmental regulation and management both at national and sub national levels. Privatisation will result in the state sector contributing less to the total pollution generated but will increase the responsibility of the private sector to be self regulatory.

The enforcement, implementation and regulatory role of CEA will need to be redefined. The Ministry of Forestry and Environment (MFE) will need to gain public trust and respect to succeed in its policy formulation and co-ordination roles. The non government sector (Private/NGO/

Community) will have to face responsibilities that will be different from now.

## **1.2 NEAP - A framework to pursue sustainable development**

The National Environmental Action Plan (NEAP) sets national priorities for environmental planning and management. This is the second update of the National Environmental Action Plan. It will cover the period 1998-2001 and will therefore be setting the national environmental agenda for the Twenty-first century. The NEAP first published in 1991 covered the period 1992-1996 and the first update published in 1993 covered the period 1995-1998.

Strategic planning for environment commenced in the early 1980s with the formulation of the National Conservation Strategy. This update coming nearly twenty years after Sri Lanka made the first visible intervention towards developing a national focus towards the management of the country's considerable environmental resources is therefore an appropriate time to reflect on the opportunities and challenges of the future. As NEAP 1998 will be ushering the country towards a new century, it also provides an opportunity to build on the achievements of the past and to look to the future.

Considerable progress has been made during the past twenty years, in the areas of policy and institutional development, and of legal and regulatory mechanisms for environmental management. National awareness of environment issues and support for conservation have grown among all segments of society. Alongside them has been increased participation in

global and regional environmental processes including conventions and treaties. There has also been a marked shift of emphasis from narrow sectoral concerns towards a more integrated approach, while the public and national concern with environment now includes the brown issues such as pollution, sewage and solid waste.

Among the country's most significant achievements are the enactment of the National Environmental Act No.47 of 1980, which established the CEA and regulations published under the Act making EIAs mandatory for designated projects and undertakings, the creation of a separate Ministry charged with responsibility for Environment, and the elaboration of a National Policy Framework starting from a modest NCS towards a comprehensive intersector oriented NEAP. During the same period, more than US dollars 60 million have been provided as grants for sectoral environmental programmes including large scale programmes like the NAREPP and the EAIP. The latter project marks the first comprehensive intersectoral environmental project and it is significant, that the project is financed through an IDA loan, again reaffirming the government's deep commitment to the environment.

At the sector level, a variety of innovative programmes have been directed at ecosystem management focusing especially on forests, and coastal and fresh water ecosystems. Inter-sectoral programmes have been implemented focusing on biodiversity conservation, pollution control and clean air. Nevertheless, environmental degradation continues at an alarming rate. The most significant features of such degradation are deforestation, land

degradation mainly through soil erosion, increased solid waste generation, water pollution from households and industry, and air pollution from motor vehicles.

The complex range of environmental problems facing Sri Lanka demands solutions based on multisectoral actions. A National Environmental **Framework** has to be developed and applied to all sectors. It must be based on policies, institutions, regulations, alternatives, information, awareness and investments that address the root causes of these problems. Then only will the framework be able to support to national aspirations on sustainable development.

### 1.3 NEAP Process : A review

Systematic planning for Environmental Management started with the National Conservation Strategy (NCS) process in 1982. The NCS was approved by the Cabinet of Ministers in December 1988. An Environmental Action Plan (EAP) was prepared in 1990 on the initiative of the World Bank. These two documents were combined with the Sri Lanka Report to the 1992 UN Conference on Environment and Development (UNCED) to produce a comprehensive National Environmental Action Plan (NEAP). This document laid out an agenda for environmental activities in Sri Lanka during the five year period 1992-1996. It specified actions to be undertaken in 14 sectors and indicated the time frame and the level of investment required.

Several of the actions and projects recommended in NEAP 1995-1998 have been implemented. World Bank projects include the Colombo Environmental Improvement Project, and assistance for the Forestry Sector Masterplan, the Biodiversity Action Plan and the Energy Services Delivery project. ADB

has provided assistance for preparing the Water Resources Masterplan, for strengthening the EIA process and for promoting the use of renewable sources of energy in the Plantation Sector. JICA has provided assistance for the Colombo Flood Control and Drainage programme and also donated vehicles for solid waste collection. The United Nations system has provided assistance for wildlife management (GEF), for reducing ozone-depleting substances (UNDP) and for industrial pollution control (UNIDO). Bilateral assistance includes the Natural Resources and Environmental Policy Project (NAREPP) funded by USAID, assistance for Wetland Management (Netherlands), Environmental Education (Norway), Upper Mahaweli Watershed Management (Germany and UK), Coast Conservation (Germany) and the Colombo Sewerage System (UK).

A number of sector specific actions have also been put in place under the umbrella of the NEAP, to produce masterplans and strategies. These include the Biodiversity Action Plan, the Water Resources Masterplan, the Coastal Zone Management Plan, Clean Air 2000 Action Plan, the Forestry Sector Masterplan, and the Colombo Regional Structure Plan (with a large environmental component). These reports have been extensively referred to in the preparation of this updated NEAP.

NEAP has gradually evolved over the years to be a planning process for Sri Lanka's environmental agenda. It has played a valuable role in conceptualising the numerous environmental problems facing the country and helped significantly to draw the attention of national development planners towards the environmental and economic linkages. It has also provided a

valuable guideline to donors to identify environmental priorities of the government albeit in a rather disjointed manner. Most importantly, the NEAP process has promoted the much-needed cross-sector consultation and provided a mechanism for the non-governmental sector to participate in formulating national environmental policy.

NEAP both as a process and as a planning tool needs further improvement to respond to the new environmental challenges referred to earlier, and to fulfil the role expected from a National Environmental Framework. Among the major weaknesses of the existing NEAP is its lack of ownership. This has resulted in the lack of a mechanism to make regular updates more coherent, and focused. Actions identified in the NEAP are rarely defined in a policy implementation context. Neither does it provide an institutional framework for implementation, follow up and monitoring. To a great extent these institutional shortcomings could be remedied by locating the NEAP process in the proposed Policy Planning Unit of the MFE or by establishing a separate NEAP secretariat.

#### **1.4 NEAP Update 1998-2001**

This NEAP update, although focused on the future, is based on past experience. It is a framework to articulate a vision for the

future and to identify policy and institutional gaps and the needed sectoral and intersectoral co-ordination mechanisms to pursue sustainable development. It is implementation-oriented; it identifies priority issues and recommends actions that have the best chance of implementation in the context of the current socio economic and political thinking. The update is presented in two sections.

Section I, "**A Strategy to Pursue Sustainable Development**" is a multi-sectoral analysis that identifies policies, institutional shifts as well as actions needed to meet the environmental challenges both in the short and the long term and also presents a strategy or implementation. The Section II, "**Sectoral Perspectives**", is a sector-wide analysis of environmental issues in the following nine key sectors that are of increasing environmental concern to Sri Lanka.

- 1 Land Resources
- 2 Water Resources
- 3 Biological Diversity
- 4 Coastal and Marine Resources
- 5 Industry
- 6 Minerals
- 7 Energy
- 8 Built Environment
- 9 Environment and Health

## 2 State of the Environment

Developing an appropriate framework for environmental policy requires a clear understanding of the current state of the natural environment, and the major causes of environmental damage. The following sections present this information focusing on the high priority issues of environmental health threats; land degradation; water pollution; loss of biological diversity; unsustainable exploitation of forest, fish and mineral resources; disposal of solid and hazardous waste; and air pollution. For each issue the main strengths and weaknesses of the resources are presented, as well as some of the important underlying causes of their degradation.

These underlying causes focus on the economic and institutional aspects. Past experience shows that it is only by changing the economic and institutional framework that environmentally damaging behaviour can be significantly altered in the long term. This brief review of the state of the environment is to be expanded and produced as a State of the Environment Report by the Ministry of Forestry and Environment based on a clear and up to date set of environmental indicators.

### 2.1 Environmental health threats

Sri Lanka's extensive basic health and social services have resulted in a relatively long average life expectancy of 71 years (Central Bank, 1995). However as in many other countries, insufficient attention is paid to preventive health measures as compared to curative interventions. Environmental health covers clean water and sanitation, occupational health, food safety and hygiene, vector borne diseases, health

impacts of solid waste dumps, industrial pollution, air pollution and noise (WHO, 1996).

Occupational health problems like accidental pesticide poisoning are serious in the sectors where labour is less organised such as agriculture and mining. Cholera, typhoid fever, viral hepatitis and several bowel diseases are spread through contaminated food and water. Mosquitoes, which breed in stagnant water, spread malaria, filariasis and encephalitis.

Occupational health problems, particularly in the sectors where labour is less organised such as agriculture and mining are a major cause of mortality and morbidity. Accidental pesticide poisoning killed an estimated 150 people in 1995 (assuming that only 10 per cent of the fatal pesticide poisonings are accidental) (MoH, 1995). Several major environmental health issues are related to water. Cholera, typhoid fever, viral hepatitis and several bowel diseases are spread through contaminated food and water. Mosquitoes, which breed in stagnant water, spread malaria, filariasis and encephalitis. In 1995 there were 84 deaths and 30,832 recorded cases of water related diseases such as shigella food poisoning, viral hepatitis and typhoid, and 77 deaths from and 46,643 recorded cases of vector borne diseases (MoH, 1995).

The most acute environmental health problems occur in urban low income settlements, where sanitation and clean water are lacking, drainage is poor and exposure to vector borne diseases is high. One third of the urban population in the Western Province presently live in low-

income settlements (UDA, 1996). This problem will increase as urbanisation spreads.

Both public health and occupational health officials need to focus on key environmental health priorities, such as sanitation, vector borne diseases and pesticide poisoning. The environmental health problems of low-income settlements call for a co-ordinated response from local and central government agencies and community groups. Some important initiatives are under way in certain localities, but a more strategic approach is needed to address the failures in the housing, land and credit markets that encourage the creation of such settlements.

## 2.2 Land degradation

Sri Lanka has relatively stable and fertile soils and a moderate climate with plentiful monsoon rain. Dense forest cover spreads over only about 24 per cent of the land (FSMP, 1995). Soil erosion is severe in many parts of the Wet Zone, especially in the mid country where slopes are often very steep. This has led to abandoned lands, costly investments in fertiliser application, and heavy siltation of several major reservoirs. Topsoil once lost can take generations to replace. Little topsoil remains in some areas as a result of poor land management from colonial times. Increased soil salinity, salt water intrusion and waterlogging are currently localised issues, but could become more serious in the future unless preventive measures are taken in time.

The main cause of land degradation is that the costs of soil erosion have not been properly reflected in land use decisions. These can be traced to failures in land markets or to institutional weaknesses

which prevent those who cause soil erosion bearing the full costs of their actions. At present upstream farmers who cause soil erosion can pass on the costs of siltation of reservoirs to the electricity consumers who pay for hydropower generated by water released from the reservoirs. This institutional failure can be solved by using the watershed approach to land and water management to bring upstream and downstream users together.

Soil erosion also arises when land users have no incentive to invest in maintaining land productivity. Due to distortions in the land and credit markets, many land owners are either encroachers, part time farmers or absentee landlords. Many of them have little incentive to invest in long-term land management. In the light of the increasing commercialisation of agriculture and the greater liberalisation of the land market, the government must strategically select land for conservation purposes such as watershed protection and provide more information and incentives to encourage environmentally sound land use practices.

## 2.3 Water pollution

Sri Lanka enjoys plentiful rainfall even in the so-called "Dry Zone" which experiences heavy precipitation during three months of the year. Part of this rain flows to the sea along the 103 river basins. These rivers have been tapped to provide irrigation for more than 650,000 ha of paddy land and more than 85 per cent of the country's electricity needs. There is good quality groundwater in most areas, which is heavily used in homes and factories in coastal and urban areas, and for agriculture in Kalpitiya and Jaffna. There are more than 20 major wetlands, which provide rich habitat for fish and other aquatic organisms.

The demand for water is increasing as the economy grows. The waters of many of the rivers flowing through the dry zone, such as the Mahaweli have more than two thirds of their water used by the time they reach the sea. The increased demand for water has been met by heavy investments in irrigation, while rainfed farming has been largely neglected. This has resulted in inefficient rationing of water by the state, sub-optimal allocation between different users and bitter conflicts over water at the local level. The return of investment per unit of water is currently low, as rice is a low value crop. Groundwater extraction, particularly through tube-wells, is high although no clear data is available. No management strategy has been developed for the extraction of groundwater.

In many urban areas, particularly Colombo, there is high organic pollution of waste water from households, which lack disposal facilities. Industry causes chemical pollution of water in some areas. Agricultural run-off containing pesticides and fertilisers is affecting water quality in other areas. Responsibility for the quantity and quality of water is divided among about 20 government agencies and covered by about 40 water related laws (ADB, 1994).

The basic issue is that water has not been fully recognised as an economic good that should be used optimally. The need to provide a rational system of water allocation has been addressed by the formation of a Water Resources Council, the preparation of a Water Resources Management Plan and the necessary supporting legislation. The focus of the Plan is to use the river basin as the basis of planning and managing land and water resources. At the micro level greater

efficiency of water use is being promoted by increasing tariffs for water consumers and in irrigated agriculture by encouraging greater farmer involvement in operation and maintenance of the irrigation water distribution system and by experimenting with water rights. Higher value per unit of water is being sought by encouraging farmers to shift to other food crops.

Water pollution is being addressed in a number of ways by improving sanitation, particularly in low-income settlements; by reducing the use of pesticides in agriculture through integrated pest management; and by encouraging industry to install clean technology or move operations to industrial estates.

Sri Lanka has approximately 300 high polluting industrial units. Water pollution is the most serious concern (ERM, 1993). The regulatory process, subsidies for clean technology, and the provision of common wastewater treatment facilities have improved compliance by existing industrial units. An industrial estate management strategy is being promoted for siting new industries. This strategy can be improved by the government setting a clear framework for siting industrial estates and encouraging private-public partnerships in establishing industrial estates. Despite these initiatives, most firms still show little inclination to invest in clean technology and waste treatment, although the cost of such investments is generally less than one per cent of total profits (IPS, 1995).

Although integrated pest management is now official government policy, many farmers still use more than the recommended level of chemicals, especially insecticides. Most farmers however depend on private retail suppliers for advice. The private sector therefore needs to be



involved in a training programme for providing advisory services to farmers on pesticide use. Such preventive measures are much more cost effective in the long run than cleaning up polluted water bodies.

## 2.4 Loss of biological diversity

Sri Lanka has one of the highest numbers of plant and animal species per unit area in the world spread among a wide range of different terrestrial and aquatic ecosystems and habitats. Many of these species are endemic (found nowhere else in the world). A quarter of the flowering plants are endemic, as are half the number of reptile species, and one third of the teleost fishes (BAP, 1997).

Despite significant reductions and declines in density, natural forests covered about 24 per cent of the country in 1992. Lands, such as dense home-gardens contain rich stores of biological diversity. The freshwater rivers support at least 20 endemic fish species. The coastal zone has rich ecosystems of sea-grasses, lagoons, mangroves, estuaries and coral reefs. Official records state that the about 14 per cent of the land area is protected by the Forest Department and the Department of Wildlife Conservation, one of the highest proportions in Asia (FSMP, 1995). The World Heritage Reserve of Sinharaja and two marine sanctuaries are included here. These parks are enjoyed by over 375,000 visitors each year, who bring in over Rupees 50 million in entrance fees (NAREPP, 1996).

Biological resources are however being rapidly lost as rich ecosystems are converted to other uses which yield higher financial returns. As a result many natural forests have now become secondary, encroachment into protected areas for

agriculture is widespread, coastal habitats are badly degraded, wetlands are being filled and agriculture is shifting towards single (mono) crops. These ecosystems take generations to recover and are often lost for ever.

The main cause of the failure to protect such ecosystems is that the present economic returns from protecting bio-diversity are too low, leaving local communities and government agencies with no incentive to promote biologically diverse land uses. Monocrop agriculture is made more profitable by current crop based subsidies. No subsidies are available for more bio-diverse land uses such as home-gardens. Aquaculture and ornamental fish collection enjoy tax benefits as export industries, but minimal funds have been invested to protect the vital natural resource base in order to substantially manage these activities. Nominal state control over many wetlands and natural forests has led to open access to the resource, and short-term exploitation with damaging consequences.

A number of economic incentives to address these shortcomings and to safeguard protected areas are being developed. These incentives include the promotion of nature tourism, sustainable harvesting of products in protected areas by local communities, bio-prospecting (where specimens are tested for commercial uses), effective insurance cover for wild elephant damage and direct and indirect assistance to the local community to compensate them for not encroaching into protected areas. These economic incentives must generate benefits for local communities, which should be reflected in the management plans for each ecosystem. Community participation is expected to help reduce illicit felling of trees and poaching.

Management plans for protected areas have often been prepared without adequate local participation, so a sense of ownership is lacking and implementation is weak. Profit earning activities that do not harm biodiversity such as mining inland coral deposits for limestone, freshwater fish farming and cultivation of medicinal plants should be encouraged to preserve vital habitats.

## 2.5 Unsustainable use of natural resources: forestry, fisheries and minerals

Sri Lanka has rich resources of forests, fish and minerals which people have utilised for generations. Forestry resources including natural forests, home-gardens and rubber and coconut plantations are valuable sources of biomass which need to be properly managed. The recent growth in demand for biomass has outstripped availability in some areas. Logging from slow growing natural forests is now forbidden and the use of fast growing species of timber from home-gardens and plantations is being promoted. Even so natural forests supplied an estimated 22 per cent of sawlogs and 7 per cent of bio-energy in 1994 (FSMP, 1995).

Fisheries resources, which are also renewable, if properly managed are becoming over-exploited in the coastal zone. Larger fish stocks are available in the deep sea. Inland fisheries can also be developed into a rich source of fish. Deep sea fishing and inland fisheries are being encouraged, and assistance for near shore fishing is being reduced.

Sri Lanka's mineral resources include gems, graphite, phosphate and limestone. These

resources are finite, and minerals must be extracted without causing any long-term damage to the environment. Mining in sensitive locations should be limited and pits dug for the purpose must be carefully filled after use. Natural resources whether forests, fish or minerals must be exploited in a manner that promotes optimum economic benefits while causing minimum environmental damage.

Lack of a clear management focus on long term sustainability issues has been the main cause of unsustainable use. The need for such a focus has become even more important as the interest of the private sector in these resources expands and the demand for them increases. Government agencies must shift emphasis from involvement in exploitation/ extraction to setting a framework for sustainable use within which the private sector can operate. Such a shift has begun in the forestry sector with the preparation of the second Forestry Sector Master-plan. The management framework for fisheries has recently been improved with the implementation of the new Fisheries Act (1996), supported by the recent collection of data on the available fish resources of Sri Lanka. The new Mines and Minerals Act (1992) also promotes a management focus. Rehabilitation of the land after mining has been encouraged by increasing the deposit that miners forfeit if they fail to rehabilitate the land after mining for gems. This new framework faces a major test with the largest ever mining contract awarded for exploration of the phosphate deposits at Eppawala.

Although the need for a management focus for forestry, fisheries and minerals is now appreciated, implementation is only just

beginning. Meanwhile, many resources such as sand, lime and ornamental fish are still being extracted without any efforts being made to ensure sustainability.

## **2.6 Solid and hazardous waste**

Solid waste is a growing problem in urban and industrial areas as systems for collection and disposal are weak. It is estimated that Colombo Municipal Council area presently generates over 700 tonnes of waste a day, and that this quantity will increase as incomes rise (World Bank, 1995). At the national level, more than 45,000 tons of hazardous waste are produced. This includes hospital waste (ERM, 1997). However Sri Lanka still has no sanitary landfill or hazardous waste treatment facility, although these are now planned for Colombo. Solid and hazardous waste is unloaded into open dumps causing serious health hazards, burnt in the open air where they cause land and water pollution. There are an estimated 58 waste dumps in the Western Province, most of which are almost filled to capacity (UDA, 1996). Some glass and paper waste is recycled and some organic waste converted into compost. But these operations are usually ad hoc initiatives. Most local authorities focus only on domestic waste leaving industrial solid waste untouched.

The main issue is that no proper management strategy has been developed to co-ordinate the many public and private agencies involved in solid waste generation, collection, recycling and disposal. Since waste is generated only on a small scale and at a local level, waste collection, recycling and disposal do not present opportunities for any significant economies of scale. The large up front investment costs require strategic planning and adequate incentives

to encourage private sector involvement. This function is often beyond the capability of local authorities, who face political resistance against increasing taxes to finance improved services. These bottlenecks can be overcome by a National Waste Management Strategy which would provide a menu of policy options for local authorities. The Strategy would also identify opportunities for economies of scale at the national level when providing recycling and disposal facilities.

## **2.7 Air pollution**

Concern for air pollution in Sri Lanka is focused mainly on Colombo, where vehicle emissions are the main source of pollution. Other hotspots include Kandy city and the area around the Puttalam cement factory. Air pollution from fossil fuel power stations is minimal, as 85 per cent of installed capacity is hydropower. This will however change as more fossil fuel power stations are commissioned. Colombo's air pollution level is less than that in many Asian cities because of the sea breeze and the relatively few vehicles. Recent monitoring results in Colombo show that air pollution from particulate matter and sulphur is well above WHO recommended levels in certain congested locations within the city. The situation will worsen as the number of vehicles is growing at a rate of 7 per cent a year. Diesel powered vehicles emit more particulate matter and sulphur compounds which cause concern.

Air pollution remains unchecked mainly because polluters do not have to bear the costs of cleaning up the pollution they cause. Such pollution can be reduced by tuning the vehicle engines, or by installing pollution reduction equipment in industrial facilities. At present there is no enforcement of the

laws and regulations governing vehicle emissions even though the traffic policemen themselves suffer from high levels of lead absorbed from the atmosphere. The Clean Air 2000 Program drew up a detailed set of recommended actions to improve air quality but progress has been very slow owing to lack of funds. Some positive developments include the phasing out of unleaded petrol by the year 2010 and the import of gas conversion kits which allow vehicles to use liquid petroleum (LP) gas. The use of these conversion kits should be promoted. All vehicles should be subjected to regular motor operation tests (MOT) to monitor emissions.

The installed thermal power generating capacity is expected to increase 42 per cent

by end-2000, and to exceed 50 per cent by 2010. Local air quality may be lowered by the particulate matter and sulphur and nitrogen dioxides in the exhaust emissions from thermal power plants. These impacts can be reduced by appropriate siting and the choice of clean technologies. The government can require the use of clean technology as a condition of approving the investment in privately owned power projects. The need for new thermal power plants can be reduced by increasing energy efficiency by measures such as reducing the 16-18 per cent power distribution losses to the achievable level of about 12 per cent. The use of renewable energy such as solar and wind power can also reduce demand for thermal energy.

### 3 Environment and Development Trends

Sri Lanka faces a wide range of environment management challenges that are tied to its economic development. Foremost among these are the inter linked problems of land and water degradation. Unsustainable agricultural and forestry practices are causing bio-diversity loss, severe soil erosion on sloping lands and reduced productivity of irrigated lands. Agricultural chemicals and agro processing by-products are polluting soil, air and water. As competition over water intensifies, efficient allocation measures must be devised to share the available water among its different uses, principally irrigation; industry; power generation; base flow in rivers; domestic supplies. This situation is further complicated by increasing water pollution caused by industrial effluents. Air pollution and other threats to urban environmental quality must also be addressed as industrial growth fuels migration to urban areas. The very existence of forests, agricultural germplasm, marine organisms and other biological resources is threatened. These resources, though vital to life itself remain vulnerable because they are grossly undervalued in the traditional system of economic accounting.

All these environmental problems are inseparably linked to national development. They can well undermine gains from development if they are not adequately addressed.

#### 3.1 Population, Resources and the Environment

Sri Lanka's population was estimated in 1995 to be 18.1 million, and growing at a

relatively low rate of 1.3 per cent a year. Population is expected to increase to an estimated 22.3 million by 2021, and stabilise at under 25 million thereafter (Census and Statistics 1996) Thus, over the next 30 years, the physical environment will have to sustain a population increase of up to 6 million, 30 per cent over today's levels. This population increase means growing demands for resources, infrastructure and opportunities.

The population is unevenly distributed across the country with two thirds of the population living in the Wet Zone on one third of the total land area. More than 75 percent still live in rural areas. To some extent, these densities reflect natural resource constraints since the districts with the lowest population density are also those with the least water available. At the present rapid rate of urbanisation, the urban population is expected to reach the level of 40 per cent of total population by 2020.

The current per capita demand for water, food, transport, energy and building material is low because the per capita income is still relatively low. However, as income levels increase, so will the consumption levels.

In the mid 1980s, it was estimated that 90 per cent of households relied on biomass for cooking. About 35 per cent of households use water from unprotected wells, and about a third use natural materials for housing construction. As per capita income increases, there will be a corresponding increase in demand for electricity, pipe borne water, and materials for building more permanent houses. Electricity demand is growing at 10 per cent a year. This has already placed severe demands on

generation capacity. Major shortages are expected in water supply capacity in the coming years.

The environmental impacts of all these factors will be significant. The construction industry already requires an estimated 100,000 tons of lime per year (ICTAD estimates), part of which comes from sea coral reefs. Increasing per capita income will also increase the rates of urbanisation, with consequences for water, land and air pollution in urban areas. The Urban Development Authority has identified environmental degradation as the key issue facing the Colombo metropolis. Already, many urban areas face acute environmental problems: indiscriminate reclamation of wetlands has intensified flooding; vehicle traffic is growing by 7 per cent a year, adding to air pollution; and solid waste generation from households is increasing in both quantity and its non-biodegradable content.

Consumption rates can however be held at manageable levels with proper policies despite the increase in income levels. Rational use of water in agriculture, improved mass transportation, and the choice of design and material for building construction to improve energy and lighting efficiency can slow incremental consumption demand.

### **3.2 Poverty and Environment**

With continuing economic growth of about 5 per cent and a relatively slow population growth of about 1.3 per cent, per capita income has reached US\$ 770 by 1997. However, there are serious anomalies in income distribution: more than 20 per cent of the population (about 4 million people) live in absolute poverty, and one third of

families receive poverty alleviation grants under the government's Samurdhi programme.

Poverty is particularly concentrated among households with female heads, which represent 2 per cent of all households (Census and Statistics, 1993). Among the poor, women tend to suffer disproportionately from environmental degradation as they are traditionally responsible for collecting water and fuelwood, cooking and other domestic work. Women have to spend additional time collecting water and fuel wood when they are scarce.

### **3.3 Changing nature of the economy**

The content and the context of the economy has changed over the last decade with manufacturing and service sectors generating more output than agriculture, while private investments are expanding. The Sri Lankan economy continues to expand at an average rate of five per cent a year. The economy is projected to more than double by the year 2020 on the assumption that this growth rate will be maintained. The rapid growth of industry means that issues of industrial environmental infrastructure, such as waste water and solid and hazardous waste disposal will grow in importance. The CEA already turns down 25 percent of all industrial siting requests because of inappropriate location. There needs to be a pro-active and cohesive strategy towards industrialisation.

While current government policy emphasises manufacturing output, Sri Lanka's economy still remains heavily

dependent on natural resources. The main natural resource-dependent sectors are shown below with their contribution to the GNP in brackets:

Agriculture	(17.6%)
Fisheries	( 1.8%)
Mining	( 2.5%)
Forestry	( 1.4%)
Tree crop processing	( 2.3%)
Tourism	(about 3.0%)

Together, these sectors made up 28.6 percent of GNP in 1994 (Central Bank, 1995). They usually contribute between one quarter and one third of total GNP. Agriculture continues to absorb 37 percent of the work force. In addition, hydro-power provides about 85 percent of Sri Lanka's electricity. Sri Lanka's dependence on natural resources for economic productivity is shown to be high even when it is calculated on the basis of a conventional measure of GNP. Trade volumes have also increased rapidly over the last 5 years with the reduction of tariffs and emphasis on export led growth. In 1996 imports and exports represented 76 per cent of GNP. Private investment accounted for most of this growth.

Trade liberalisation as intended in the WTO agreements can generally be beneficial for the environment if it promotes cleaner technologies, and good harvesting practices. Trade can however also have certain negative environmental effects. Therefore, trade policy and private investment flows have to be environmentally sensitive to achieve maximum economic and environmental benefits.

(a) **Trade liberalisation and the Environment**

The liberalisation of markets and tariff barriers consequent to the WTO agreements is expected to lead to an expansion of exports and imports, and thus make a significant contribution to export led growth. Expansion of trade can however have both positive and negative influences on the environment. There are many who hold the view that free trade is often environmentally friendly. Giving markets a bigger role, notably in energy and agriculture and equally important introducing strong environmental policies, they believe, will allow resources to be used more efficiently. However, incentives and relaxed fiscal policies can also lead to harvesting of natural resources at unsustainable levels, as in the case of export of endangered species of animals and plants. Imports of materials like hazardous wastes and other chemicals can also pose environmental threats,

Trade liberalisation can have far reaching environmental implications. Some of these could favour a developing country like Sri Lanka, whose negotiating options at global level are often limited. The WTO rules could, for instance, restrict the use of environmental standards by developed countries as an unfair tariff barrier against Sri Lankan exports. Trade liberalisation also has some potential negative consequences for the environment as in the following cases.

- Trade liberalisation can encourage unsustainable harvesting of natural resources and environmentally damaging production, packaging and marketing systems for export.
- It restricts the right of the country to apply whatever environmental measures and standards it chooses

(if they can be shown to be unfair non-tariff barriers).

- It restricts the right of the country to keep out an imported item because of the way it is harvested or produced.
- It prevents the imposing of countervailing duties on imports produced under lower environmental standards.
- It discourages subsidies which are a means of compensating local producers to keep higher environmental standards than foreign competitors.

These issues must be addressed by national environmental legislation, and not by discouraging free trade. Any national environmental legislation and standards that are fairly applied to Sri Lankan and foreign companies will be consistent with WTO rules.

Alongside trade liberalisation are initiatives on environmental standards and eco-labelling, that will have an influence on how trade policy is conducted in the future. Exporters need to respond constructively to the pressure for clean production and sound environmental management. Already, the international standard for environmental management, ISO 14000, is spreading throughout the world. Sri Lankan enterprises should be given assistance and encouragement to qualify under ISO 14000.

Technology change is also generally stimulated by trade liberalisation since it allows the best available technology to be imported from anywhere in the world. This is recognised by the current policies which allow fiscal incentives such as import duty waivers for the import of

advanced technology. Environmentally friendly technology can also be encouraged by appropriate incentives, information campaigns and regulations. Sri Lanka's external trade policy, especially in its commitment to free trading and WTO agreements, will therefore have implications for sustainable development goals pursued under the national environmental policy framework. The Ministry of Forestry and Environment should set up a Trade and Environment Committee with wide participation to regularly monitor the environmental impacts of liberalising trade and develop incentives to encourage an environmentally responsive trade regime for the country.

#### **(b) Private investment and environment**

With trade and market liberalisation the contribution of the private sector to national economic output is on the rise. The increase in manufacturing output and the growth of exports must be credited to the private sector, which provided 90 per cent of total industrial output by value in 1996 (Central Bank). The public sector now employs only a quarter of those in employment. The role of the private sector in manufacturing industry, services and trade is therefore expanding significantly. This calls for a new orientation for the private sector on environmentally sustainable extraction, production, packaging, marketing and trading.

A clear need exists for a strong partnership between the government and the private sector to promote sustainable development. Innovative mechanisms will be required to promote private sector involvement in such actions as voluntary agreements, self



monitoring and environmental audits. The objective of the state should be to facilitate the development of a self regulating and an environmentally responsible private sector. The need for economic incentives to ensure sound environmental management is widely accepted in Sri Lanka. Given the dominant role of private investment in national productivity these incentives will have to be directed at such investment but in a manner that they can be absorbed by the private sector.

Private enterprise can similarly be harnessed to raise funds for proactive environmental interventions. The new privatised management regimes present an opportunity for introducing environmental concerns. The private sector can be more effective than the state sector in developing and maintaining environmental infrastructure. At the same time it can internalise environmental costs more easily because privatised management regimes are less subject to extraneous influences.

### **3.4 Current Policies, Regulations and Institutions**

#### **(a) Policy Issues**

Providing leadership for formulating national environmental policy and its review is the mandate of the Ministry of Forestry and Environment. This is clearly recognised in the mission statement developed for the MFE as part of the administrative reform strategy of the government. Policy formulation includes setting environmental standards, developing and reviewing regulations and advising on macroeconomic policies to promote sustainability.

Sector agencies such as the Forest Department, the Coast Conservation Department and the Urban Development Authority have produced policy statements as master plans and action plans for the sector which will have implications for national environmental policy. The MFE mandate should be extended to include advising the sector agencies on the sustainable development content of the sector policies.

The MFE should encourage extensive consultation with sector agencies to avoid conflicts and harmonise sector and national policies. Sector agencies have at times shown an understandable reluctance to participate in multi sector initiatives because of budgetary and institutional constraints. The MFE should play a facilitating role, encouraging multi sector policy development, co-ordination and implementation. MFE and its agencies have to carefully develop their functions so as to facilitate and motivate rather than implement or supervise policy implementation. Implementing and supervising should be the responsibility of the sector agencies who would be guided by their own statutes.

#### **(b) Legislation Issues**

Environmental policy in Sri Lanka has traditionally focused on government regulations aimed at controlling environmentally harmful activities. This is reflected in the National Environmental Act (1980 and 1988), the Forest Ordinance (amended 1988), the Coast Conservation Act (1981) and the Mines and Minerals Act (1992) and other laws. More than 90 separate statutes have been enacted over the last 100 years that have some connection

with environmental protection and/or natural resource management. Almost all of them follow a regulatory approach. Individual environmental legislative acts reflect some of the major concerns that existed at the time of their enactment. During the colonial period laws stressed nature protection and conservation enforced by the state. This tendency continued for many years after independence. Following the 1972 United Nations Conference on the Human Environment, laws began to stress the need for environmental management rather than protection by the state. In the late 1980s and early 1990s, emphasis was laid on participatory environmental management. Focus has now moved to a wide-ranging, comprehensive framework for environmental management for sustainable development.

The first pieces of legislation were passed by the British colonial government to assert authority and control over natural resources. The Crown Lands Encroachment Ordinance (1840) declared "all forests, waste, unoccupied or uncultivated lands shall be presumed to be the property of the Crown until the contrary thereof be provided". Subsequently a number of conservation and protection orientated Acts were passed to mitigate the environmental damage this Act encouraged. They included the Forestry Ordinance (1907), Fauna and Flora Protection Ordinance (1937) and the Soil Conservation Act (1951).

The 1978 Constitution recognised that the "State shall protect, preserve and improve the environment for the benefit of the community", and that "it is the duty of every

person in Sri Lanka to protect nature and conserve its riches". Subsequent legislation sought to put this important responsibility of the state into operation by focusing on environmental management rather than the earlier narrow emphasis on conservation and protection.

However, environmental management in the 1980s was still oriented towards regulation. Consultation and stakeholder participation were minimal. The pledge given in the 1978 Constitution to safeguard the environment was formally institutionalised with the enactment of the National Environmental Act No 47 of 1980. This Act established the Central Environmental Authority (CEA) in 1981 as the premier state agency responsible for the "formulation and implementation of policies and strategies for the protection and management of the environment in Sri Lanka".

Sri Lanka was also among the first few countries to recognise the objectives of the World Conservation Strategy (WCS) of 1980. An important recommendation of the WCS was that each country should prepare its own National Conservation Strategy (NCS) to guide the management and rational utilization of its natural resources in achieving the development objectives of the country. Work on the preparation of a NCS for Sri Lanka was initiated in 1982 and completed in 1988. It identified priority areas and a strategy to deal with the problems of environmental degradation in Sri Lanka.

Several other pieces of environmental legislation were introduced in the 1980s.

The Coast Conservation Act was passed in 1981 and amended in 1988. In 1984 the government decided at an administrative level to introduce compulsory Environmental Impact Assessment (EIA) procedures for all development projects. This was written into the National Environmental (Amendment) Act of 1988. The required supporting regulations were published in June 1993. Most of these Acts stress rigid enforcement and regulation by state agencies for environmental management.

From the late 1980s to the mid 1990s, several environment related Acts were revised to focus on a more participatory approach to environmental management. The revisions in 1995 to the Fisheries Act envisaged setting up of fishery management committees, the 1988 revision to the Irrigation Ordinance mandated farmer organisations, and the Forest Ordinance revision of 1988 contained provisions for participatory forestry.

The new generation of statutes seeks to move away from simple regulation to an effective management framework, which enables government officials to interact with community resource users and the private sector. The Mines and Minerals Act (1992) contains a number of innovative mechanisms for reducing pollution resulting from mining. The new draft National Environmental Bill presents a framework for national environmental policy involving both the private and the public sectors and mechanisms for managing air and water pollution. A draft Forestry Bill has also been prepared. A draft Water Resources Bill is also under preparation for managing the available water resources. Amendments to the Coast Conservation Act are under discussion.

### (c) Institutional Issues

The environmental legislation enacted created new government agencies or designated existing ones to enforce and administer their provisions. Overlap of responsibilities between implementing agencies has discouraged enforcement as well as policy review and updating. Table

For instance, a number of agencies share the responsibility for different aspects of water management. Water quality standards are determined by the Central Environmental Authority, but the responsibility for drinking water is with the National Water Supply and Drainage Board (NWSDB); providing water for agriculture is the Irrigation Department's responsibility. Sewerage in Colombo is now the responsibility of the NWSDB, but drainage generally comes under local authorities identified in the Urban Development Act and the Pradeshiya Sabha Act.

Responsibility for air quality standards lies with the Central Environmental Authority and the Sri Lanka Standards Institution. CEA has issued ambient standards but not emission standards. Monitoring and regulation of motor vehicle emissions which cause most of the air pollution in urban areas is the duty of the Motor Traffic Department. The Ceylon Petroleum Corporation is accountable for the pollution potential of petroleum fuels. Refining of crude petroleum oil and the distribution of the refinery products is done by the Ceylon Petroleum Corporation. Another source of polluting emissions, thermal power generation, comes under the purview of the Ceylon Electricity Board.

The number of interest groups, NGOs and community groups in Sri Lanka will increase as social development proceeds. The growth of participatory environmental management is a world-wide phenomenon and is now also recognised in a number of Sri Lankan legal and policy documents. In the sectors of agriculture and irrigation, urban settlements, and fisheries and forestry, there is growing emphasis on the need for government agencies to work with user groups, and to give these groups more responsibility in environmental and natural resource management. There has also been growing public participation at a project level with Project Approving Agencies calling for public comments on environmental impact assessments. The number of environment related complaints is also increasing.

### 3.5 Decentralisation and Devolution

The major institutional developments since the last NEAP include the increasing shift towards decentralisation and institutional implications of the proposed devolutionary arrangements. If pursued with commitment and in the context of a clear elaboration of responsibilities between the centre and the proposed regions, both these developments can lead to more efficient management of local resources and appropriate investment decisions.

**Decentralisation** was encouraged by the 1987 Provincial Councils Act and the 13th Amendment to the Constitution (1988) which dealt with the devolution of powers and administrative responsibility in a number of areas including environment. Act No.58 of 1992; Transfer of Powers (Divisional Secretaries) Act devolved the powers of 25 Government Agents to 280 Divisional Secretaries (previously

designated Assistant Government Agents or AGAs).

Under the Thirteenth Amendment some powers were retained by the Centre, and some were devolved to the Provinces; while the Province and the Centre had to agree on the implementation of the remaining powers which were held concurrently by them. On the subject of the "environment" the Thirteenth Amendment states, "Protection of the environment within the province to the extent permitted by or under any law made by Parliament" is the responsibility of the Provincial Council. Each Provincial Council had the authority to enact and implement any statutes related to their responsibilities.

The North Western Provincial Council, on the basis of these provisions, passed its own environmental statute and created its own environmental agency the Wyamba Environmental Authority (WEA). The other provinces have not so far enacted any such statutes. WEA is understaffed and the present staff is under trained. Provincial agencies generally lack expertise and financial resources. Therefore the initial enthusiasm shown by the WEA has somewhat diminished. They now depend on central government agencies for support and assistance. There is much to be learned from the NWP/WEA experience about decentralisation and decentralised environmental institutions.. This case highlights the need for strong support from the MFE to get the sub national agencies equipped and operational.

**The devolution** proposals presently under review and discussion are meanwhile adding new dimensions to the subject of decentralised environmental management. Under the proposals environment appears in List 1, that specifies the reserved subjects and also in the list 2 that specifies subjects

devolved to the Regional Council. List 1 makes reference to "National Environment" while List 2 refers to "Forestry and protection of the Environment within a region" (Draft proposals Ministry of Justice). Although this is ambiguous and lacks clarity, it can be assumed that National policy concerns come within the responsibility of the MFE while the actual implementation functions and policies are the responsibility of sector Ministries/ Departments.

The objectives of devolution as those of decentralisation can be frustrated by the lack of adequate staff and expertise in the provinces for environmental management. Training and other forms of technical support are required. Well thought out co-ordination arrangements are required at national level to handle environmental

concerns that cross provincial boundaries. Such co-ordinating arrangements are especially useful in cases where national and regional standards differ from each other and in cases involving the management of resources that are shared between provinces.

Decentralisation and the proposed devolution call for a credible leadership and a facilitating role from the MFE. It must play a major role in national policy formulation and advise, guide and facilitate work in the provinces. The Ministry will also be responsible for developing the sub-national institutional set up and establishing durable linkages with central agencies and private sector institutions and Chambers of Trade to share responsibilities especially in enforcement work.

## 4 Pursuing Sustainable Development: A long term perspective to 2020

Like most other developing nations, Sri Lanka is faced with the conflicting demands of socio-economic development and environmental conservation. In the past, Sri Lanka's development planning had paid inadequate attention to the long term impacts the development processes had on the natural resource base and the environment. The immediate aim was to promote strategies that would bring economic growth and relief from poverty and other social inequities.

However, in recent years, the adoption of scientific principles and practices for sustainable development and the influence of emerging global thinking on these issues have led Sri Lankan policy makers to ensure that environmental considerations will be taken into account in all spheres of economic development. This recognition also stems from a realisation that Sri Lanka has a relatively limited natural resource base upon which to build its economic development programme, which makes it imperative that this base be safeguarded so that development can continue.

In Sri Lanka, the problems of environmental degradation, and hence the threat to sustainable development, arises out of a state of under development. It would be futile to attempt to solve the problems of environment while people are poor, malnourished, unemployed and living under conditions of squalor. The first priority is to address the problems of under development. Simultaneously, environmental issues should receive attention, for otherwise, development achieved will not be durable and lasting.

It is now recognised that while economic growth is important the more important goal of development is the enhancement of

the quality of life. The Human Development Index, (HDI) developed by the United Nations attempts to measure true development in ways that pure economic indicators cannot (UN, 1995). This index is based on life expectancy at birth, adult literacy rate and purchasing power of the people. Despite its low per capita income, Sri Lanka has been ranked high on the HDI in comparison with countries with similar income levels. This is the result of investing in education, health and social welfare.

Building on this promising base of human development achievements, Sri Lanka now needs to ensure that the economic development achieved is socially, environmentally and culturally sustainable during the coming years and decades. The pursuit of sustainable development is no longer the narrow, sectoral interpretations of environmental activists alone. A much broader definition of sustainable development calls for far reaching measures and strategies to be adopted across the wide spectrum of sectors.

The island's physical limits that can be sustained -in other words, the extent of its "carrying capacity" are not yet known. Growing demands on the water, land and air resources make it imperative that all stake-holders in society be made aware that there are certain natural limits to economic development.

### 4.1 Sustainable development in Sri Lanka

The concept of sustainable development is not new to Sri Lanka, though the term itself has come into prominence only in the past two decades. Sri Lankans have had a long tradition of living in harmony with nature while harnessing natural resources to meet their needs. Rapidly expanding human numbers have placed new pressures on

resources, infrastructure and civil society during this century. The challenge today is to achieve higher levels of economic development with minimum adverse impacts on the natural environment, cultural norms and society at large.

Environmental conservation and rational management of natural resources form integral parts of sustainable development. The crucial role of environmental management has been recognised at a national level by the many environment related policies, laws and regulations, and at international level by the various environmental conventions and treaties that Sri Lanka has signed.

As Sri Lanka enters the twenty first century, steps to sustainable development will have to be firmly rooted in the main national goals of promoting peace, strengthening local government and reducing poverty by enhancing the role of the private sector, liberalising the economy, reforming the public sector and increasing people's participation in the decision making process.

**Promoting Peace:** Achieving lasting and meaningful peace is crucial to sustainable development for a number of reasons. The high level of military expenditure represents both a drain on national resources and a loss in terms of investments in human development. The conflict has seriously disrupted traditional ways of life both in the North East and to a lesser extent in the South. It has inflicted considerable damage on the environment and natural resources in the conflict areas, the true extent of which will only be known after the conflict has been resolved. Deforestation has increased due to demand for fuelwood by refugees and combat operations. Refugee camps for displaced persons place immense stresses on the wood

and water resources. Country-wide assessment of population, natural resources or their usage patterns has not been possible for over 15 years due to incomplete data from the conflict areas a drawback to scientific planning and management of resources and development initiatives.

**Strengthening local authorities:** As many environmental problems are location specific and vary from one locality to another, the local authorities are best positioned to tackle these problems more cost effectively and more expeditiously. Local bodies have traditionally handled responsibility for solid waste disposal, water supply and planning of minor settlement schemes. In recent years they have however been asked to take on additional environmental functions in the area of pollution monitoring and control. Today, local government bodies have to cope with several major environment related problems such as providing safe drinking water, solid waste and waste water collection and disposal, reducing landslides and controlling environment related diseases such as dengue, malaria and cholera. Many of these agencies require training and financial support from the central government to carry out their tasks in an effective integrated manner.

**Poverty alleviation:** Poverty in its many different manifestations represents one of the greatest dangers to the environment and human well being. The poor engage in environmentally damaging activities that include illicit gemming, sand and coral mining, encroachment of protected areas, and poaching to eke out a living. They lack alternative livelihoods or funds or skills to engage in alternative and less damaging activities. The poor are trapped in the vicious circle of debt and landlessness. In the short term, these problems will be reduced only with large scale investments

and interventions that address the needs of the poor and enable them to take to productive and less environmentally damaging pursuits. It has been shown that a combination of economic incentives, community level empowerment, enhancement of skills and creation of new employment opportunities is far more effective than mere enforcement of laws and regulations. The problems of poverty, it must be recognised, can be reduced in the medium and long terms only through greater economic activity and development, and more equitable sharing of the benefits of development.

**Enhancing the role of the private sector:**

As the private sector expands, its social and environmental responsibilities will grow. The ideal would be an entirely self-regulating and responsible private sector, but until that is achieved, the state will need to play a regulatory role. Environmental regulations should be clear, consistent and uniformly enforced. The private sector now recognised as the engine of growth, is starting to spend more on the environment, and is expected to increase such spending in the future. Developers in industries such as shrimp farming, rubber and plastics, and ornamental fish have already started debating the issues of sustainable development. Many hotels and manufacturing industries have made heavy investments in waste treatment and clean technologies. All developers whose projects are undergoing Environmental Impact Assessment (EIA) must bear the costs of the EIA. The Environmental Protection License which has so far been issued on the payment of a flat rate fee, will in future be subject to a fee linked to the pollution load of the effluent.

**Economic liberalisation:** The expansion of the market economy and trade liberalisation requires a shift away from the traditional command and control regulations towards

greater use of economic incentives and disincentives. Some economic incentives have already been introduced to encourage environmentally friendly practices, but these incentives can be expanded further. Incentives and disincentives can be used to increase revenue and to make attitudes more environmentally friendly. For instance, parking fees can be raised to ease vehicular congestion and reduce air pollution. Pesticides can be subjected to an environmental levy which will help finance integrated pest management. An export levy, or cess, on ornamental fish and shrimp exports may be introduced to finance sustainable management of the industry.

**Reforming the public sector:** A large number of government agencies are responsible for the quality of natural resources and the control of pollution. Some other government agencies have dual development and conservation mandates, which can sometimes lead to a conflict of interests if not carefully managed. Public sector reform should include steps to reduce the duplication of and the considerable overlap of responsibilities.

**People's participation:** Recent legislation and policy statements have often emphasised the need for greater community participation and dialogue between different stake-holders in order to reduce environmental conflicts. Achieving this objective however requires major shifts in attitude. Government agencies must be more flexible, accommodative and willing to work with local communities, to ensure true public participation. The local communities and community organisations, on their part, must become more motivated, better organised and more self reliant. Truly meaningful public participation will take place only when the multiple stake-holders are involved in the planning, implementing, monitoring and evaluation of a development activity with



full transparency and accountability on the part of all parties. While such conditions are still rare in Sri Lanka, much can be gained by pursuing this objective.

## **4.2 Creating an economy for sustainable development**

### **(a) Macro-economic policies for sustainable development**

At the current annual growth rate of 5 per cent, the Sri Lankan economy will more than double in size in the next twenty years. An environmentally sensitive macro economic framework can ensure that this economic output is achieved in an environmentally sustainable manner. In general, a stable macro-economic framework helps to conserve the environment. During times of poor macro-economic performance including high inflation and high unemployment, the environment also suffers as people shift to resource intensive activities like illicit logging illicit mining and short term subsistence farming. Conversely, positive macro-economic indicators of low inflation and declining unemployment are good omens for the environment.

A greater understanding of the relationship between economic and sectoral development policies and the environment is required. For example, subsidies for small scale fishing engines and boats have helped improve the status of individual fishermen, but at the same time they have intensified the fishing effort so that each fisherman's individual catch is less. Understanding these effects, had led to the fishing subsidies now being directed towards developing the deep sea fisheries, where more fish is available. Another example is the increase in the duty levied on potato import. This

caused a substantial increase in the market price of potatoes, which in turn led to a significant expansion of potato cultivation in the hill country. Incorrect land use practices and inadequate soil conservation measures followed on potato farms often led to heavy soil erosion. The eroded soils pose a threat of siltation of the major hydro power reservoirs in the hill country and the attendant prospect of reduced hydropower generation capacity.

Economic incentives should be employed to encourage environmentally friendly behaviour as the market economy expands. Some steps have already been taken in the right direction. Customs duties on imported timber have been lowered to encourage their greater use; water and electricity tariffs have been increased indirectly encouraging conservation. Low interest loans and tax holidays have been granted to the private sector for investments in clean technologies. Low energy light bulbs are made available at reduced prices to promote energy saving. Farmers in key watershed catchments are provided financial assistance to install organic soil conservation measures. Vehicle use, which generates air pollution, is discouraged by high import duties on vehicles, spare parts and motor oils; petrol is taxed and an additional annual tax has been imposed on all diesel vehicles.

Planning institutions when formulating policies in their areas of concern should routinely consider their environmental implications. Some institutions have already initiated such action. The National Planning Department has created an Environmental Group. The Central Bank Annual Report now contains includes some environmental information. data in their Annual Report.

The Department of Census and Statistics has set up an environmental data collection unit. The Sri Lanka Institute for Development Administration (SLIDA) has some environmental training courses.

Environmental investments must be cost effective and should not impose excessive costs on the business. Making investments cost effective requires careful analysis of their costs and benefits. Industry costs can be held at tolerable levels by focusing on economic incentives. At the same time the standards and regulations applied should be fair, transparent, stable and uniformly enforced.

**(b) Financing environmentally sustainable development**

Achieving environmentally sustainable development requires large scale financial investments in the short, medium and long terms. In 1996, environment related investments made up an estimated 12 per cent of the Public Investment Programme (PIP) representing about 1.2 per cent of Gross Domestic Product (GDP). It has however been recommended that this figure should rise to at least 2 per cent of GDP or 20 per cent of the PIP (World Bank, 1996). There is an urgent need to examine innovative ways to increase funding for environmentally related projects as government funds are heavily constrained and donor funds are not sustainable in the long term. There have been large donor funded environmental related projects in the forestry, coastal, energy, industry and urban sectors. Funding for environmental work in the agricultural, fishery management and bio-diversity areas has been much less.

Funds for environmental activities can be profitably spent when such activities form part of a larger programme. Agriculture projects should include a dimension on soil conservation and watershed planning. Fishery projects should include a dimension on managing fish resources, protecting fish breeding habitats and discouraging the use of destructive fishing methods. Similarly private sector investments in new technology should examine available clean technologies environmental impact.

Economic instruments can be used to raise funds for improved environmental management in areas such as solid and liquid waste collection and treatment maintenance of irrigation structures; and bio-diversity management. Economic incentives can be offered to install domestic sewerage, improve solid waste collection and effect common industrial wastewater treatment.

Privatisation of state enterprises can generate new funds for environmental management if the necessary regulatory framework is in place. State enterprises often suffer from weak management and lack funds for installing "clean" technology and making other improvements. Privatisation, if it leads to better management and increased profits, can generate more funds for environmental investments. The privatised plantations are now investing more in soil fertility and energy conservation than was done during state ownership.

Privatisation of industries also relieves the state of many pressures to better concentrate on regulatory responsibilities. In the past, the state owned most of the large industries

some of which caused heavy pollution. Law enforcement against polluting state enterprises was weak presumably due to a conflict of interests. Environmental concerns can be explicitly included in the privatisation process as in the case where the State Paper Corporation required the new investor to address the pollution problems of the Embilipitya paper mill as a condition of ownership.

Private provision or public - private partnerships for environmentally related infrastructure building can provide new funds for expansion and maintenance. Most of the infrastructure for solid waste collection and disposal, and for treatment of liquid waste is at present provided by the public sector. Adequate funds are not available for the maintenance and expansion of this infrastructure to owing to political pressures to maintain low rates. A number of projects are underway to promote public-private partnerships. They include common wastewater treatment plants for industries and a high technology sanitary landfill for Colombo's municipal solid waste. Japan's Overseas Economic Development Co-operation Fund (OECD) has agreed to finance the entire cost of U.S. dollars 10 million of a project for developing the infrastructure of the tourist hotels and resorts along the western coast from Marawila to Galle. This project will cover the main infrastructure needs such as central water supply, sewage treatment, hygienic garbage disposal, road development and a telecommunication network. This project is expected to protect the tourist establishments and coastal landmarks from erosion and pollution from all sources.

Innovative private sector financing can include projects with advertising value, private donations and co-financing. The upkeep of roundabouts in Colombo has for many years have been financed by private companies who are allowed to put up small advertising signs. Private donations have been made to the Department of Wildlife Conservation to meet certain park management needs. Co-financing to improve visitor facilities and infrastructure at national parks could be invited from the tourist industry, which currently complains about the poor services available. Co-financing of solid waste collection is being developed with plantation companies, which require compost. Funds provided by foreign donors for environmentally related projects should be carefully invested and the implementation of the projects should be well co-ordinated. Government agencies should maintain focus on the objectives of a project; donor agencies must make maximum use of available local expertise and co-ordinate their activities. The responsibility for overall donor co-ordination lies with the Department of External Resources, but the Ministry of Forestry and Environment through the NEAP and other strategies can ensure that funding of environmental projects is well co-ordinated.

#### **4.3 Strengthening institutional structure for sustainable development**

##### **(a) Central Government institutions**

As the network of state structures becomes leaner and more policy orientated, its mandate for environmental conservation and natural resource management will grow in importance. This will call for

innovative approaches. As activities currently handled by the public sector are handed over to the private sector, the government's function in setting the regulatory framework will grow in importance. The government is already developing innovative ways to tackle environmental issues in the plantation sector, where management has been handed over to the private sector.

An environmental problem is difficult to solve when its source is controlled by one government agency, but its environmental effects and costs are borne by a different agency. Since each agency is operating on a separate budget, there is little incentive for them to co-operate to save money and reduce the severity of environmental problems at source. The solution of these problems requires greater appreciation of the economic benefits to be gained from greater co-operation and better co-ordination between agencies.

Inter-agency co-ordination is essential in environmental management since it involves many government institutions. Competing mandates have delayed and frustrated a co-operative approach. Inter-agency resource management initiatives generally succeed best where there is strong leadership, adequate funding and political support. This has been demonstrated during the formulation and implementation of the Muthurajawela Management Plan and the creation of the Water Resources Council with representation from all the key water using agencies.

Recognition of the need for such co-ordination at the highest levels has motivated the formation of the Committee on Integrating Environment and

Development Policy (CIEDP) which is chaired by the Secretary of Finance and co-chaired by the Secretary to the Ministry of Environment. This need is also recognised in the draft Environmental Bill that has provision for a National Committee on Sustainable Development (NCSD)

Government agencies having responsibilities for both development and conservation often have problems with this dual mandate. For example, the Ministries of Agriculture and Fisheries have focused much more on increasing production in the short run, than preserving the resource base for the long term. The Department of Wildlife Conservation is too often distracted from concentrating on long term biodiversity conservation by pressures to meet the needs of visitors to wildlife parks. A careful rationalisation and redefinition of mandates and responsibilities would avoid such conflicts of interest which inhibit or impede effective environmental management.

**(b) Institutions at the sub national level**

A new generation of sub national environmental institutions has to be established to manage the responsibilities placed on them by decentralisation and devolution. Decentralised management allows better skill deployment and flexibility in responding to the priorities of the local environment. The terms of reference for the sub national institutions must be clearly defined in relation to the central governmental institutions. Appropriate institutional co-ordination mechanisms must be put in place especially to avoid conflicts within and among national and regional policies.

The main environmental issue in the North Central Province is water scarcity, while flooding is a common problem in parts of the Sabaragamuwa and Western Provinces. The factors and processes that cause environmental problems are also distributed around the country. Several Provinces are developing their own industrial estates. This can create pollution problems in the future. A strong case therefore exists for devolving environmental management and regulatory functions to local institutions.

There is therefore a pressing need for minimum national environmental standards and for co-operation between the Provinces in addressing environmental problems which cross Provincial boundaries. The price of neglect can be seen in the water pollution caused by the Embilipitya paper mill. This paper mill, situated in the Sabaragamuwa Province, discharges its black liquor effluent into the Walawe River. This river is the source of the water supply for Hambantota town in the Southern Province.

**(c) Community-based Institutions and Non Governmental Organisations**

Collaborative resource management (co-management for short), which seeks to involve all players that have a stake or interest in a resource, is now being promoted in Sri Lanka. New legislation on agriculture focuses on user groups of farmers; the new Fisheries Act provides for consultation with fishery user groups; and in forestry there is greater recognition of forest users. This shift has occurred because of the constraints on government agencies in managing use of natural resources, and the realisation that communities, who have

a stake in a resource, can often be its best managers.

The local community is a key partner with the state in reducing environmental pressure in projects such as afforestation. More than 50 per cent of Sri Lanka's timber needs are met by timber harvested from home gardens, while state plantations provide less than 2 per cent of total timber demand (FSMP, 1995). The state can respond by providing more technical assistance and systematic subsidies for establishing and managing home-gardens, instead of the complicated crop based subsidy and extension systems that currently exist for timber plantations.

Many communities have social stratification, which creates inequalities and tensions. Far from withdrawing to allow the community to take over, the government must play a more demanding, but less visible role as the supporter and facilitator of community efforts.

The government must provide legal support for co-management, for example by granting legal recognition to community participation. While recent legislation emphasises co-management, the older laws often limit or even prohibit any form of meaningful community participation. The Fauna and Flora Protection Ordinance requires that all decisions on wildlife must be approved by the Director of the Department of Wildlife Conservation. He cannot delegate these powers to a management committee with community representatives. A community's right to participate in managing and making decisions regarding resources in the locality must be given legal recognition. The Forest

Department is now responding by giving usufruct rights to communities who plant trees on state lands. The Fisheries Ministry is studying the issue of whether a lagoon fishing society which limits its membership to maintain the fish catch within the lagoon's maximum sustainable yield (MSY) or carrying capacity and thereby reduce over-fishing, should be empowered to prevent non-members from fishing in the lagoon.

Non governmental organisations (NGOs) should receive greater support and recognition from government for environmental conservation activities. Equally, the NGOs must respond by working co-operatively maintaining certain minimum standards. The most successful NGOs are those that are able to develop innovative approaches and work closely with communities and with each other. The NGO sector requires capacity building and training to develop financial and organisational management skills.

#### **(d) Private Sector Institutions**

The private sector is recognised as the largest employer and the engine of economic growth. Private sector institutions therefore have a critical role to play in the pursuit of sustainable development. Environmental concerns must be institutionalised within the trade and industry associations representing large, small and medium enterprises. The private sector is now more actively involved in environmental management, and several industry associations and development banks have established in-house environmental units. The Federation of Chambers of Commerce and Industry and the Chamber of Small Industry have both

started to actively address environmental issues by setting up environmental cells to advise members, sending representatives to government meetings and encouraging members to adopt clean technologies.

The banking and finance sector can play a particularly important role in promoting environmental management. A bank can insist much more effectively that a client satisfy environmental standards than can a government agency such as the Central Environmental Authority. The omission of environmental management conditions from loan conditions can lead to serious financial risks. While most banks do require that basic environmental standards are followed before financing begins, they show less interest in monitoring once the project becomes operational. Banks should take a more pro-active stance in financing projects, requiring that firms who have installed effluent treatment plants to gain approval for the project should continue to operate these plants even after production begins.

Small and medium scale enterprises may not have the funds or skills to invest in environmental management measures and often require external assistance. While pollution from individual enterprises may be small, the combined effect of pollution from a group of several small units such as metal workshops and electroplating units would indeed be significant. Regulations may not be easy to enforce because the high cost of monitoring a large number of small units. Financial assistance and voluntary codes of conduct promoted by industry associations may be more effective here.

Environmental concerns provide opportunities for new products and

activities, such as "organic" foods, nature-based tourism, and natural products like coconut coir products and reed mats. While companies are starting to exploit this potential, much more can be done. Nature tourism, for example, is one of the fastest growing segments of the global tourist industry. There are already several specialised nature tour companies in Sri Lanka, marketing activities such as bird watching, coral diving and camping. Other companies are experimenting with "organic" tea exports. The government can assist in promoting these products overseas.

Environmental technology is expanding rapidly in Sri Lanka, but the organisations involved need to improve self-regulation to guarantee service standards and reliability. Waste treatment plants supplied have often failed to work to specifications. The environmental technology industry needs to form an association whose members would guarantee the quality of their products and services and would provide maintenance agreements. Customers for their part need to provide reliable discharge data to the contractor and not opt for the cheapest technology. There is a demand for government intervention, but such intervention can lead to more problems. Difficulties would arise, for instance, if the CEA had to assess technology, which it had, itself recommended. Other professionals have developed their own professional bodies to self monitor and enforce standards. Environmental technology practitioners can do likewise. Where government can assist is in providing finance for training abroad, attending foreign trade fairs and holding trade fairs in Sri Lanka.

#### **4.4 Creating a policy framework for sustainable development**

The most recent environment related policy statements, including the earlier versions of the NEAP, the Forestry Sector Master plan and the Coastal Zone Management Plan, provided for some form of public consultation. Most of the environment related agencies, including the Central Environmental Authority, have advisory bodies that have both private sector and non governmental representatives. The Ministry of Forestry and Environment is in the process of setting up a Council for Sustainable Development where all the major interests will be represented.

A large number of environment related policy documents are now available. Their effective implementation will however occur only if the agencies involved take ownership of the plans enunciated in and gain political support to implement them as high priority. The latest Forestry Sector Master plan, the latest Coastal Zone Management Plan, and the latest UDA Master Plan for the Colombo Metropolitan Region all have a large focus on environmental issues.

This is the third National Environmental Action Plan. While previous NEAPs did generate very important ideas, which later become projects, such as the provision of a sanitary landfill for Colombo, and common wastewater treatment for industry the monitoring of implementation was weak. It is hoped that the more of the recommendations in this latest NEAP will be implemented through the active participation of all the key agencies, and effective of implementation by the same

sector committees which contributed to the drafting of this NEAP.

The government needs to use the environmental policy instruments it has for regulation and planning in a more focused and strategic fashion. The government should focus its limited resources on the most environmentally damaging activities instead of spreading its resources thin. The Environmental Protection License (EPL) scheme will in future be focused on the high polluting prescribed industries. The number of inspections can be reduced by requiring the license application by the investor to be made under oath. The forestry regulations have been streamlined to focus only on large scale illegal logging, as evidence suggests that rigid application of regulations can act as a disincentive to tree planting by small holders. While Environmental Impact Assessment (EIA) has been used fairly successfully at a project level, its overall results have sometimes been ineffective or negative. In the future, it is hoped that these problems can be minimised by conducting strategic environmental assessments at the policy or sector level.

Non governmental organisations (NGOs) or community based organisations (CBOs) can be used as intermediaries to implement certain environmental policies, in cases where the government agencies themselves lack skills or where the status of government officials limits their effectiveness. Both NGOs and community mobilisers need to be further trained in participatory techniques. These approaches can be used very successfully to promote watershed management, biodiversity conservation and improved sanitation and hygiene.

The government can often implement environmental policy more cost effectively by greater harnessing of private sector expertise, for example in environmental inspection and environmental testing. Private sector laboratories are now being accredited by the Sri Lanka Standards Institution. The Private sector can also take steps to implement environmental policies through environmental audits, voluntary agreements, and the award of environmental prizes. A number of companies have now conducted environmental audits focused on ways to save energy and reduce raw material costs. Voluntary agreements or Codes of Conduct can be used by industry to reduce waste and pollution. Environmental prizes, such as an Environmental Entrepreneur of the Year award of the industry chambers, will reward good practice in the same way that the Exporter of the Year awards do.

#### 4.5 Creating a regulatory framework for sustainable development

**Environmental legislation** is often scattered in many overlapping statutes which need to be simplified and codified. Many of the Acts are too detailed and contain very specific provisions, such as the level of fines, which are probably better defined in secondary regulations. As they stand, many of the Acts are very inflexible, and swiftly become out-dated. The fines stipulated in them are rendered unrealistic by inflation. Enforcement is weak as responsibility is shared between several agencies. An attempt at codification has begun with the new draft Forestry Bill and work is starting on a simplified Water Bill. Economic incentives can be used to complement the traditional regulatory approach. The revenues could be returned



to industry to finance sustainable management.

**Environmental regulations** should be clear and consistent, and uniformly enforced with effective dispute resolution mechanisms. The private sector generally welcomes a clear, strictly enforced regulatory framework. Investors require regulatory stability since they are taking long term decisions involving large sums of money; arbitrary, unpredictable regulatory changes can have adverse impacts on their business plans. Investors require clear regulations so that they are not delayed in their business development by obscure regulatory processes scattered among several enforcement agencies. Investors prefer that regulations are uniformly enforced to create a 'level playing field' which does not favour one business over another. Finally, investors require effective dispute resolution mechanisms like the Environmental Tribunal proposed in the draft Environmental Bill.

**Environmental standards** should be developed after full consultation with those affected, be set at levels appropriate for the context and, most importantly, be enforceable. Detailed consultation is required with the private sector and community groups to allow a compromise to be reached in case of dispute. Such consultation increases the chances of compliance by the private sector. Appropriate standards are required to maintain Sri Lankan competitiveness, although environmental compliance usually represents a very small fraction of total production costs. The current standards are set at levels comparable with

India and Malaysia. Public confidence could be lost unless the standards set are enforced. If the standards are difficult for the private sector to achieve immediately because of short-term constraints, they can be phased in through legally binding agreements with the companies. Some existing standards, such as those for noise are badly framed because the methods of establishing legal proof are complicated.

**Enforcement mechanisms** should be easy to implement. Punishment for environmental offences should be deterrent. A scheme of rewards should be established for providing information and other assistance in detecting and preventing environmental offences.

**Land use planning** in urban and agricultural areas is crucial for environmental management, but this will be effective only if it is supported by strong enforcement. One option would be to vest more land in the private sector. The state still owns 75 percent of the land in the country. It is recognised that private institutions are not good at regulating themselves; the same applies to state agencies engaged in land use planning and development. Many of the land use planning failures often arise from political pressures on village land alienation programmes, and encroachment on state canal and railway reservations in urban areas. This problem may be reduced if more land is vested in the private sector. The Bellanwila-Attidiya Wetland immediately south of Colombo, the only wetland in private hands, is also the wetland with the least illegal encroachment.

#### **4.6 Creating a knowledge base for sustainable development: information, education, training, research and awareness**

Pursuit of sustainable development requires that all partners are well informed, sensitised and adopt the correct attitudes towards the issues, problems, solutions, choices and alternatives. Environmental management and sustainable development, to be successful, require sufficient awareness at all levels: among legislators, policy-makers, law enforcement officers, developers, professionals and all other leaders and players in civil society.

Sri Lanka has some clear advantages in this respect. High levels of adult literacy and education make it easier to transmit information and messages to the people. A historical legacy of rich traditional knowledge and cultural practices of wise natural resource management enable people to appreciate the value of environmentally friendly practices. Environmental studies have been incorporated in primary, secondary and tertiary education. The print and electronic mass media have considerable penetration and provide effective means of reaching the masses. Several Research & Development institutions are engaged in studying aspects of sustainable development. The NGO community is committed to raising environmental awareness of the people and is working hard to achieve this goal.

Notwithstanding the considerable progress made, there are many gaps and inadequacies in the areas of environmental awareness, education, research and

training. These stem principally from a lack of resources especially of skilled personnel, weaknesses in accessing and disseminating information, lack of focus in research, and the absence of innovative and strategic approaches to education, awareness creation and communication.

The following is a brief overview of the key areas which need to be addressed in preparing for Sri Lankan society to achieve sustainable development.

##### **Information management:**

Lack of up-to-date and accurate information has hampered decision making and environmental action. Environmental data collection is improving, but there are gaps; for instance, the lack of continuous environmental monitoring programmes for water quality, ground water availability and animal genetic diversity. A number of state agencies routinely collect data, but collation, analysis and sharing of information are poor. Many of the data bases were established only during the past decade and therefore lack past trends. Only the results of academic studies are available in some vital areas. No single institution has a mandate to regularly gather and store data relating to the environment. Data gathering on an island-wide scale has been hampered by difficulties in accessing the conflict-ridden North and East. This makes all the data compilations made during the past 15 years incomplete. No island-wide Census of Population has been carried out since 1981. Most of the demographic figures for succeeding years are therefore based on estimates or projections.

Serious shortcomings in the way available data and information are managed by state and academic institutions makes access difficult even to legitimate researchers and professionals. The absence of adequate provision in the country's laws leaves data seekers at the mercy of the holders and managers of such data. Streamlining information management to improve analysis, access and dissemination is therefore an urgent need.

**Research and studies:**

Most research and development activities in Sri Lanka are carried out by government research institutes and the universities. The private sector and NGOs play only a minor role in this key area. Driven by growing demands from the environmental management sector, and encouraged by the prospect of foreign funding and training opportunities, the state research network now focuses more on environment related topics. Several universities have started environmental studies on different environmental aspects

In spite of an increasing number of environment related research projects, and a growing output of research findings and studies, several inadequacies remain. Many research studies are planned and carried out without adequate consultation with the end-users and without a realistic assessment of the ground situation. The dissemination of research results is weak, and their commercial and policy applications rare. Links between university and industry are still weak, with most Sri Lankan industries still relying on foreign expertise and technology to meet their needs. There is a need to better plan and co-ordinate environmental research in Sri Lanka, a role

that the Ministry of Forestry and Environment has started playing. The involvement of a co-ordinating body such as National Science Foundation, and the participation of professional organisations of scientists, would ensure that environmental research is better targeted, is more appropriate to the country's needs, and the findings of such research are better used.

**Formal education:**

Education prepares the community to meet the challenges of environmental management and sustainable development. Having moved from the earlier ad hoc approach, environmental education has now been included in the formal education system at primary, secondary and tertiary levels. Curriculum development for environmental education is largely complete, but there remain formidable challenges in:

- achieving sufficient coverage in pre-service and in-service training and orientation for teachers;
- producing and distributing textbooks and supplementary readers on environmental subjects that are relevant to the local context in the national languages; and in
- encouraging students to apply their environmental knowledge to real life situations.

Formal education efforts are supplemented by numerous efforts at non-formal education carried out by NGOs, CBOs, mass media and some state agencies with an environmental mandate. While formal education mostly covers those engaged in structured studies, the non-formal efforts reach out to a much wider section of society, sensitising and influencing their conduct.

While non-formal environmental education has contributed substantially towards greater environmental awareness in Sri Lanka, there is scope for further streamlining these efforts. Added emphasis must be placed on what communities and individuals could do at their own levels to promote environmentally friendly lifestyles and practices.

**Environmental training:**

General and specialised training in different aspects of environmental management is urgently needed for all state, private and NGO sector personnel whose professional work involves an environmental dimension. Opportunities have opened up in the past decade for pursuing higher academic studies in a number of environmental disciplines. There are now five Masters Courses in environmental subjects at Colombo, Moratuwa and Peradeniya Universities, and a forestry course at Sri Jayawardenepura University. Yet some gaps remain. The local courses are much more cost effective and more locally relevant than foreign courses. Some are however still too general, with insufficient detailed course material or inadequate practical components. Short and medium term training for several specialised environmental functions is not available locally and Sri Lankans still have to seek such training opportunities abroad.

More short term environmental training courses should be developed, as they are cost effective and more relevant to the local context. The success of the ten-day Environmental Impact Assessment Course first conducted by NAREPP and subsequently entrusted to the Centre for Environmental Studies (CES) at Peradeniya

University is that over 200 private and public sector participants were trained at the cost of sending five students abroad for masters degrees. Short term courses could be developed in many other environmental areas such as coastal management, clean technology and industrial pollution control, solid waste management, and environmental policy.

Rationalisation of foreign environmental training opportunities is also required, to ensure that the persons selected are those capable of benefiting themselves and the country. Placement of the persons so trained should be planned to make the best use of their training. The increased investments made over the past decade has produced several hundred environmental professionals in the country. Their services and skills should be optimally used in the areas of environmental policy, enforcement and management. Government recruitment schemes should recognise these environmental courses. Policy related research carried out during recognised consultancies as well as academic publications on environment-related topics should be given credit in university promotion schemes.

**Media coverage of the Environment:**

The many forms of mass media perform a vital role in achieving environmental management and sustainable development. The media acts as a watch-dog against lapses and excesses of government and industry; promotes discussion and debate on proposed and on-going development projects and priorities; helps disseminate the latest environmental information and research findings; brings into focus

environmental success stories and worthy initiatives, and publicises the efforts of key players in environment and development. In many developing country situations, the media also plays the role of non-formal environmental educator, with most people outside formal education systems receiving their environmental information through one or more organs of the media.

The NAREPP Environmental Awareness Survey of 1992, the only one of its kind so far conducted, found that the three major sources of environment related information for the Sri Lankan urban and rural public are the print media, television and radio. Newspapers and magazines penetrate into most parts of the island; radio is the dominant electronic medium in rural areas while television, the dominant medium in urban areas, is a close second. Media coverage of environmental issues has vastly increased over the past 15 years. Articles on the environment appear regularly in the daily, week-end and periodical press; environmental reports and other features often appear in the news; many radio and television stations carry regular environmental programmes; and several newsletters and magazines devoted entirely to the environment are published by NGOs.

This increase in quantity has however not been matched by a corresponding rise in quality. Many constraints remain:

- coverage is often simplistic and insufficiently investigative;
- cause and effect relationships and scientific aspects are poorly understood and analysed;
- information cited is either outdated or inaccurate or both;
- some coverage is alarmist, sensational and some articles lack balance; and
- the media does not focus sufficiently well on the good news: the success stories, positive results and achievements.

Many of these weaknesses reflect the lack of access to reliable information and material, lack of proper training for journalists in environmental issues, resource constraints of media organisations, and the absence of a strategic approach to using the media on the part of state and NGO environmental organisations.

The mass media is still not used as a vehicle to effectively and strategically raise environmental understanding and awareness levels among all sections of society. A major challenge for the environment sector is to cross the threshold from propagandistic publicity to structured and well packaged environmental communication using the media. Catalytic investments in information materials, training and exposure of media professionals will vastly improve the quality of media coverage of environment and development issues.

#### **NGOs and CBOs:**

Most of the several hundred environmental NGOs and thousands of CBOs in the island are active in raising environmental awareness among their constituencies, e.g.:

- disseminate environmental information at the grassroots level;
- help gather information on natural resource use trends and conditions;
- monitor the impact of development projects including industrial activities;
- mobilise communities to defend their right to a clean and healthy environment;
- engage in dialogue with state and private sector institutions to ensure effective environmental management; and

Provide a platform for the public to express their views and concerns on a wide range of environmental issues and problems.

Although they perform an extremely valuable role in civil society, most NGOs and CBOs are constrained by a lack of resources and skills, and some also lack innovation and vision to confront new challenges. NGOs in the 1990s have to move beyond mere rhetoric and alarmism of the early years, and engage public and private sector institutions in a multi-party, consultative process to collectively address and resolve environmental problems. This requires that NGOs achieve greater professionalism and operate on a more structured, full-time basis without compromising their advantages of staying outside formal hierarchies and bureaucracies. It also requires the state and private sector institutions to relate to NGOs in an equal, collaborative relationship and to create opportunities for meaningful NGO participation in environmental management.

In spite of their current limitations, NGO and CBO environmental education and awareness work represent better value and greater impact for investments. Their ability to reach out to people at the grassroots level is unparalleled. There is an urgent need to tap this potential to its full extent, particularly to mobilise people to change lifestyles and consumption patterns to ways that are environment friendly. At the same time, NGOs and CBOs need to adopt more diverse and innovative means of raising environmental awareness levels, moving away from the traditional lectures and leaflets into other areas such as park-based interpretation, greater use of audio-visual

material, outdoor activities and competitions.

**Beyond awareness: the need for action:**

The combined thrust of research organisations, universities, state sector agencies, media and NGOs certainly creates a formidable knowledge base for achieving environmental management and sustainable development. But information, while being necessary, is by itself not sufficient for fulfilling this task. Information and knowledge must be applied in real life situations in ways that produce meaningful change. In other words, awareness must pave the way for action at all levels.

There are many success stories of NGOs increasing community awareness of the value of sanitation, agriculture management and biodiversity protection. But unless these programmes are combined with assistance to alter the ground situation, awareness by itself is not likely to produce much results. People need choices and alternatives to move away from environmentally damaging practices. Combining awareness with actual interventions also ensures that the awareness is properly targeted to be useful and that it is of practical value to the target audience.

#### **4.7 International linkages and commitments**

Sri Lanka has subscribed to an impressive array of international commitments since the last NEAP update. These international linkages and commitments are becoming increasingly important. Prominent among them are participation in the UNCED preparatory processes; signing the Rio declaration; membership in the Sustainable

Development Commission; and becoming a party to the international treaties on Biodiversity and Climate Change. Alongside is membership and participation in earlier treaties such as RAMSAR, CITES and the Montreal Protocol and a variety of multilateral environmental institutions (most significant among them being the Global Environmental Facility, the UNEP and international organisations such as IUCN). At the regional level Sri Lanka is making a prominent contribution to the South Asia Co-operative Environmental Programme (SACEP) and the Environmental Committee of South Asian Association for Regional Co-operation (SAARC).

The context of international environmental treaties as multilateral interventions is also changing. They were earlier thought of as mechanisms for technical dialogue, sharing of experiences and expressing the national commitment to prevent environmental disruption. There is a marked shift now towards a global commitment that often transcends geopolitical considerations. The underlying reason is the emergence of sustainable development and globalisation as prominent global and national issues and almost universal subscription to them as a way forward to meet the environment and development challenges of the future. Sri Lanka has expressed its strong commitment to sustainable development and globalisation both at national and global level.

RAMSAR, CITES, Montreal Protocol and the Conventions on Biological Diversity and Climate Change have made Sri Lanka liable to some significant commitments that go

beyond environmental management to trade, biotechnology, bio-safety and emission controls that have an impact on income, employment and nutrition both at local and national level. Some others if not understood and acted upon carefully have implications for national sovereignty and geopolitics. Participation in this new generation of international treaties calls for a broad range of negotiating and technical skills. Responding to the commitments made to the modern international environmental institutions calls for consistent follow up and careful preparation.

However, the existing institutional mechanisms are too dispersed and disorganised to meet the national obligations and to benefit from these commitments. The national institutional capacity is not adequate for managing the country's international commitments. A focal national agency for international environmental commitments at Ministerial level is urgently needed. The Ministry of Forestry and Environment (MFE) is well suited to fill this role.

It is not realistic to find or to develop the required negotiating, technical, legal and political skills within the MFE. An international affairs unit should be established within MFE to co-ordinate national participation in international environmental processes and to ensure a focused approach. The unit should take the lead in organising delegations and inputs. The required skills should be drawn from other national agencies that also accept the responsibility for representing the country and for follow up actions.

## PART 2. IMPLEMENTATION OF THE NATIONAL ENVIRONMENTAL ACTION PLAN

### 5 Actions Recommended in the NEAP Sector Papers

The sector papers prepared through an extensive participatory process identified many corrective actions that need to be taken by the different government agencies (NEAP 1998, Section II). These actions are expected to provide short- and long-term solutions to the issues and problems specific to each sector. The NEAP should however be considered not only a corrective mechanism but also a guiding tool to encourage proactive interventions that will avoid environmental problems in the future. In short, the actions recommended in the NEAP should ensure that the development process adopted by the country is environmentally sound throughout all its stages (namely planning, implementation and evaluation). In order to achieve this objective, environmental policy planners and regulators should anticipate potential problems, and guide the development process along an environmentally sound path.

Most of the actions recommended are clearly aimed at correcting existing policies, legislation or institutions in order to make them environmentally sound. Such actions are referred to as **reactive reforms**. Recommendations for research, new policy and institutional instruments and technology introductions aimed at anticipating problems fall into the category of **proactive reforms**. They are aimed at setting the framework for an environmentally sound development process.

An analysis of the recommended NEAP actions indicate that they can be broadly

grouped into the following four action frameworks:

1. Actions promoting policy initiatives or recommendations;
2. Actions to improve technical and management tools and the skills needed to use them;
3. Actions to facilitate Research, Extension and Education on environmental issues; and
4. Actions to increase effectiveness and efficiency of the institutional and legal structures to manage environmental issues

#### 5.1 Actions to Promote Policy Initiatives

- a) Formulate and implement policies necessary for environmental conservation and management of development programmes, through:
  - The development of a National Land Use Policy;
  - Promotion of the Integrated Watershed Management approach; and
  - Formulation and implementation of a National Policy on Bio-diversity including indigenous knowledge and information and the need for access to such information.
- b) Promote policies to enhance community participation in natural resources and environmental management through:
  - Promoting the involvement of the local community and other stakeholders in natural resources management;
  - Development of a strategy to involve



the local community in maintaining and managing the eco-systems that are being rehabilitated. Examples include the canal system in Colombo and its suburbs and the minor irrigation tank system in the Dry Zone.

- c) Encourage and promote private sector participation in environmental management through direct and indirect actions such as
  - Providing incentives for establishing private wood-lots and participatory forestry programs.
  - Providing incentives for the private sector to invest in industrial estates that are equipped with effluent treatment facilities;
  - Promoting BOO or BOT type environmentally friendly ventures through the grant of investment incentives. Such ventures would include solid waste management, waste water treatment, mass transport, water supply and the development of alternate energy sources.
- d) Review and revise policies and plans that impact on environmental quality such as trade policy, transportation policy, fuel pricing, agriculture and policy relating to the use of agro-chemicals.

## 5.2 Actions to develop technical and management tools and the skills needed to use them

- a) Demarcate and establish a network of conservation and protected areas and promote partnerships between the local community and government officials to manage them using modern protected area management techniques such as:
  - Implementing environment protection provisions in existing laws with the help of improved management techniques. For example, declare cultivated land above 1500 MSL with more than 60 per cent slope as

conservation areas, and employ modern conservation farming techniques to increase land and water productivity.

- Protecting and managing all uncultivated lands in these areas depending on their environmental value.
  - Preparing and executing management plans for wetland, forest and wildlife conservation areas through a participatory process.
  - Encouraging the use of modern conservation techniques such as special Area Management and the creation of "Buffer Zones" around national parks and sanctuaries.
- b) Promote the concept of Spatial Planning and implement correct project siting procedures.
    - Establish industrial estates and induce relocation within such estates of industries situated near human settlements and sensitive ecosystems through an effective incentive or disincentive (enforcement) programme.
    - Study the impact of current and proposed uses of critical water bodies that supply water for domestic consumption, and determine their carrying capacity.
    - Pay special attention to the possibility of maintaining or improving the environment when approving and developing urban settlements.
  - c) Promote conservation farming
    - Organise an extension service to promote farming systems that conserve the environment;
    - Provide incentives for environment friendly practices such as home gardens;
    - Identify and promote those many environmentally friendly activities practised by local farmers such as the use of organic fertilisers, soil and water

- conservation, and integrated pest management.
  - Introduce the practice of water pricing, starting in areas with a competitive demand for water. Implement this practice with the assistance of user groups and back this effort with an effective awareness creation campaign.
  - d) Promote environmentally compatible alternatives to common environmentally damaging practices:
    - While discouraging common practices destructive to natural resource conservation provide information on and incentives for the adoption of viable alternatives, such as adoption of energy saving practices, recycling of waste/garbage, conserving water, and the production and use of biodegradable products such as biodegradable packing materials.
  - e) Formulate and enforce or encourage the adoption of environmental standards:
    - Limits to pollution of marine environments;
    - Water quality monitoring programs, starting with monitoring of sources of drinking water supplies;
    - Sanitary requirements and standards for the issue of building permits by UDA and local authorities.
  - f) Promote economic incentives (or disincentives) to promote practices that conserve natural resources;
    - Provide incentives to private sector to invest in and develop environmentally friendly technologies and measures to mitigate environmental degradation.
- 5.3 Actions to promote Research, Extension and Education Activities**
- a) Establish information management systems needed for better Natural Resource Management (NRM) and institutionalised information dissemination.
    - Study and identify habitats and over exploited fish species;
    - Establish and use GIS for monitoring the status of water bodies, forests and other natural resources.
    - Establish baseline data on impacts of environmental degradation on people's health.
  - b) Encourage environmental research by increasing funding for research on biological resources and environmental awareness building
    - Strengthen the agencies conducting research related to bio-diversity such as the adoption of biotechnology in commercial applications.
  - c) Support education institutions with facilities and funds to develop skills needed for Environmental Planning and Management.
    - Upgrade skills at the universities to teach environmental technology and its application in pollution control;
  - d) Conduct country wide awareness programs to highlight consequences and costs of environmental degradation.
    - Increase public awareness on available alternatives to common environmentally damaging practices;
    - Launch a national campaign to educate the public about
      - \* the relationship between health and the environment and ways of promoting human health by improving the environment;
      - \* the value of biological resources and the consequences of destroying ecosystems;
      - \* The health hazards resulting from improper solid waste disposal.

#### 5.4 Actions to support the institutional and legal provisions for environmental management

- a) Enhance the capacity of the regulatory institutions for environmental management and pollution abatement by:
  - facilitating the setting-up of a network of laboratories for pollution monitoring; and
  - providing training to CEA and BOI staff to handle high polluting industries;
- b) Improve legislation and legal instruments to facilitate implementation of actions recommended in NEAP.
  - The Fauna and Flora Protection Ordinance and the Fisheries Act contradict each other about which biological resources are subject to restricted export or import. These Acts need to be harmonised.
  - Restructure the institutions involved in water resources management to reflect user rights and to ensure their effective linkages.
- c) Strengthen the capacity of sub national agencies to carry out environmental management and monitoring more effectively.
  - Develop land use planning and management skills in the sub national agencies handling land use responsibilities;
  - Strengthen capabilities of provincial and local authorities to enforce environmental regulations governing small scale industries and environmental monitoring;
  - Develop a series of standardised Environmental Indicators that can be used by sub-national agencies.
- d) Implement provisions of international conventions and treaties as appropriate to local situations through the enactment and revision of domestic laws and regulations.

## 6 Strategy for co-ordination and Monitoring of NEAP recommendations

NEAP is a national plan containing many recommendations. No single agency can undertake the responsibility for implementing the entire plan. It contains both sector specific as well as economy wide actions. Both Government agencies and non-government agencies (comprising private sector organisations and NGO's) are expected to implement the measures recommended in the NEAP. The Ministry of Forestry and Environment as the agency responsible for preparing the NEAP will take the primary responsibility for facilitating the implementation and the internalisation process. MFE is also expected to initiate several cross sectoral actions recommended in the plan.

Success in implementing a plan depends on several factors. Co-ordinating the activities of the involved institutions and monitoring are two important requisites for successful implementation. However, monitoring of NEAP requires close cooperation and commitment on the part of the implementing agencies. A command and control approach is inappropriate. As no single organisation can be entrusted with the task of implementing all these cross-sector activities, it is proposed that a consultative mechanism be adopted to receive and evaluate information on the progress in implementing the different actions.

### 6.1 Sharing responsibility for implementation

Most reactive actions and some proactive actions recommended in the NEAP are clearly sectoral and fall within the purview of a single agency. In such a case the recommended actions should form part of the development program for that sector. The MFE can assist the line agency to formulate projects and plans, and to draft

legislation in accordance with the NEAP recommendations. Assigning responsibility for cross-sector actions in NEAP to a single agency can be more complicated. Responsibility for implementing cross sector actions can lie with several agencies. In such a situation the agency that will have the responsibility of finally managing the resource or the process should be assigned responsibility for the overall process. Successful implementation requires all the implementing groups to collaborate in designing a clear strategy to co-ordinate the overall process. A clear strategy to co-ordinate the overall process should be developed in consultation with all the groups responsible for implementing different segments of the Plan.

Where the recommended action is essentially a national planning process or an activity too complex to be identified with a single primary agency, the MFE or the Ministry of Planning should take the primary responsibility for co-ordination. The development of the Water Resources Management Plan and the Water Resources Council by the National Planning Department and the preparation of the Biodiversity Action Plan by the Ministry of Forestry and Environment are examples of such actions.

NEAP envisages active participation of the private sector in implementing many of its recommendations. The government agencies are expected to provide a greater role for and facilitate the entry of the private sector into environmental management. Chambers of Commerce and Industry can play an important role by disseminating information among their membership about development and investment opportunities in environmental management. The

Chambers should prevail on the Government during regular discussions to expedite the implementation of the policy declarations, tax incentives and other concessions recommended in NEAP.

## **6.2 Institutional framework for co-ordination of actions and progress review**

The Ministry of Forestry and Environment (MFE) is charged by its mandate with the responsibility of facilitating sustainable development through the promotion of sound environmental management. This also makes the Ministry responsible for monitoring and reporting progress in implementing the NEAP. This can be considered as the main item in the Ministry's agenda for the next four years.

The institutional framework for co-ordination will be thru Committees on Environmental Policy and Management (CEPOMs). These will be jointly convened by the MFE and the sectoral Ministry concerned and chaired by the Secretary of the Sectoral Ministry with the Secretary/MFE as Co- Chair.

Successful implementation of the NEAP therefore requires that MFE should have an effective institutional structure. This requires the creation of a separate unit within the MFE to deal specifically with NEAP related matters. The demands on such a unit may range from co-ordinating the work of the different sections within the Ministry and helping other agencies to obtain assistance from MFE or CEA, to monitoring and reporting on implementation. The NEAP secretariat/unit should function under the Policy Planning Unit of the MFE. Some of the important tasks of this unit would be to:

- Obtain regular information from the agencies on progress in

implementing sector specific recommendations;

- Organise quarterly review meetings with focal points of the other agencies concerned with NEAP. The focal point is the officer or unit within each implementing agency designated to act as the channel of communication with the NEAP unit in the Ministry.
- Set up the CEPOM structure, institutionalise it and follow up on the co-ordinating and reporting mechanisms.
- Organise bi-annual NEAP progress review meetings with NGO and private sector participation to support their activities and to monitor the impacts of such activities;

### **Implementing sector specific recommendations:**

Implementing institutions should be encouraged to co-ordinate and monitor the progress of sector specific actions through their normal progress review procedures. A focal point should be designated by each sector agency to act as the channel of communication between the sector agency and the NEAP co-ordinating committee.

All correspondence between the agency and NEAP secretariat on NEAP implementation issues should be channelled through this focal point. The progress of these sector specific actions must be regularly reviewed by the agency that has the primary responsibility for implementation.

The MFE/CEA in collaboration with the sector agency may devise a method to share information on the progress of implementation. The proposed planning and monitoring division in each line ministry can be entrusted with the task of

progress review. The head of this division is well suited to function as the focal point.

It is recommended that the NEAP secretariat at the MFE in collaboration with the focal points develop and design a reporting format and indicators. The minimum information required to monitor the progress with minimum extra effort should be identified. These formats will be reviewed by the co-ordinating committee as and when necessary.

### **Implementing inter sectoral recommendations**

A primary agency should be assigned the responsibility for monitoring when the NEAP recommendations cover several sectors. The MFE or NPD can undertake this responsibility in special cases. Whenever non-governmental (private sector or NGO) representation is recommended the subject specific co-ordination group should ensure such representation. An official may be nominated by the MFE or CEA to serve on such a co-ordination group. What is more important is that a clear reporting link is established with the NEAP secretariat at the MFE, so that progress made is regularly reported. The selected focal point of the subject specific co-ordinating group should serve as a member of the main NEAP co-ordinating committee. He will report progress on an agreed format to the NEAP co-ordinating committee.

The MFE will therefore have to play the leadership role in developing and facilitating implementation of these actions. The leadership and facilitating roles as envisaged would be directed at the two main implementing sectors, namely the private sector and the state sector. The role these two sectors are expected to play should therefore be clearly described and understood.

## **ROLE OF THE PRIVATE SECTOR**

In view of its increasing contribution to and influence in national economic productivity, the Private Sector will have an important contribution to make in implementation within the broad policy and regulatory parameters set by the government. Formulation of policy, legislation, establishing institutional structures, planning projects and programs, monitoring and evaluation should continue to be the responsibility of the government. However, the diversity of these activities and heavy demand for prompt attention makes it almost impossible for the state sector to deliver these services efficiently. The alternate way to address the inefficiencies and inherent weaknesses of the existing implementation mechanisms is to encourage the private sector to take over some of the tasks.

The private sector will however take only calculated risks in making investment decisions, but tends to avoid such risks when uncertainty is high because of bureaucratic and political factors or legislative bottlenecks. However, if the circumstances are favourable and conducive to investment the private sector may be quite willing to explore the opportunities for investment. There are several areas of direct environmental management opportunities which are attractive to the private sector. These include providing consultancy and laboratory services, environmental financing, development and management of environmental infrastructure and providing services for environmental management.

**Concessionary finance for small holders**  
Small holders cultivating plantation crops do not enjoy immediate benefits from investing in soil management techniques that can prevent soil erosion in hilly land

plots. Making available concessionary finance such as low interest bank loans and outright grants to small holders using conservation practices will lead to greater control of soil erosion. Such actions need to be supported by a policy declaration by the government agency responsible for plantation crops. Once supported by policies the government can negotiate with a donor involved in development finances e.g. IDB, ADB or OECF to include in their programmes the financing of soil conservation activities by small holders. Commercial banks already involved in SMI loan disbursement may be encouraged to join with small holder organisations in a program to encourage small holders to invest in soil conservation measures.

**Encourage the private sector to invest in forest plantations** in a way similar to what was done for promoting plantation crops. The government should make a policy announcement that plantations opting to convert some of their unproductive lands to forests yielding timber and fuel wood would be given the same incentives as those already given for expanding traditional plantation crops. This will encourage many plantation companies to actively participate in forestry development programs. The government should canvass an international donor interested or already supporting the plantation sector such as ADB to include a component in their funding to provide concessionaire funding through commercial banks to support forestry programs in plantations.

**Formulate a policy on alternative energies** that can be used to supplement current hydro and thermal generated power. The adoption of the correct pricing policy to enable the private sector to invest in power generation from alternative sources and encourage (through tax reductions and duty

rebates) the importation or assembly of equipment that use alternate power sources. For example incentives to promote the use by motor vehicles of Liquid Petroleum Gas (LPG) in place of petrol and diesel will enable the private sector to invest in environmentally sound technology. This could even lead to local manufacture of some of the pollution control equipment needed to use with LPG. The opportunities for the manufacture and use of equipment for harnessing solar and wind energy should be explored.

**Institute policies that mandate the rehabilitation and restoration of lands**, which have been mined for minerals. Undertaking to commission the services of a company capable of restoring and/or rehabilitating excavated land should be a condition for the grant of a permit for gem mining. Work with the banking sector to insist on an environmental management plan from large-scale miners before granting permits and/or financial assistance.

**Strategy to issue Environmental Pollution Licences (EPL) through certified private licensed institutions:** Establish a policy of issuing pollution control permits for low and medium industries granted through certified licensing agents designated by the CEA. Any institution applying to be so designated should have specially qualified and experienced staff. The CEA and the local authorities should only conduct validity checks to examine the performance of these licensing agencies. The government should introduce laws mandating that the annual licence to operate these industries should accompany such a certificate. The CEA in turn should cover its expenses by an annual registration fee charged from these agencies.

**A fund generated by contributions from environmental pollution control charges (licenses and penalties) to finance research and development in industrial pollution control.** The findings of research and services so funded should be made available free or at a reduced rate to industry. The Government may have to create the right policy environment for operating this fund. The fund, once established should be easily accessible through the network of commercial banks at a concessionaire interest level.

**Encourage a private sector led Environmental Insurance and Financial Guarantee system for environmental and natural disasters:** As the impact of development activities on environment become increasingly critical, it becomes important that adequate measures are in place. Industrial organisations also have adequate resources to minimise the impacts of unplanned disasters. This program can cover a variety of situations ranging from damage caused by wild animals to crops, properties and life to major disasters such as oil spills and land slides. The government can work with the private sector and insurance companies to develop such a scheme on a pilot scale and even provide seed capital to initiate such a program.

**Make the Government's privatisation program environmentally sound** The Government is committed to promote private sector participation in economic development. This can be pursued in ways ranging from the offer of incentives for investment to privatisation of state ventures. The Public Enterprises Reforms Commission (PERC) presently handles the process of privatisation. The obligation of the successful bidder to manage the environment is however not adequately emphasised.

Submission of an environmental management plan as part of the bid for the enterprise on offer should be made mandatory. This may require bidders to submit an Environmental Impact Assessment and carry out a verification of the process through environmental audits. Such a requirement would ensure that the management of the privatised enterprise will be aware of its environmental responsibilities from the inception of the project and environmentally sound practices will form part of its culture.

**Mandate that community organisations and local authorities** are involved in decisions on land alienation that will change the current land use pattern. Study the models of community participation developed and practised by previous projects which involved community participation such as the Muthurajawela Wetland Project, and the Special Area Management projects at Hikkaduwa and Rekawa.

## **ROLE OF THE PUBLIC SECTOR**

Traditionally, the government bore total responsibility and authority in policy formulation, regulation and enforcement. The process used to be largely a central government agency's concern and rarely involved consultation with local communities. or even the government's own peripheral agencies. Pressure has however built up to decentralise and devolve these functions to the periphery. The democratic political system has catalysed the decentralisation and devolution process.

The Government's declared policy is to promote decentralisation of administration and devolution of selected subject areas.



Environment is one such subject area that will be devolved to the periphery. The details of these policies are being worked out. The central government, it is expected, will soon design and implement some form of decentralised or devolved institutional reforms.

The Government is also committed to trim state agencies while making them more responsive to public needs. This can be achieved by making their services better focused, more efficient and more effective. These government institutions need to be strengthened with high quality staff and improved facilities in order to meet challenges posed by the future development.

The management and technical capabilities of the state sector need to be enhanced through a critical assessment of institutional mandates, its expected role (in relation to the private sector) and the available resources. Activities identified in this section are aimed at directing government resources towards addressing these institutional issues. The following actions are recommended to strengthen the capacity of institutions involved in Environmental Management.

**Restructure the CEA to adjust to the changed circumstances created by the decentralised administration and the greater role of the private sector in environmental management.** The CEA faces challenges posed by a decentralised administration and the enlarged role for the private sector. The minimum cost options to meet the demands of the regional administration need to be assessed. The future role of the private sector in

environment management needs also to be well thought out and the support needed from the public sector for this role should be carefully assessed. Once the new role of the private sector is determined and the amendments needed for a decentralised CEA role are decided on, CEA can be restructured to carry out its new responsibilities. The related Agencies are CEA, Ministry of Environment, Chambers of Commerce and Industry, Ministries of Public Administration and of Local Government.

**Information availability and management:** Establish an Environment and Natural Resources Data Base and a Data Base Management Unit at a central institution such as NARESA. This unit will be self financing. It will link the public sector, academic institutions and the private sector to sources of local and international environmental information.

The organisation identified must ensure the reliability and quality of information. It will be responsible for administering an up to date information collection, storage, retrieval and dissemination program. The unit will have state of the art Information Technology where its services could be made available for a fee to interested clients.

An effort must be made to obtain a grant/ loan from a foreign donor to develop the data base network. Corporate or individuals could be linked through negotiated agreements and allowed access to data maintained at various member agencies.

**Related agencies:** NARESA, Census and Statistics Department, Universities. The Survey Department, Meteorological Department, Forest Department, Customs

Department, private consulting companies, private marketing agencies interested in environmental technologies.

**Institute environmental monitoring and annual reporting of environmental performance indicators:**

The Central Environmental Authority should become the principal agency responsible for monitoring of the status of the country's environment. The impact of development policies, programs and actions should be reported on an annual basis through a publication such as The State of the Environment Report. This report should form the basis of policy dialogue and investment planning in the country. An attempt should be made to assess the economic value of these impacts and recommend remedial actions that can be adopted by the responsible government agency. The report should be published in all three national languages to facilitate wider circulation. To attract the attention of wider sections of the population it is advisable to report the performance sector wise and region or province wise. The regional environmental officers should be encouraged to participate in the preparation of the report by submitting reports on the progress made in implementing recommendations made in the previous year's report.

**Related Agencies:** The MFE/CEA should play the lead role in this task. As a first step, encourage and support annual regional seminars involving the public, industry and local authorities to identify possible indicators

**Improve policy analytical capabilities at the Ministry:**

Establish a strong Environmental Policy Planning Unit within the Ministry of Environment that would work in

collaboration with a professional agency such as the Institute of Policy Studies (IPS). Enhance their capabilities to interact with other planning agencies at central and peripheral levels. The Ministry of Environment will have a daunting task of ensuring that socio-economic policies of the government are environmentally sound, realistic and cohesive. This can be achieved only by employing highly qualified skilled professionals to analyse development policies and programs in terms of their environmental consequences. This task need not be done by the MFE alone. The Ministry cannot be expected to retain such large number of high calibre staff. Institutional mechanisms must be developed to link with other professional bodies that have the required capabilities. Foreign donor assistance should be sought to develop these basic studies and establish such a unit with the required technical skills. A training program could be organised to enhance the skills of existing staff.

**Related Agencies:** Ministry of Forestry and Environment, National Planning Department, National Development Council, Central Bank, Ministry of Policy Planning, Institute of Policy Studies and Universities.

**Establish an Internationally Accredited Association for Practising Environmental Professionals.**

The world is making rapid progress in environmental knowledge. The scientists, engineers, economic planners and managers involved in environmental and natural resources management are forming professional bodies to share their information more effectively. Professionals in Sri Lanka also need to be closely linked with some of these professional bodies. Initial work needed for the formation and

## **7 Translating actions in NEAP into projects for the Public Investment Program**

The Public Investment Program (PIP) 1997-2001 envisages a total investment of Rs. 1,659 billion for the period. Most of the public investments consist of ongoing projects and represent investment decisions taken during the last five years. This is seen as a one factor that resulted in relatively low investments directed towards environmental management. The World Bank carried out a review in 1996 on the contribution of Public Investment Programs to environmental management over the two consecutive years of 1995 and 1996. This study revealed that 10 percent of the total public investment programme in 1995 and 12 percent in 1996 were directed towards environmental issues highlighted in the previous NEAP.

An attempt is made in the current NEAP to overcome the factors that hindered incorporating environmental concerns into the PIP. The 1996, the World Bank review highlighted the importance of integrating NEAP priorities into PIP and thereby making the development process sustainable. Sri Lanka like many other developing countries does not have the luxury of spending scarce resources on exclusively environmental management activities that do not have a direct bearing on national development priorities. Aligning environmental interventions with development priorities is therefore the main thrust of the current NEAP.

The review also suggested that expecting line agencies to incorporate environmental concerns in their development programs as sub-projects may not be realistic. This could have been due to several reasons. One major

reason is that agencies give greater priority to accomplishing their sectoral mandates. Since sustainability issues are not raised in project evaluations, incorporating environment concerns are not addressed seriously.

The current NEAP presents many recommendations to enhance sustainability of ongoing development programs. Implementation of these recommendations requires packaging them in project formats. Preparation of projects could even help agencies to seek extra budgetary funding from external resources.

Those NEAP recommendations that can easily supplement some ongoing project activities and projects under preparation are carefully selected in this chapter for consideration by agencies responsible for their implementation. Whenever possible these recommendations are presented as possible extensions to the on-going programs described in the PIP and pipeline projects published by the government (NPD, 1996). Listed project objectives indicate that the interventions are aimed at filling gaps in policy, planning, institutional, and the regulatory framework to make current and planned projects environmentally sustainable.

### **7.1 Land and Water resources:**

Land and water resources receive considerable attention in NEAP. Many environmentally sound agricultural and other land use actions need to be firmly established in current programs. The PIP (1997-2001) includes pipeline projects and several programs that can accommodate the following recommended investments.

**(a) Formulation of a Land Use Policy and Preparation of Guidelines for Land Use Practices for all development programs.**

*Rationale*

Land has been indiscriminately used with the rapid population growth and rapid expansion of economic activities. The problem has been aggravated because land has been used as a convenient means of alleviating unemployment and poverty. This has resulted in the fragmentation of lands into unproductive units that eventually degrade. The lack of community involvement in land use planning and management has stood in the way of finding a manageable solution.

The Ministry of Lands should prepare a land use policy framework as an initial step towards developing a National Land Use Policy. Guidelines should be developed in consultation with each agency involved in managing land to identify land use practices from the most damaging to the least damaging practices. A project with this limited scope should be programmed for funding. Technical assistance could be obtained to facilitate the process where necessary.

An attempt may be made to accommodate this either in the in the second phase of the National Land Use Survey (Rs. 40 million) or Watershed based Land Use Planning Project (Rs. 60 million). Such inclusion can be justified since having a national policy would determine future direction of land use plans and strategies.

*Implementing Agencies:*

The Ministry of Agriculture and Lands should take the lead role. The Land Use Planning Division of the Ministry should commence this work by formulating a Framework National Land Use Policy in consultation with other agencies. A set of

general guidelines to be adopted by all agencies (especially by the provincial and district authorities) responsible for managing and using land should also be drafted.

*Project objectives:-*

- ♦ Produce a policy framework on land use ;
- ♦ Hold consultative discussion on a framework to develop a National Policy on Land Use;
- ♦ Develop general guidelines to be adopted by different agencies involved in land utilisation and management ;
- ♦ The Ministry of Lands to produce in consultation with CEA a checklist type set of guidelines to help determine environmental implications of land use;
- ♦ Develop provincial land use plans that broadly identify lands that need immediate protection and lands that could be put into production or used for settlements without further studies;
- ♦ Listing of lands with doubtful environmental implication (that shall be determined by a set of guidelines issued by the Ministry of Land in consultation with the Central Environmental Authority) for case by case clearance which is the current practice of granting permission for land use.
- ♦ Issue of clear easily understand, cost effective and practical guidelines on how to ensure critical environmental features in land use.

**(b) Develop a National Conservation Farming Strategy with innovative economic incentives and technical programs to encourage farmers to adopt such practices.**

*Rationale:*

Farmers and small holders are reluctant to adapt watershed conservation measures since their subsistence income levels do not allow them to invest in such measures. Managers of larger plantations on the other hand do not receive necessary technical

advice and economic incentives to adopt integrated pest management on their estates. It is unrealistic to expect any of these groups to do so for the benefit of downstream uses such as irrigated agriculture and hydro- power generation without being adequately compensated.

Integrated pest management (IPM) and other conservation farming techniques should be promoted through an incentive program coupled with an effective training and extension program for farmer organisations. It is important to recognise the role of the various stakeholders such as importers and retailers of agricultural inputs, and the usefulness of having effective extension and training programs.

Pesticide importers could be encouraged to provide integrated crop protection services to farmers. They could be discouraged through higher taxes from concentrating only on importing and selling pesticides in their retailer network. Agrochemical importers and retailers who change their practices could be rewarded through a national program with wide publicity for using wider approaches to pest management.

It is however advisable that introduction of conservation farming is approached in a systematic manner with the involvement of major stakeholders in the agriculture and plantation sectors. A preparation of a National Conservation Farming Strategy by the Government will help agencies to introduce an integrated approach to on-going agriculture and plantation development programs.

*Implementing Agencies:*

Ministry of Agriculture and Lands together and Ministry of Plantations should initiate actions for preparing a national strategy. Several projects referenced in the current PIP can accommodate the recommended

program. A clearly defined strategy developed through a consultative process will ensure the sustainability of the planned program.

*Project Objectives:*

- ♦ Production of a National Conservation Farming Strategy.
- ♦ Launching of an effective awareness campaign to promote the use of conservation farming techniques and explain the costs and benefits of such actions.
- ♦ Develop crop protection and soil conservation packages for different crops that can be sold or provided through private dealer networks.

**(c) Develop an institutional structure at the national and sub national levels for land use planning.**

*Rationale:*

Many development activities affecting land will be devolved to and implemented by the Provincial agencies. National land use patterns need to be planned and monitored through a central agency equipped with skills and technology to do so. Provincial authorities should develop their own capabilities to plan and implement land use patterns to ensure sustainable development within the province.

The Land Use Policy Planning Division (LUPPD) of the Ministry of Lands is currently implementing National Land Use Survey Phases 1 and II. The LUPPD aims to train provincial officers on land use planning techniques. The staff so trained should be assigned to a properly constituted institutional structure that allows their services being made use of by other agencies.

*Implementing Agencies:*

The Land Use Policy Planning Division of The Ministry of Lands should take the lead

- ♦ Watershed Management Project (Rs. 166 million) and Multiple Use Management of Natural Forests Project (Rs. 104 million) and Social Forestry and Extension Project (Rs. 260 million) of the Forest Department.
- ♦ Mahaweli Environmental Enrichment Project (in the pipeline) (Rs. 600 million)

*Implementing Agencies:*

Ministry of Forestry and Environment should take the lead role while involving government departments, Local Government agencies, CEA, NGOs and CBOs. The task should be institutionalised within the Ministry of Public Administration and the Ministry of Local Governments.

*Project Objectives:*

- ♦ Continue to support and conduct natural resource management model programs commenced under previous projects.
- ♦ Continue to expand the projects into other areas. Introduce lessons learned on community participation in natural resources management models into existing projects.

## 7.2 Coastal and Marine Resources:

The World Bank review of the Public Investment Programme (PIP) for environmental concerns in coastal and marine identified that issues highlighted in the previous NEAP were not included in the PIP to the extent possible. It recommended that projects should in future be designed with reference to NEAP so as to ensure that the PIP gives adequate consideration to NEAP recommendations. Actions that can be taken by the agencies under their current and planned projects include the following:

- (a) **Implement the 1997 Coastal Zone Management Plan (CZMP) and the 1996 Fisheries and Aquatic Resources Development Act with emphasis on community participation.**

*Rationale:*

The recently amended (1997) Coastal Zone Management Plan (CZMP) and the new (1996) Fisheries Development Act outline a series of policy and institutional reforms needed for effective management of coastal resources. It is recommended that a strategy incorporating lessons learned during the past be developed and implemented. For example, the consultative process developed in the Special Area Management (SAM) projects at Hikkaduwa and Rekawa and in the Muthurajawela Wetland projects be used in implementing the provisions of the revised CZMP and the new (1996) Fisheries Act.

The Cabinet of Ministers approved the 1997 Coastal Zone Management (CZM) Plan which was prepared with assistance provided under the USAID /NAREP Project. Some of the programs specified in the CZM Plan can be accommodated within appropriate projects identified in the PIP that are already in the pipeline. This can be done without making any significant deviation from the stated objectives of the programs. The projects in the PIP that can accommodate programs relating to coast conservation include the Kelani River Project (Rs.150 million); Maha Oya Project (Rs. 250 million) and projects in the pipeline such as the Galle Project (120 million) and the Bentota Project (Rs. 120 million).

*Implementing Agencies:*

The Ministry of Fisheries and Aquatic Resources in collaboration with the Coast Conservation Department, the National

role in developing the Central Land Use Planning Unit. It should assist the Provincial Councils in the establishment of the provincial land use planning units.

*Project Objectives:*

- ♦ Develop land use guidelines to assist provincial authorities to make decisions in allocating lands for development purposes.
  - ♦ Ensure that areas that may need immediate protection are identified and reserved so that such lands will not be allocated for environmentally harmful uses.
- (d) **Establishing a single body to restructure the sub-sector institutions involved in use of water resources.**

*Rationale:*

It is now accepted that user based allocation of water will be a more effective and an efficient way of managing this resource. However, translating this concept into action will require significant institutional changes. As a first step towards cohesive institutional arrangement, it will be necessary to set up a central authority that will develop the Terms of Reference for each agency involved with water uses.

*Implementing Agencies:*

The Ministry in charge of Lands together with the National Planning Department should take the lead role in setting up this institution. This effort should be supported by the Ministries in charge of Agriculture, Fisheries and Environment.

*Project Objectives:*

- ♦ Establish a single legally recognised body that will work in collaboration with all related agencies to co-ordinate activities connected with the use of water.

- e) **Establishing a number of integrated natural resources management model projects in selected watersheds for practical demonstration of environmental management involving local authorities and local communities.**

*Rationale:*

It is important that many environmental management concepts are practically tried out with the local institutions and communities participating. Many such efforts conducted under the previous projects such as NAREP/ SAM and SCORE need to be taken to the next step of broad basing the lessons learned. The costs must be within realistic limits. This is a very involved task, as it requires close co-ordination with many agencies and NGOs involved in rural development activities. This program must therefore be carefully planned with a strong leadership exercising considerable flexibility in the day to day business.

MFE and CEA could provide leadership and guidance for formulating and implementing such programs. Many donors have placed high priority in their assistance program on support for such community based resources management programs. The MFE can work out mechanisms for introducing the concept into several ongoing and planned projects listed in the PIP. The following projects offer opportunities for such introduction:

- ♦ Agricultural Village Development Project (Rs. 805.05 million) of the Ministry of Agriculture and Lands;
- ♦ Infrastructure Development at the Muthurajawela Land Fill Site Project (Rs. 600 million) of the Sri Lanka Land Reclamation and Development Corporation;
- ♦ Alleviation of Poverty in Sittaram Palatha with Diversion of Welioya Project (Rs. 350 million) of the Department of Irrigation;

Aquatic Resources Agency (NARA) and the Department of Fisheries should take the initiative to develop strategic project proposals based on the strategies and action plans available for the sector in order to seek funding and other resources.

*Project objectives:*

- ♦ Mandating the establishment of a co-ordinating and consultative process to be adopted by local authorities involved in managing coastal and fisheries resources.
- ♦ Ensure participation of stakeholders and other local and community level organisations involved in making resource management decisions in current and planned projects.

**(b) Promote alternatives to river sand and coral based lime.**

*Rationale:*

The extraction of sand (sand mining) from the lower reaches of rivers reduces the quantity of sand available for beach replenishment. It also lowers the river bed, causing salt-water intrusion. Beach erosion is greatest in the south-western parts of the island. Sand mining is also heaviest in the same area. Three major rivers, the Maha Oya, the Kelani Ganga and the Kalu Ganga are mined heavily to supply sand for the construction sector. It is these same three rivers that bring sand for beach replenishment on the south-west coast. Sand extraction from less exploited rivers to be mined under control conditions is one available option.

Corals reefs are mined to supply limestone used for producing lime for the construction industry. Past attempts to enforce restrictions on the supply of river sand and coral limestone have met with only limited success. The need now is to reduce the demand for river sand and coral-based lime

by identifying and promoting the use of alternative materials. Alternative local sources of lime for coral based lime are Miocene limestone (now used only for cement manufacture at Puttalam), Dolomite from Matale and inland coral deposits. The alternatives to river sand are inland deposits like the sand dunes in Negombo, washed offshore sea sand and quarry dust.

The possibility of associating with the project planned by the National Engineering Research and Development Centre (NERD) to develop Cost Effective Housing Construction for low and middle income groups (Rs. 110 million), to accommodate this recommendation should be explored.

*Implementing Agencies:*

Coast Conservation Department in collaboration with the Industrial Development Board and other institutions involved in construction engineering should identify a strategy to promote use of alternatives. Collaborate with BOI to locate and invite a foreign investor interested in such venture development.

*The project objectives:*

- ♦ Promote the use of dolomite and Miocene limestone as sources of lime to be used in place of coral based lime;
- ♦ NARA to identify sites for off shore sand mining and BOI to invite foreign investment in extracting sand from off-shore sources;
- ♦ Encourage local manufacture or importation of alternatives to products made from coral based lime such as Gypsum Boards, Wallpapers, partition boards.
- ♦ Masonry cement imports to be encouraged and sold with clear labelling and pigmentation to prevent confusion with Portland Cement;
- ♦ ICTAD to conduct awareness on alternatives to river or beach sand and



coral based lime for the construction trade;

- ♦ Encourage the use of sand and coral lime alternatives in the construction or refurbishment of all public buildings;
- ♦ Restrict extraction of river sand down river.

### 7.3 Biodiversity Conservation:

The current (1997-2001) PIP lists forestry, fisheries and agricultural programs under the Agriculture sector. Bio-diversity projects may have relevance to most of these sectors. Several bio-diversity conservation specific actions are recommended in the NEAP and the Bio-diversity Action Plan. Some of these development sectors cannot be limited to one such area. For example fisheries diversity or livestock population will have direct implications for bio-diversity conservation. Future projects designed in agriculture, fisheries, forestry and plantations should make reference to NEAP and the Bio-diversity Action Plan. It is envisaged that the preparation and implementation of Bio-diversity Action Plan will yield several projects in the future. Agencies responsible for developing forestry and wildlife projects should use the NEAP and the Bio-diversity Action Plan to identify priority actions to be incorporated in future projects. Some actions that can be started immediately are given below:

- (a) **Preparation and Implementation of Management Plans for all protected areas through a participatory approach.**

*Rationale:*

Although nearly 20 percent of the country's land area enjoys protected status, these areas are not adequately managed to protect the natural resources from threats and weaknesses highlighted in this document. In the absence of both long term and short term management

plans or the ability to implement existing plans, the agencies responsible are often constrained to carry out ad-hoc management of these areas. The agencies concerned should develop management plans that can be implemented with the assistance of public sector, private sector and community organisations. These plans should ideally cover terrestrial; marine and aquatic protected areas.

*Implementing Agencies:*

The three front line agencies responsible for managing protected areas namely the Forest Department, the Department of Wildlife Conservation and the Coast Conservation Department should immediately embark upon developing and implementing management plans for the protected areas. The participatory planning and management approach can be immediately introduced to several ongoing and planned forestry and wildlife conservation projects such as the planned Wildlife Conservation Project with ADB assistance (US \$ 39 million) and GEF Wildlife Project (US \$ 4.0 million).

*Project objectives:*

- ♦ Update and publish all management plans prepared (through a participating process including stakeholders) for protected areas.
- ♦ If other basic information like resource profiles is available start preparing management plans through a participatory process.

- (b) **Formulation and Implementation of a National Wildlife Strategy**

*Rationale:*

One of the immediate casualties of industrial and agricultural development has been the country's wildlife. There is an urgent need to reform the wildlife sector not only to meet current and future challenges but also to make this an investment opportunity. Wildlife

Management in Sri Lanka has however not received the due attention of senior decision makers. As a result serious depletion of wildlife resources has taken place and continues to date. The institutions responsible for management of wildlife resources continue to perform poorly mainly due to lack of leadership and institutional coherence. The lack of leadership and a strong institutional framework has resulted in continuous postponement of the preparation of a National Strategy for Wildlife Conservation. This has resulted in unplanned and weak management of the valuable wildlife resources.

It is proposed that immediate action be taken to prepare and implement a National Wildlife Strategy on the lines of the National Bio-diversity Strategy, the National Forestry Master Plan and the National Wildlife Policy. Ideally the Strategy should embrace modern wildlife management concepts and the recommendations made in previous policy documents.

It is strongly recommended that this proposal be taken up for inclusion as a project under the proposed ADB assisted Wildlife Conservation (US \$ 39 million).

*Implementing Agencies:*

The Department of Wildlife Conservation should play the lead role and collaborate with all other concerned agencies and stakeholders to prepare the National Wildlife Conservation Strategy.

*Project objectives:*

- ♦ Assessment and preparing an inventory of the national wildlife resources;
- ♦ Restructuring of the Wildlife Department to reflect national priorities;
- ♦ Identifying critical ecosystems of wildlife that need urgent protection and embarking on such protection programs;

- ♦ Developing Eco-tourism programs to improve conservation of wildlife resources;
- ♦ Innovative approaches to obtain active participation of the private sector and community organisations in wildlife conservation;
- ♦ Developing a staff development scheme to attract and retain quality personnel in the wildlife sector.

## 7.4 Human settlements and Industrial Infrastructure

The current PIP lists environmental management as a sub sector of the human settlements sector.

### a) Strengthen national and sub national agencies to implement pollution control regulations more effectively.

*Rationale:*

The CEA is entrusted with the responsibility for monitoring pollution control and implementing the legal provisions in the NEA. CEA with its limited resources however finds it difficult to handle the increasing number of public complaints related to environmental problems. As a result the CEA is unable to intensely follow-up its control functions with respect to major polluting industries. It is suggested that these regulatory tasks can be performed better if shared with the local authorities. The CEA should continue to concentrate on heavy polluting industries until some other agency like the BOI or the IDB develops the capability to monitor them. Local authorities may be encouraged to accept the task of regulating small and medium polluting industries. This could be done by helping local authorities in time phased manner so that CEA is not burdened with training the local authorities in the entire country at once.

There are several on going efforts on improving the pollution control capabilities of the different agencies. The project on Environmental Monitoring and Sustainable Development through Improvement of Weather and Climatological Services (Rs. 511 million), Industrial Service Centre in Gampaha (Rs. 24.6 million) and Pollution Studies (Rs. 14 million) and Island-wide Monitoring of Ambient Air Quality (Rs. 127.7 million) offer opportunities for introducing the proposed activity.

*Implementing Agencies:*

MFE and CEA should develop a plan to systematically develop the capabilities at the local authorities to monitor and license small and medium polluting industries. It may be advisable to introduce the program selectively.

*Project Objectives:*

Develop a phased program whereby selected local authorities will be trained and assisted to progressively take over the pollution control regulatory tasks.

**b) Institutional support to upgrade environmental conditions in low income urban settlements**

*Rationale:*

People living in low-income urban settlements suffer from many problems arising from poor environmental conditions such as inadequate drainage, lack of potable water and sanitation and vector borne diseases. Lack of adequate sanitary facilities in low-income settlements also affects other residential environments. The UDA estimates that about 35 percent of the population numbering about 550,000 in the Western Province live in such areas and that the problem will grow as industrialisation and urbanisation increase.

The Colombo Environmental Improvement Program (CEIP) and the planned

Sustainable Cities program offer ideal opportunities to transfer the recommendations into implementation.

*Implementing Agencies:*

Urban Development Authority, in consultation with Provincial Councils of the respective areas.

*Project Objectives*

- ♦ Ensure community participation in design and construction of sanitation and water supply;
- ♦ Reform the Rent Controls Act to increase supply of affordable rental accommodation;
- ♦ Provide deeds and generous displacement allowance to low income dwellers to allow road widening etc, before formal land acquisition;
- ♦ Placing public standpipes, wells and latrines under community management and self financing maintenance system;
- ♦ Establishing revolving loan schemes to pay for incremental home improvements.

**c) Encourage relocation of high polluting industries in industrial estates**

*Rationale*

The major industrial pollution control strategy in place is to site high and medium polluting industry in industrial estates with common wastewater treatment, solid waste disposal and other environmental infrastructure. This strategy is highlighted in a Cabinet paper signed by the Ministers of Industry, Environment and Science and Technology. Although about 25 industrial estates are claimed to exist now, many are empty and only a few have high polluting industries.

*Implementing Agencies:*

Ministry of Industries and Central Environmentally Authority

*Project Objectives:*

- ♦ Improved co-ordination in the allocation of these estates.
- ♦ Industries located in approved estates to be exempt from individual EIA or EPL
- ♦ Tax and other incentives to be provided to industries locating in estates.
- ♦ Private sector to be encouraged to set up estates on same terms as public sector;
- ♦ Public sector estates to be set up after a clear survey of demand;
- ♦ Category A or high quality estates to be promoted for high polluting industries only.

**d) Develop and implement a National Solid Waste Management Strategy**

*Rationale*

Formulate and implement a National Waste Management Strategy including domestic, market and industrial solid waste, and role of government, private sector and public. Innovative strategies should focus on charging for waste collection from middle and upper income areas.

Support for a plastic recycling plant, recycling collection points established by public-private partnership with special incentives for prospective investors.

The Environmental Action 1 (EA1) Project now being implemented by the Ministry of Forestry and Environment may accommodate this recommendation by making provisions during the review to be held after one year of commencement of the project. A short technical assistance could be obtained through open bidding process to develop the strategy on Terms of

Reference prepared by the Ministry in consultation with related agencies.

*Implementing Agencies:*

Ministry of Environment and Central Environmental Authority should take the lead role. Close consultation with all provincial councils should be ensured.

*Project Objectives:*

- ♦ A National Solid Waste Management Strategy that collates all ongoing and planned actions.
- ♦ Reduced health hazards to area residents.

**e) Colombo Metropolitan Region Flood Control and Drainage Strategy**

*Rationale*

Two of the major urban environmental issues are flood control and poor drainage. While some programs are underway (e.g. Colombo Environmental Improvement Project and Colombo Flood Control Project), there is still a need for implementing clear strategies to reduce these problems at source. Most flood control focuses on expensive engineering solutions, while better land use planning may be more cost-effective.

*Implementing Agencies:*

Sri Lanka Land Reclamation and Land Rehabilitation Board should take the lead role under the guidance of the Ministry of Housing and Construction.

*Project Objectives:*

- ♦ Formulate and implement Colombo Metropolitan Region (CMR) Flood Control and Drainage Strategy defining role of public and private land filling agencies, and assessing cost effectiveness of soft and hard (technical) solutions.

## 7.5 Energy

None of the energy related projects listed in the PIP have addressed NEAP recommended actions. Therefore the projects prioritised under the energy sector should be reviewed, and wherever possible interventions recommended in the current NEAP included within existing programs. Some immediate interventions that could take place with no significant deviation from current programs are listed below.

### (a) Revision of Clean Air 2000 Air Pollution Control Strategy

#### *Rationale:*

A National Task Force chaired by the Ministry of Environment was appointed in 1992 to co-ordinate the implementation of the Clean Air 2000 Action Plan. But even by June 1996, only 4 of the original 50 actions had been implemented fully due to lack of funds, lack of institutional capacity and lack of infrastructure. What is needed now is to critically reassess the plan and update it with a new list of priorities, budgets and time frames.

The focus of the updated Action Plan should also be on economic instruments and there should be greater integration with institutions in the transport sector.

Since several interim recommendations aimed at improving air quality in Colombo are linked with improvements to traffic problems, it is suggested that the possibility of incorporating some of these recommendations in planned highway projects be explored. For example the current Road Network Improvement Project (Rs. 4,500 million), Outer Circular Highway (Rs. 1100 million) and several projects to construct fly-overs in Colombo may be reviewed to explore the possibility of accommodating some of these recommendations in them.

A number of short term measures to reduce air pollution in urban areas especially Colombo are listed in NEAP Volume II, Chapter on Energy.

#### *Implementing Agencies:*

Urban Development Authority should take the lead role and collaborate with the Ministry of Transport, Central Environmental Authority, Motor Traffic Controllers Department and relevant Municipal Councils to plan out an action program for implementing above recommendations.

#### *Project Objectives:*

- ♦ An updated Clean Air 2000 action plan with specific recommendations to identified agencies.
- ♦ An interim action plan to address the Colombo traffic congestion and related environmental problems

### (b) Promote environmental safe guards on air pollution resulting from burning bio-mass for energy generation

#### *Rationale:*

The country still depends to a large extent on biomass for its energy supply. Extracting fuelwood from forests and its inefficient burning are becoming increasingly environmentally damaging.

Immediate steps should therefore be taken to reduce the extraction levels from forests and improve efficiency of burning it. The proposed Bio Energy Development Project (Rs. 26 million) and The Forestry Research and Information Project (Rs. 36.4 million) of the Forest Department may provide a useful vehicle to implement the following recommended actions:

- ♦ Encouraging the establishment of village wood lots by providing subsidies similar to those given for cash crops and small holder plantation crops;

- ♦ Encouraging large plantation management companies to grow fuel wood to meet their own requirements.
- ♦ Promoting the designing, manufacture and use of improved fuel-efficient stoves.
- ♦ Provide tax incentives and concessionaire loan facilities to investors willing to provide cost effective alternatives (briquettes made up of organic waste, use of wind power and solar energy).

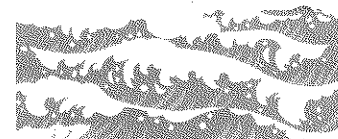
*Implementing Agencies:*

The Ministry of Power and Energy should set up a task force with the active

participation of the Forest Department. The members of this task force should include the Ministry of Plantation Industries, the National Planning Department and Chambers of Commerce and Industries representing the private sector.

*Project Objectives:*

- ♦ Promoting fuel wood production in small-holdings and plantations;
- ♦ Encouraging the introduction of energy efficient, environment friendly alternatives to conventional energy sources like electricity and fossil fuels.



## 8 LAND

### 8.1 Overview

Land is a major natural resource that sustains Sri Lanka's growing economy. So far land has provided space and resources needed for expansion of many economic processes such as forestry, agricultural and plantations, industrial development, fisheries, irrigation and power generation, infrastructure development and human settlements. The pressure on land to meet and continue to accommodate development needs is however fast becoming unsustainable. This is a major challenge for development planners who are concerned with sustainability of economic programs. Hence many innovative reforms are being proposed to address the issues concerning the land resource and its uses.

Sri Lanka has 65,525 sq. km of total land and 1,570 sq.km. of inland waters. Only about 40 percent of the total land area is arable, and only about 26 per cent of the total land is used for agriculture. The surface configuration of the land shows three peneplains or erosion levels: a highland massif, an intermediate zone and a large flat plain. The highland massif rising to more than 2,500 metres in places is situated in the island's south central area. An intermediate zone of upland ridges and valleys surrounds the central massif in most places. The intermediate zone is itself surrounded by a large flat plain, which expands northwards to cover the greater part of the island. The coastal fringe consists of a series of estuaries, lagoons, marshes, sand bars, dunes and other associated features. The continental shelf is generally narrow, less than 20 km. wide and lies at a

maximum depth of 70 metres. The country is underlain mostly by crystalline Precambrian rocks, Miocene limestone and Quaternary deposits.

#### Strengths:

Sri Lanka has fairly stable relatively fertile soils, and a moderate climate with more than twice the world average rainfall. Much of the land is protected from erosion by tree cover provided either by natural forests or tree crops. An assessment made by the Forest Department in 1993 showed that dense natural forests covered about 23.9 percent of the total land area while the total natural forest cover including sparse forests remains at 30.8 per cent of the total land area. Plantations of tea, coconut, rubber and other tree crops and home gardens provide cover for other areas. Environmental friendly practices such as terraced paddy fields have been traditionally used in agriculture.

The fertile soils, plentiful rain and good tree cover have given rise to a well developed agricultural sector. Agriculture has been the backbone of the country's economy and the farmer enjoys an exalted position in Sri Lankan culture. Agriculture made the largest contribution to the country's Gross Domestic Product till the 1990s when it was supplanted by manufacturing industry. The agricultural sector absorbed 45 per cent of the labour force in 1990. This share dropped to 34 percent in 1994. A total of 1.75 million hectares representing 26.7 per cent of the total land area was used for agriculture in 1995. A breakdown of the areas under agriculture is given in Table 1.

**Table 1. Agricultural Land ('000 hectares)**

		(Percentage)
Paddy	732.0	41.8
Tea	193.0	11.0
Rubber	161.0	9.2
Coconut	442.0	25.2
Other Export Crops	66.5	3.8
Subsidiary Food Crops	141.0	8.0
Sugar	10.6	0.6
Tobacco	6.0	0.4
<b>Total</b>	<b>1752.1</b>	<b>100.0</b>

Source: Department of Statistics (1996) Statistical Abstract

Most of the agricultural land is situated in the Dry Zone where problems of erosion and water logging are not so severe as in the Wet Zone.

The land also yields a number of valuable minerals including gemstones, several varieties of clay, silica sands and beach sands, limestone and phosphate ore. These are further discussed in the section on Minerals.

The creation of a separate Division of Soil Conservation in 1950 within the Department of Agriculture and the passing of the Soil Conservation Act in 1951 and the amendments to Act in 1996 were major landmarks in soil conservation efforts of the country. The Soil Conservation Division identified and proclaimed erodible areas. This Division however never received the financial or the human resources support to implement the provisions of the Soil Conservation Act. The devolution of power to the Provincial Councils further reduced the effectiveness of the Soil Conservation Division.

#### **Weaknesses and Threats:**

The country's population has nearly tripled during the past 50 years from 6.5 million in 1946 to about (estimated) 18.3 million in 1996. Demand for more food production has increased the pressure on the land. The land:man ratio is 0.38 hectares per person and the arable land:man ratio is only 40 per cent of this value.

Soil erosion and land degradation are widespread, occurring in all the agro-climatic zones at different intensities. These problems are more acute in the hill country where the land:man ratio is even lower and the rate of soil erosion is higher. Soil erosion, particularly in the hilly watersheds not only harms local crops, but also reduces power generation capacity and irrigation capacities by reducing the water retention capacity through the deposition of silt in them. The costs of soil erosion can therefore be extremely high, but are difficult to estimate.

Soil impoverishment is a less dramatic but a very serious issue. The loss of organic matter and biological activities in the soil, growing of "soil exhausting" crops like tobacco and exposure of soil to the elements through removal of ground cover have reduced soil fertility. High income generating (high value) crops such as potato, tobacco and vegetables are encroaching into very vulnerable areas of the hill country with hardly any soil management techniques being used because of their high initial costs coupled with eagerness to obtain maximum profits. Many of these farmers have the means to invest in conservation means, and will do so if provided adequate motivation. Government fiscal and trade policies had sought to help local potato farmers by imposing high tariff rates on imported potatoes. The severe adverse environmental impacts of potato cultivation were not seriously considered in arriving at these decisions.

The actions of property developers have also contributed to land degradation. Increased soil salinity and water logging are still localised issues but may in the long term become more widespread if adequate corrective action is not taken. An underlying cause of inappropriate land use and the depletion of the land resource has been the absence of land use plans and non-adherence to such plans even when they are available. This can be attributed largely to lack of political commitment.

#### **Opportunities:**

A number of important steps have been taken to increase the productivity of land and agriculture. The government has realized the importance of



creating a suitable environment for the private sector to invest in soil conservation and other longer-term management measures. Long-term leases have already been awarded to 23 plantation companies. Small-holders are encouraged to group themselves into private companies to ensure better management.

Improved economic returns have resulted in increased investments and improved management of the estates. Reforms have been introduced in Agricultural Marketing, as in the paddy sector. The fertilizer subsidy has been refocused and the wheat flour subsidy reduced. Seed production is being privatized, greater private sector investment in agriculture has been promoted and land tenure is being strengthened.

These reforms should encourage the investment of more resources into and improved management of the land. This however requires appropriate incentives.

The world price levels for tree crop products has been high. This should encourage investment in tea, rubber and coconut plantations with benefits of reduced pressure on natural forests and increased cover for the soil against erosion. It is however important to provide adequate incentives to induce plantations to adopt soil conservation measures during the first few years of new planting since the bare soils at this stage are most vulnerable to erosion.

A number of innovative conservation farming technologies and institutional approaches for agriculture are being developed to provide high economic benefits and protection for the environment. These include crop-stock integration, greater use of organic fertilizer, Sloping Agricultural Land Technology (SALT) which uses leaf mulch, and integrated pest management (IPM). The adoption of participatory land use planning and watershed based land use planning are being promoted on the institutional side.

## 8.2 Issues

### i) Soil Erosion and Soil Impoverishment

Physical losses of soil in the upper catchment area of the Mahaweli Ganga have

been estimated at 132,000 tons per year. The Polgolla reservoir which collects substantial quantities of sediment from the Mahaweli watersheds was reportedly silted to the extent of 44 per cent of its total capacity within 12 years of its commissioning. The sedimentation rate of the Rantembe reservoir (4.3 percent per annum) is reported to be even higher than at Polgolla. The situation is similar in other major hydro-power reservoirs. The cultivation of crops on steep slopes and banks of water ways without any conservation measures, the reduction of forests in critical places and inappropriate land use practices such as growing potatoes and tobacco in the hill country have caused severe soil erosion and landslides. The results have been significant reductions in the operational life-times of the country's hydro-power reservoirs with grave consequences for the national economy.

The extent of soil erosion also depends on the agro-ecological zone (land type and climate), on the crop, and on the cultivation practices. Kandyan home gardens (mixed cultivation), one year old tea plants nourished with mulch, and forests showed the least erosion. Erosion was heavy in the upcountry Wet Zone with clean weeded crops cultivated without any conservation measures. Soil losses caused by potato cultivation in the Nuwara Eliya district have been estimated at 15 metric tons per hectare during the Maha season and 09 metric tons per hectare during Yala.

The main causes of soil erosion can be traced to policy failures, institutional failures and inappropriate economic incentives:

- Policy failures include the tendency of the government to use land as a convenient denominator for alleviating the problems caused by unemployment and poverty. Lack of employment opportunities in other sectors has forced people to grab whatever land has been accessible to

them. Highly sensitive lands such as river and stream bank reservations have been encroached on or allocated for most unsuitable practices through political shortsightedness.

Institutional failures include the lack of clarity in institutional responsibilities towards coordinating land management. No serious effort has been made to implement the Soil Conservation Act of 1951. Dilution of institutional structure has been a major cause of the failure to implement this Act. This has been exacerbated by the lack of any effective land use plans and non-adherence to the few that were available. The responsibility for land management has over the years been spread over a number of ministries making implementation difficult.

Inappropriate economic incentives include fiscal and trade policies that favor unsuitable land uses. For example the potato trade is an artificial market that has successfully lobbied for protection from imports. The consumers suffer as a result of higher prices and potato farmers benefit only marginally from increased prices, while the potato traders reap most of the benefits. The environmental consequences are disastrous as potatoes have been identified as a highly erosive crop. These tariff barriers on imported potatoes will have to be removed soon under the SAARC trade agreements, but their removal should be considered immediately.

Other major causes of land impoverishment are insecurity of tenure and lack of incentives for the management of land in small-holdings. Chena or slash and burn cultivation is practised usually on encroached state forest lands. The fallow period now allowed, being too short for any significant restoration of the forest, results in severe soil degradation.

### 8.3 Recommendations

The economic development of Sri Lanka still depends largely on the productivity of the country's land resources. How this resource is managed will in turn determine its productivity and sustainability. To make land productive its characteristics and capabilities must be well understood. Land should be used within the limits of these capabilities.

#### i) Improve the institutional and policy framework for promoting land management

- ensure that adequate attention is paid to land management and soil fertility;
- Assess the effects of recent agricultural reforms and the increased role of the private sector in agriculture in land management; and
- Estimate the cost of soil erosion to the economy and to key state agencies like the Irrigation Department and the Ceylon Electricity Board.

#### ii) Develop and implement effective mechanisms for promoting spatial land use planning in the context of a liberalized land market

- Finalize and implement the National Land Use Policy recommendations presented in the National Agricultural Policy framework of the Ministry of Agriculture and Lands. The land use policy should be formulated and implemented in consultation with sub-national bodies. Restrictions must be placed on the utilisation of land, including privately owned lands, the guiding principle being that impacts of land use are felt by the rest of the community as well.

- Formulate and implement a Land Use Act that incorporates also the important features of the Soil Conservation Act.
- Evaluate and implement in order of priority the recommendations made by the recent Land Markets study on the land tenure system including legal measures and institutional developments and implementation programmes necessary for a rural land market to function openly and effectively.
- Promote watershed and river basin planning to address the issue of soil erosion in critical catchments. Carefully monitor and regulate the use of land lying within watersheds.
- Identify critical watersheds and implement watershed management measures.
- Use Community based Resource Management as a strategy in the implementation of land use policies.
- Develop guidelines for use by the provincial and local authority decision-makers to help them evaluate social, economic and ecological appropriateness of proposed development activities.
- Establish an institutional mechanism to facilitate implementation of this process by the agencies responsible for land management and utilisation.
- Expedite implementation of the Land Title Registration Act as a policy for granting secure land title.
- Proclaim areas that are highly vulnerable to soil erosion, land slides and degradation as conservation areas.

- Formulate economic measures to discourage use of such land in any environmentally harmful manner.

**iii) Promote innovative natural resource management projects in critical watersheds**

- Formulate a plan to introduce land improvement and conservation practices
- Implement soil rehabilitation through forestry and other agronomic practices
- Mandate the use of soil conservation practices in all those public and private activities that disturb the soil structure.
- Rehabilitate irrigated lands which have developed soil salinity and unproductive tea lands
- Implement a policy for stabilising chena lands.
- Promote the adoption of conservation farming techniques such as crop-stock integration, Sloping Agricultural Land Technology (SALT), Integrated Pest Management (IPM), cover cropping, Kandyan home gardens and biological nitrogen fixation.
- Involve the private sector in land management practices through regulation as well as incentive based programs.

**iv) Provide economic incentives and information for Land Management**

- Expand development incentive schemes for small-holders to use biological methods to protect crops.

- Encourage private sector organisations engaged in outgrow schemes to promote the use of soil conservation measures by small-holders ;
- Implement an effective extension program to promote the use of environmentally sound soil conservation practices such as mulching with biomass and inter-cropping with legumes.
- Train and set-up soil conservation teams within farmer associations to provide advisory services to farmers at low cost.
- Use mass media to promote awareness of the value of land management.
- Review costs and benefits of restricting potato imports and identify the beneficiaries of this restriction. Phase out protection for local potato cultivation if costs are found to be higher than benefits.
- Introduce an incentive scheme for crop-stock integration projects that improve the environment.
- Implement regulatory and management measures to arrest degradation of forest and natural

ecosystems where necessary after conduct of research

- Monitor phenomena such as forest die back, salt water intrusion, land subsidence, landslides and desertification that may be accelerated by human intervention.
- Explain to policy decision makers the principles that should be applied in watershed management and in designing and implementing land use activities. Encourage land use monitoring using modern technologies available at national institutions.

Many of the above recommendations have already been made in the studies conducted under:

- The Programme for Sustainable Management of Land Resources (UNDP)
- The Land Titling and Related Services Project (World Bank)
- The Land Markets Study (World Bank)
- The Registration of Titles Act and draft Survey Mapping Act (Aus.Aid), and
- The Agricultural Policy Framework (National Development Council)



## 9 WATER RESOURCES

### 9.1 Overview

Sri Lanka is well endowed with an abundance of surface water resources. The mean annual rainfall of around 2,080 mm. (Arulanathan, 1985) is almost three times the world annual average rainfall of 750 mm. Water is a crucial constraint in land development and agriculture because of "the inefficient management of available rainwater". Water Resources Management (WRM) in the context of water scarcity and increasing demand is therefore a major challenge. The term "Dry Zone" (used to denote the land outside the "Wet Zone" in the country's southwest quadrant) is a misnomer because "rainfall during certain months in the Dry Zone far exceeds that in any other area in Sri Lanka." (Land Commission, 1987).

About 70 percent of this rainwater is lost by surface evaporation and through transpiration by plants (evapo-transpiration); a portion seeps into the ground, while the remainder flows as surface run-off into reservoirs, lakes, marshes, ponds, streams, rivers and finally into the sea. In the Dry Zone where over 50 percent of total runoff is utilized, there is limited scope for major development of supplies (ADB-USAID, 1994). In the Wet Zone nearly 79 percent of the run-off escapes into the sea.

Harnessing of the rainwater for rice (paddy) cultivation and domestic use has been practised in Sri Lanka from ancient times. The other major uses of water at present are in power generation and in industry. About 70 percent of installed power generating capacity is in hydro-power plant, but in a year of normal rain more than 90 percent of the power generated is supplied from hydro sources.

Water related projects in Sri Lanka, mainly irrigation, hydro power generation and town supply schemes, presently absorb about 22 percent of total public sector investment.

#### Strengths:

Sri Lanka is rich in water resources that include 103 rivers, more than 20 major wetlands, a sophisticated system of major and minor irrigation systems and significant groundwater resources. The country's southwest quadrant receives rain from both monsoon periods and is referred to as the Wet Zone. The Dry Zone comprises roughly two thirds of the country that receives very heavy rain during the period mid October to mid-January and very little at other times. A part of this rainwater is impounded in reservoirs and used for irrigation during the dry season and for power generation. An Intermediate Zone has been demarcated between the Dry Zone and the Wet Zone. Minor (village) tanks which are present in large numbers in the Dry Zone serve the extremely useful function of recharging (groundwater) aquifers. This process is very effective when these (minor) tanks form part of a cascade system.

The major freshwater wetland bodies include the irrigation and multipurpose reservoirs, the inland sections of rivers and streams, riverine marshes like the villus and seasonally flooded grasslands associated with the Mahaweli River and the numerous flooded paddy fields (rice paddies). Many of the important wetlands are situated in the coastal belt where the water is brackish. Coastal and marine waters are not discussed in this chapter, since they are dealt with in the chapter on "Coastal Resources".

Nearly all the country's major rivers have their sources in the central highlands and flow in a radial pattern into the sea, the notable exception to this pattern being the longest of them, the 335 km long Mahaweli Ganga which drains about a sixth of the country's total land area. The Mahaweli Development Program included the completion of four of the country's largest reservoirs, along with transbasin diversion irrigation systems and the establishment of downstream human settlements. Nearly half the country's total hydropower produced is generated by the Mahaweli system and Mahaweli lands yield one fifth of the country's total paddy production.

The quality of the groundwater is relatively good except in urban areas particularly where the layer of soil is thin and the water table high. These conditions promote pollution of the groundwater. Heavy use of agricultural chemicals has led to the groundwater in some areas like the Jaffna peninsula having a high nitrogen content.

#### **Weaknesses and Threats:**

Water demand is growing and major water conflicts are developing between different users. Irrigation is the major water user, followed by hydro-power generation, while a smaller portion is used in industry and for domestic purposes. Shallow wells are the sources of domestic water supplies in rural areas. The development of deep tube well technology has enabled the use of ground water for irrigation in parts of the Dry Zone.

One of the main causes for water conflicts and inefficient water allocation is the lack of coordination between the large number of government agencies concerned with water conservation including ministries and government departments. There is no system for allocating water. The approach to resolving conflicts relating to water is ad hoc and on a case by case basis. The institutional arrangement will become even more complex as decentralization of powers progresses since rivers are the most

important inter-provincial natural water sources. Unless clear principles are agreed upon now for allocation of the available water, major conflicts could develop later.

The other major threat is pollution of coastal and inland surface and ground waters by human and industrial wastes. Pollution is severe in many urban and coastal areas especially where the soil is shallow and the water table high. Groundwater pollution exacts a high cost in lowered human health and in expensive treatment measures such as boiling and filtering water before drinking. The rapid degradation of watersheds, particularly upper watersheds, is a threat to the sustainability of water resources.

#### **Opportunities:**

Water has traditionally played a central role in Sri Lankan cultural and religious activities. Historians studying Sri Lanka's ancient hydraulic civilization have marveled at its engineering technology and water resource management systems (NARESA, 1991; Dissanayake, 1992). The temple, the village and the tank (reservoir) were the cornerstones of the early "hydraulic civilization". The traditional concern for clean water needs to be restored in order to ensure that water resources are used efficiently. The government has established a Water Resources Council which will formulate a national strategy for water management and promote integrated water management.

## **9.2 Issues**

### **i) Diminishing Water Supplies**

There is evidence of a long term decline in rainfall in the Central Province. This seems to be a part of global climate changes related to global warming. There are also localized changes in water run-off rates and water yields as a result of land use changes. The loss of forest cover, and of topsoil through erosion has greatly reduced the capacity of the soil to absorb rainwater and the storage

capacity of the major reservoirs. Some research suggests that fast growing timber species like Pinus and Eucalyptus have affected water yield rates in certain key catchments. The net result is heavy run-off and flash floods during the rainy season and droughts during the dry season. The country has faced severe droughts during 1982-1983 and 1994-1995 when the failure of the monsoon rains led to a sharp drop in agricultural production, particularly in rice production during these years.

**ii) Lack of a rational system for water allocation between different users**

The increasing demand for water and the diminishing supplies require that water policy makers accord high priority to the economical and productive use of the available water resources. Water demand management is crucial to such use of water resources.

Competition for water is increasing between the irrigation, power, industrial and domestic sectors. Access to water generates significant economic and other benefits, so that bitter political and social conflicts arise in the absence of a clear and agreed system of water allocation. This can be seen at a micro level in many irrigation schemes where lack of water can condemn farmers to poverty and can lead to a significant degree of water stealing and vandalism of irrigation structures. Political conflicts have also arisen at the national level through lack of access to water as in the Hambantota district of the Southern Province where a shortage of water has hampered development. The most efficient unit of water allocation is the river basin. A clear allocation system for different water uses must therefore be developed for each river basin. This system of water allocation needs to be based on clear economic and social principles.

Competition for water is already apparent between users such as irrigation, power, industry and residential demand. More than 70 per cent of the available water is used for irrigation of rice (paddy) fields.

Paddy cultivation which is extremely water intensive is also the most extensively practised. The question is beginning to be asked whether the creation of such large reservoirs at such environmental cost to provide irrigation for paddy fields was a wise decision. The demand for water for the other users including the industrial and domestic sectors has also increased sharply over the years. Domestic water consumption is increasing as urban populations grow and new pipe borne water schemes come into operation. Hydro sources provide about 85 percent of the electricity presently consumed in Sri Lanka, although this proportion is expected to decrease with the installation of more thermal power generating units. At present there is sharp competition between irrigation and hydropower generation for the available supplies of water in certain Mahaweli areas. The timing of the release of water used for power generation is different to the time water is needed for irrigating the paddy fields. This competition is expected to increase in the years to come.

The lack of a rational system of allocation is hampered by conflicts between the large number of government agencies involved in water management. This includes Ministries in charge of the subjects of Agriculture, Irrigation, Power, Industrial Development, Environment and Forestry, Health and Local Government. The other agencies involved in water management are the Departments of Irrigation and Agriculture, the Central Electricity Board, the Water Resources Board, the National Water Supply and Drainage Board, the Central Environmental Authority (CEA) and the National Aquatic Resources Agency (NARA). More than 40 government agencies are charged with responsibilities for watershed and land management. Coordination of their activities and jurisdiction has proved difficult.

Irrigation is the responsibility of the Department of Irrigation and the Mahaweli

Development Authority. Hydropower is generated by the Ceylon Electricity Board and the Mahaweli Authority. The Mahaweli Authority controls seven major reservoirs that have an installed generation capacity of more than 670 MW and supplies irrigation water for more than 120,000 hectares of paddy lands. The National Water Supply and Drainage Board supplies water for domestic and industrial use. The Water Resources Board administers the subject of ground water supplies and engages in the installation of tube wells and the construction of dug wells on a commercial scale. The International Irrigation Management Institute is involved in research on water use and its managerial aspects. The National Aquatic Resources Agency (NARA) is engaged in research on water quality and aqua-culture. NARA, the National Building Research Organization (NBRO), the Sri Lanka Institute of Fundamental Studies (IFS), the Central Environmental Authority (CEA) and the Ceylon Institute of Scientific and Industrial Research (CISIR) have capability in water analysis and other aspects of water supply and use including pollution. There is however little coordination between them. The management of water data and information is critical for sound water resources management. This function is however often ignored and uncoordinated.

The focus on the use of water for development activities, mainly irrigation and hydropower generation and for domestic use resulted in the establishment of a number of institutions and the enactment of a number of laws concerned primarily with water. More than 50 legislative Acts presently deal with different aspects of water. The ambiguity and overlap of authority shown in these statutes have resulted in duplication, confusion and ultimately ineffective law enforcement and regulation. This complex

situation has been further complicated by the devolution of powers to Provincial Councils to enact their own parallel statutes.

While the scope of existing environmental legislation is wide enough to provide adequate environmental safeguards, the standards set are unrealistic and the institutional capacity is inadequate to enforce them. These factors and the lack of resolve to regulate through decentralized authority have made such regulation ineffective.

As the population grew and the demands of development increased, the existing institutions were pressurized to focus more on development and less on conservation and sustainable use of the country's water resources. The linking of the right to water with the rights to land has also adversely affected the long term prospects for water resources by enabling local authorities and individual officials to make arbitrary decisions on water extraction that have adverse impacts on water resources. Regulation and law enforcement have suffered particularly where decisions of a legal nature are enforced through a delegated or decentralized arrangement. This fact is illustrated by the limited achievements of such arrangements like the District Agricultural Committee (DAC) and the Mahaweli Water Panel in the areas of environmental conservation and pollution control. The emphasis even at the central policy making level has been on monitoring the development process and providing policy support for such development. Although there is provision to address environmental policy issues comprehensively the organizations responsible for such activities, because of their nature and functions, view environmental concerns as being of little importance. The development programs of many state agencies therefore contribute not only to over-exploitation of water, but also to its degradation.



Even in the water services sub-sector, for example in water supply, environmental issues are considered only as far as the immediate periphery of the operation of the service, not beyond to the water source itself.

Rational water allocation is also hampered by failure to understand the complex nature of the water cycle and underground water flows. Because water can be reused many times, the concept of water "use" is a very complex issue. For example, as much as 70 percent of the surface run off is estimated to be "used" for irrigation. However about 10 percent of the water used for irrigation seeps down to replenish groundwater supplies (Mosley, 1977).

### iii) Low Efficiency of Water Use

The current pattern of water use within each sector (irrigation, power generation, domestic, industrial etc.) is often not efficient, that is, rarely does each unit of water generate the maximum economic benefits. Low efficiency of water use increases the fast increasing water deficit in the Dry Zone and forces development of new water sources. Such development not only requires heavy capital investment but also increases the stresses on the environment. Efficient water use is particularly important in irrigation, the largest consumer of water, where demand for water already exceeds supply throughout the Dry Zone. Present irrigation water use efficiency is rated to be only about 50 percent of what is feasible.

The Accelerated Mahaweli Development Project Area alone has an estimated deficit of 200 million cubic metres. The effects of this deficit are felt particularly by farmers and the environment in the lower reaches (tail-end) of the distribution system, but not only by them. They are experienced by all

farmers who fail to produce two crops of rice in a year because of a lack of irrigation water. There are at present 535 major irrigation schemes, each serving more than 80 hectares and nearly 18,000 minor irrigation schemes.

One of the main concerns is that paddy is a relatively low value crop, although it does have other benefits such as its long storage life. Government agricultural policy has always focussed on the goal of self-sufficiency in rice. Pursuit of this goal has resulted in a sharp reduction in the extent of forestlands and the inundation of large extents of productive and potentially productive cropland to create irrigation reservoirs. The view is now expressed that it would have been more prudent to channel at least part of that investment into rain-fed agriculture. Reform of irrigation systems is needed to improve their efficiency.

### iv) Lack of management of groundwater resources

Surface waters have often been used to their limit in the areas of low rainfall. Recourse has then been made to the use of groundwater. Lift irrigation through the use of tube wells has been practised without regulation in the Jaffna peninsula, the North Central Province and the North Western Province, particularly in Kalpitiya. Effective monitoring is essential to avoid over extraction of groundwater and its pollution. Polluted ground water sources (aquifers) are extremely difficult to clean.

When the rate of extraction of groundwater exceeds the rate of replenishment of the aquifer, saline or brackish water flows in to fill the vacuum. The chloride content of the water thereby rises. Intensive agriculture leads to the leaching of some of the excess fertilizers and pesticides into the

soil and thence into the groundwater. Studies have shown contamination of the aquifers in Kalpitiya and Jaffna. At present no agency is responsible for groundwater management and very little data is available on groundwater quality and availability.

**v) Declining water quality**

Water pollution is becoming a major problem in certain urban and agricultural areas. The quality of water in irrigation tanks and other water bodies has been affected by the inflow of excess chemical fertilizer which promotes eutrophication and algal growth. Beira Lake presents an example of such eutrophication caused by algae thriving on the sewage flowing into the lake. Pollution of water sources from non point sources such as paddy fields agricultural plots and plantations is difficult to control.

Faecal contamination of groundwater is reported from many districts, especially from densely populated urban areas and areas where the layer of soil is thin. The recent rapid industrial development has resulted in the release into the environment of untreated or inadequately treated effluents and even solid wastes thrown into canals, streams, rivers and other water bodies. Natural fluoride levels have been found to be high in certain areas of the Central Province, posing a serious threat to human health. Shrimp farms in the North Western Province are another source of water pollution are discussed in vi)

**vi) Health Problems Associated with Water**

The sources of drinking water in Sri Lanka are:

- Pipe borne water
- Protected wells
- Unprotected wells and
- Other sources (tanks, streams etc.)

The ground water in nearly all urban areas is polluted and few users boil or otherwise sterilize their drinking water. Many of the wells are situated close to toilets or are shallow with a relatively thin layer of soil, which is inadequate to filter the harmful microorganisms. Typhoid (enteric) fever and cholera are among the dangerous water borne diseases. Stagnant pools of water provide breeding places for mosquitoes which transmit malaria, filaria, dengue fever and encephalitis. The rapidly increasing level of surface water pollution is a serious health hazard. Poor storm water drainage in urban areas is an irritant and a health hazard. Recommendations for reducing the incidence of water borne diseases are contained in the chapter on Environment and Health.

**vii) Shrimp Culture**

Shrimp farming is a rapidly expanding industry in the North Western Province. A recent survey estimated the total number of farms to be about 925 covering an area of about 2,300 hectares. These farms discharge their effluents to the same water bodies that are the water sources. Shrimp farms also tap ground water to reduce the high salinity levels of the water in the ponds especially during dry weather.

**viii) Inland fisheries development**

The irrigation and multi-purpose reservoirs in the Dry Zone provide habitats for freshwater fish. Freshwater fish production increased sharply with the introduction of cichlid (e.g. Tilapia) and cyprinid fish (e.g. Chinese carp) varieties from abroad. These sources now provide about 20,000 metric tons of fish per year representing 20 percent of the total fish catch.

Government patronage for the freshwater fishery was withdrawn in 1990 and fish

breeding and stocking stations were closed down. Patronage was restored in 1995 and today there are 14 fish breeding centres. Ornamental fish exporters in Colombo give the juveniles of some of their export species for inland farmers to rear to the adult stage and then buy back stocks. This has become a useful additional source of income for farmer families.

There is still much scope for breeding both food fish and ornamental fish in inland waters that needs to be exploited. Fish is the major source of protein in Sri Lanka. In spite of the opportunities available for fish culture in inland waters, and for capture of sea fish, a high proportion of children suffer from chronic or acute protein malnutrition.

### 9.3 Recommendations

#### i) **Create a single body to guide and coordinate the activities of the different institutions involved in the supply, use and management of water.**

It is now accepted that user based allocation of water will be more effective and efficient. Translating this concept into action requires significant institutional changes. The first step in this direction will be to set up a central authority that will develop Terms of Reference for itself and for each other agency dealing with water use. All the agencies should pay particular attention to water demand management.

The government has implemented the recommendation to "establish a National Water Resources Council supported by a full-time Secretariat. This Council would be a high level advisory body consisting of government agencies and groups concerned with water resources. It would be responsible for the development of a national water resources policy, water resources law and a (water resources)

Masterplan". (ADB/USAID) The National Water Resources Act which is under preparation will define the principles governing the management and allocation of water resources.

It has been recommended that the subjects and functions must be assigned to the appropriate ministries and that ministries performing similar functions must be amalgamated (ADB, USAID, 1994). A similar rational division of labour has been recommended for the Water Supply and Sanitation Sector. The functions of individual organizations need to be clearly defined to avoid overlapping.

#### ii) **Formulate a set of national principles for water allocation and apply them in allocating water from any of the major river basins**

Water has been termed a "unitary resource" characterized by complex inter-linkages with many elements of the economy, society, and the bio-physical environment. A set of principles governing water allocation therefore needs to be drawn up in consultation with the concerned government agencies and the water user groups. To ensure comprehensive water resources management, water must be managed holistically and efficiently. Water resources management must take account of interdependencies among sub-sectors; it must simultaneously conserve aquatic ecosystems and the wider bio-physical environment. Efficiency is important because water is an increasingly scarce resource, which must therefore be used efficiently. Management of the watershed or catchment is crucial to the management of the water supplied by it. Water quality, the severity of floods, and the duration of low water flows are all adversely affected if the watershed is not sustainably managed. The watersheds of the country's 103 rivers,

as stated earlier, cover more than 90 percent of the country's total land area.

Within a river basin, allocation of water by the users themselves backed by effective administrative support can be a very efficient method since the users have a direct stake in the efficient use of the available water. A user group could be entrusted with the management rights to a canal that feeds the area which the group is cultivating or where their industries operate. This group would allocate the water among themselves. The recovery of the costs involved in this allocation can come from a number of sources. In India such organizations having management rights to certain canals have sold subsidiary rights to the use of the water for purposes other than irrigation such as fishing or the rearing of livestock. (Meinzen-Dick and Jackson, 1995)

**iii) Implement reforms to ensure that water is allocated efficiently within each sector**

Water needs to be allocated in a manner that ensures the highest possible social benefit because of its scarcity, the high cost of diversion and the need for sustainability. The focus should be on allocating surface water. An incentive provided for water conservation would also encourage efficiency. The first step in increasing efficiency in the use of water is to recognize that water is an economic good and therefore has an economic value. Water must be incorporated into a market system and a realistic price assigned to it. This price must reflect its true opportunity cost.

Efficiency of water use can also be improved by the participation of beneficiaries and users during all phases of management, decentralization of decision making; by privatization of water sector enterprises; and by targeting economic

instruments such as service and water charges, and subsidies at user groups. Water sector management must be completely businesslike, and the standards of integrity and transparency expected by the community at large must be maintained.

Two major reforms are needed in the largest user sector of irrigation. The focus must move away from large scale irrigation projects (for rice production mainly). These large irrigation schemes have absorbed 30 percent of the country's total public investment since 1970. There is a need to divert more resources to rain-fed farming, smaller irrigation systems such as cascade tanks, and for reducing the proliferation of *Salvinia* weed in tanks (reservoirs). Secondly, large scale irrigation must be managed like any other large utility such as electricity or pipe borne water. The Irrigation Department should develop a commercial approach to issues and strive to improve the attitude of the farmers who practise irrigation. Converting irrigation into a utility requires major reforms aimed at improving management.

**iv) Design and implement a program for monitoring water quality**

Monitoring the quality of water and analysing the data is important for planning, developing and managing water resources. While some data has been collected, there is no long-term comprehensive water quality monitoring program. Given the large number of institutions involved the program will have to be drawn up carefully, covering both ground and surface water.

**v) Develop a Strategy for groundwater management**

Underground aquifers, once polluted, can take generations to recover. The Water Resources Board takes groundwater samples when drilling new wells, but no

systematic monitoring of groundwater takes place, nor are there any controls on groundwater extraction.

The need for a groundwater management strategy is greater than for surface water since surface water extraction is generally

controlled by government agencies, while groundwater extraction is by the private sector. Groundwater extraction is also much less visible and harder to regulate than surface water extraction.



## 10 BIOLOGICAL DIVERSITY

### 10.1 Overview

Sri Lanka has very high endemism per unit area and is listed as one of the 18 biodiversity hotspots in the world. This diversity is found mainly in the forests and aquatic environments but spreads across the agricultural lands and home gardens. The total forest cover in the country is estimated to be about 24 percent of the total land area (SNBAPP, 1994).

#### Strengths:

Historically, Sri Lankan society has respected the existence and value of plants and animals. The inherent cultural values are a source of considerable strength for the attempts at biological diversity conservation in the country.

Two separate institutions namely The Department of Wildlife Conservation and The Forest Department guided by legislation, has jurisdiction for forest lands covering nearly 20 percent of the total landmass.

Biological diversity outside the protected areas are found in agricultural lands and in aquatic ecosystems in and around the island. A total of nearly 2 million hectares of land is under agricultural and plantation crops. Setting up of the Plant Genetic Resources Center for the conservation of germplasm and several botanical gardens in the wet zone area of the island for ex-situ conservation of plant materials have helped to prevent complete loss of some plant genetic material. A greater effort must however be made to identify and preserve some of the endemic genetic strains that have developed special features to live under local conditions. For example, local breeds of cattle have developed higher genetic disease resistance and the ability to digest coarse grasses.

The extensive freshwater and brackish water wetland systems are another unique feature of Sri Lanka's rich biodiversity. These wetland ecosystems provide beautiful variation in the landscape of the country. Many invertebrate and vertebrate species especially birds are associated with these wetlands. The direct link of these fresh water wetland systems to food production have made these areas subject to some form of informal management. Attention however needs to be paid to understanding the biological diversity associated with them and their direct relevance to people's food cycles.

Sri Lanka's diverse coastal ecosystems provide an array of endemic fish and coral species. Two marine sanctuaries have been declared, but several other areas with high diversity of corals and fish remain unprotected. Most of these areas offer good opportunities for economic development while preserving the biological diversity in them. What is needed is innovative thinking and flexibility in approach to the management of these areas.

#### Weaknesses and Threats:

Sri Lanka has one of the highest population densities in the world. The economic and social pressures arising from the increasing population have resulted in the loss of many forest lands with considerable biological diversity. This is especially so in the wet zone of the country where only about 7 per cent of the area remains under forest cover (NCR, 1995). Lack of a national land use policy and ad hoc land alienation programs have resulted in many valuable forests being converted to agricultural lands and settlements. This pressure from development is felt by both protected and

unprotected lands. Many protected areas are still not demarcated and continue to be subjected to various forms of encroachment.

Habitat destruction whether forests, mangrove swamps or coral reefs pose a serious threat to the country's biological resources including its endemic plant and animal species. Mangroves are destroyed to construct shrimp farms, live coral reefs are mined for their limestone and water bodies are being filled for urban development. The protection of habitats and ecosystem processes is a prime necessity.

The protected areas are not adequately managed. The institutional capacities of the two departments in charge of state owned forest lands, namely the Department of Wildlife Department and Forest Department, and the coordination between them need to be strengthened, especially since they are now placed in two separate Ministries.

Sri Lanka has a large body of statutes which include The Fauna and Flora Protection Ordinance, The Forest Ordinance and the National Environment Act, the Coast Conservation Act and the Fisheries Act. These laws however need to be strengthened in some respects to be adequate for protecting the country's biological resources. Sometimes there is overlap and even conflict between statutes. An activity prohibited by one Act is freely permitted by another. The Fauna and Flora Act is at variance with the Fisheries Act in respect of the export of fish and other aquatic organisms. Weak law enforcement resulting from the absence of an adequate administrative mechanism is another major factor. The failure to protect the country's biological resources is evident in the lucrative trade being carried on in the export

of live ornamental fish and plant species collected in the wild. Many cases have been detected by the Customs Authorities of attempts to smuggle out plants and animals and their products such as skins and fruits ("Bio-piracy"). Unsustainable extraction of plants and animals including ornamental fish and invertebrate species from the wild is done for the local market as well as for export. Cane, for example, is extracted from forests at unsustainable levels for production of rattan for the local furniture industry.

Although some segmented efforts have been made to involve the community in the management of natural resources, much work remains to be done in this area. Institutional responsibilities of the different government agencies are not well carved out. For instance there are institutional gaps in regard to the protection of wetlands.

The information bases on the biological resources and their use remain fragmented. Especially the indigenous knowledge associated with biological resources needs to be urgently recorded. However, the country must be made aware of the threat of global piracy of such information and of biological resources themselves. It is important to prepare our institutional and legal system to meet future trade related threats and opportunities presented by biological prospecting. However lack of information and data on the resource remain a major hindrance to the formulation of such measures.

The introduction of exotic species of plants and animals can pose a threat to local species.

The introduction of imported food fishes into lakes and reservoirs is reported to have substantially reduced the populations of

local fish species. The possible introduction of Living Modified Organisms (LMO) is also a matter of concern.

**Opportunities:**

The Biodiversity Action Plan (BAP) now under preparation has identified the major issues affecting biodiversity in Sri Lanka and has proposed a comprehensive set of recommended actions. It is therefore recommended that the BAP be implemented in full since it addresses biodiversity conservation issues in the Forestry, Wetland, Coastal and Marine, and Agricultural systems in detail.

## 10.2 Issues

### i) Deforestation

In the absence of a land use policy framework, clearing of forests for settlements and other development purposes is being carried out on an ad hoc basis. A land use policy is a pre-requisite for protecting the environment.

Both legal and illicit clearing of forests are destroying ecosystems. This problem has reached if not gone beyond the critical point. Many fragmented wood lots in several wet zone districts still retain valuable biological resources. As these forest patches are too small for the Department of Forests or the Wildlife Conservation to be involved in managing them, there is an urgent need to develop a different strategy that will involve local residents.

### ii) Loss of traditional crop varieties:

The country has developed few high yielding varieties of rice after extensive agricultural research over many years. Six of these new varieties have effectively eliminated many traditional low yielding varieties of rice that had high resistance to

drought and competed successfully against weeds. A Plant Genetic Resources Centre has recently been set up at Peradeniya with grant assistance from JICA to preserve the traditional and the wild varieties of rice in Sri Lanka. Similar situations in other crops and livestock are inevitable (e.g. orchids, fruit trees, flowers, spices and domestic animals) unless appropriate actions are taken to conserve these gene pools. The country has also lost a number of fish varieties through excessive collection and through destruction by exotic fish species introduced into inland water bodies.

### iii Overexploitation of marine resources

Lobsters and ornamental fish species are being collected from the wild at unsustainable levels and coral reefs are being damaged beyond their ability to regenerate. Pollution of freshwater resources by urban and industrial waste is badly degrading these resources. Wetlands are being indiscriminately filled causing the loss of important habitat for many indigenous and migratory birds and other animals. Extraction of plants and animals from the wild at unsustainable levels. Extraction of biological resources from the near sea, coral reefs, mangroves, estuaries, forests and other land habitats is continuing far above sustainable levels. Unless timely action is taken to stop this depredation, these bio- resources will be lost to this country for ever.

Introduction of exotic species plants and animals and of Living Modified Organisms (LMOs).

The threat posed to indigenous plants and animals by the introduction of exotic species and LMOs has been described in an earlier section. Such species should be allowed into the country only after exhaustive tests have proved that they pose no threat to existing plant and animal species.



It is important that these issues are addressed in order to arrest their destructive trends and ultimately eliminate their root causes. Both short term and long term actions are recommended.

### 10.3 Recommendations

The actions recommended here apply to both terrestrial and aquatic eco systems. Though some of these recommendations may have been presented in respect of one particular ecosystem their application need not necessarily be limited to that particular ecosystem. Some recommendations are broad based and applicable to biodiversity conservation in a cross section of development sectors.

- i) **Establish an appropriate policy framework that would guide all development sectors to focus on biodiversity issues and would also encourage community and private sector participation in such conservation efforts.** Demarcate and establish a forest network comprising protected forests, small forest patches in private estates, urban forests and plantation forests and manage them through a process involving community participation. Define the role of the state and non-governmental agencies in the management of these forests and facilitate their execution through appropriate policy, legal and institutional reforms.

- Review development policies and plans that have an impact on biodiversity in forests. In particular, eliminate policies that hinder private sector participation or discourage the use of timber alternatives; introduce amendments to the law that would encourage forest conservation.
- Review policies and legal provisions that relate to wetlands and to coastal and marine ecosystems so as to ensure

that they will not have negative impacts when implemented.

- Formulate a national policy for the management of information on Biodiversity. Encourage documentation of traditional knowledge on biological resources, their indigenous uses and other related information. Safeguard this information through properly formulated legislation. Provide necessary institutional backing for this effort by providing funding from local sources to ensure the ownership for such information collected. Nominate a state agency such as NARESA to be the repository of the information collected and manage it wisely for the benefit of the country.
- ii) **Improve enforcement and management capabilities at the state agencies responsible for managing biodiversity resources**
  - Improve the enforcement capabilities of the departments in charge of Forest and Wildlife Resources. Introduce modern techniques of monitoring of threats to biological diversity; solicit support of voluntary and community organizations to execute enforcement programs.
  - Strengthen the Customs Department to monitor export of live biological resources and items made of body parts of plants and animals belonging threatened species. Promote and institutionalize cooperation between departments responsible for the conservation of such biological resources.
  - Implement a monitoring program on forests and biodiversity conservation;

design indicators for and collect information on activities affecting forests, permits issued for forest utilization, and in-situ conservation of threatened species.

- Promote ex-situ conservation of indigenous germplasm at Gene Banks, and at Botanical and Zoological Gardens. Also encourage the private sector by providing incentives and technical know on how to invest in breeding of indigenous varieties of wild and domestic animals with a commercial value.

**iii) Promote innovative management techniques to conserve biodiversity resources that are threatened by activities in development programs**

- Promote the application of agro-forestry concepts through legal (long lease and usufruct rights) and economic incentives (property and income tax exemptions). Provide seed material and subsidies to owners of home gardens and small holders plots in order to encourage them to plant local timber, fruit and medicinal plants of high economic value for their own consumption and for neighborhood markets. This will reduce unauthorized commercial exploitation of forests to obtain such products.
- Prepare and implement management plans for identified critical wetland and marine ecosystems through a participatory process. Ensure that institutional responsibilities are clearly defined and capabilities necessary to manage these ecosystems are in place. In the planning and management of aquatic eco-systems, consider the natural linkages of these systems with

the terrestrial ecosystems and develop plans accordingly. Watershed management and command area management in irrigation systems are examples of such cases. Enforce the legal provisions in protecting reservations of aquatic ecosystems appropriate to each system. As an example, instead of total eviction of people living in such locations, devise ways of accommodating them and promoting environmentally friendly land uses that have little or no adverse effect on the aquatic ecosystems.

- Promote the use of critical wetlands and coastal ecosystems for non destructive uses such as nature based tourism (as is being done through the Muthurajawela Visitor Center), education and interpretation programs, recreational activities, and development of traditional home industries like weaving of mats and bags from water reeds and breeding of ornamental fish for export. Create an enabling environment (tax holidays, soft loans and long lease) for the private sector to invest in such ventures under stipulated conditions.
- Provide legal and institutional assistance for implementing Special Area Management (SAM) of critical wetland aquatic ecosystems.

**iv) Promote Research, Awareness, and Education on Bio-diversity Conservation:**

- Promote research in forest management, and in the propagation of indigenous timber and medicinal plant species; and organize extension and awareness programs to support forest conservation practices.
- Support programs to create awareness on the destruction of biological

resources and the consequences of such destruction. Attempt to organize community groups to provide information to the Departments on illegal removal of biological resources from forests and other locations.

- Conduct and support scientific, economic and social research on terrestrial and ecosystems through annual grants and training of personnel in research institutes. Such research should focus on:

- improving the understanding of the behavior and habitats of threatened species;
- estimating the populations of commercially exploited fish and other species, and preparing inventories of the local aquatic biological resources;
- breeding and propagation of threatened species; and
- the effects of introducing exotic species of plants and animals



## 11 COASTAL RESOURCES

### 11.1 Overview

Sri Lanka has an area of 64,000 square kilometers and Sri Lanka has a 1,585 kilometer long coastline. In the last five centuries, following foreign occupation, the country's development has been closely related to maritime activities. Prior to this period, its civilization was concentrated in the interior. Today, more than half of its population of sixteen million people live in villages, towns and cities in the coastal districts. The trade and commerce that provided the original impetus for settlement of coastal communities have been supplemented by fishing tourism and a host of other important economic activities. A substantial proportion of the national economy and social welfare of a large number of its people is inextricably interwoven with the sustainability of resources provided by the natural habitats of the Coastal Zone.

During the four decades following independence (1948), the economic importance of coastal areas has increased further with the growth of human settlements and the development of commercial harbours, fishery harbours, landing facilities, river training and outfall schemes, transport, communications, recreational facilities and tourism.

The coastal region of Sri Lanka comprises most of the country's large towns (including Colombo) and a large number of highly productive yet sensitive and therefore vulnerable ecosystems. It contains many sites of great scenic beauty and varying landscapes.

#### Strengths:

The coastal region contains most of the country's infrastructure, the coastal fishery

that now provides about 70 percent of the country's supply of fish, about 80 per cent of the tourist facilities, and most of the industrial enterprises.

#### Weaknesses and Threats:

The coastal fishery resources in many coastal brackish water and marine habitats are being severely over-exploited. Innovative institutional arrangements and economic incentives are needed to shift the emphasis from mere fisheries development to managing the resource.

The high population density and the concentration of commercial, industrial, transport and tourist activities in the coastal region have put severe pressure on the coastal resources especially those along the populated western and southwestern coasts. The extensive construction of tourist hotels almost on the beach during the 1960s and 1970s in areas like Hikkaduwa, Negombo and Uswatakeiyawa has led to pollution, erosion and degradation of the beaches and adjoining lands. A more serious cause of beach erosion has been the extraction of sand from rivers and to a smaller extent from sea beaches. Heavy mining in rivers especially the Kelani Ganga, the Kalu Ganga, the Maha Oya and a few other rivers has caused severe beach erosion. This is because beach sand lost to the sea by natural erosion through wave action is replenished with sand brought down from the interior by rivers. Removal of coral from offshore fringing reefs has been highlighted as another major cause of beach erosion. The severe erosion along the southwest coast near Kahawa is attributed to the removal of large quantities of coral from the near-shore reefs.

**Opportunities:**

The new Coastal Zone Management Plan (1997) and the new Fisheries Act (1996) which show a greater focus on environmental issues will be implemented with much greater community participation than before. The Coast Conservation Department (CCD) has selected a number of sites for testing out Special Area Management (SAM) planning. Here the local community actively participates in the planning and execution of environmental conservation measures to protect resources that serve them. Two exercises carried out on SAM Planning are the rehabilitation of the marine sanctuary in Hikkaduwa and restoring the damaged lagoon fishery at Rekawa. CCD and other organizations provide technical support and advice, but the planning and the implementation of the plans is done by the local community.

**11.2 Issues****i) Strategy for managing fishery resources**

Fish provides 60 percent of the animal protein and 16 percent of the total protein consumed in Sri Lanka. About 80 percent of the country's total fish catch is supplied by the coastal fishery. Civil unrest in the northern and eastern districts that were the major sources of fish supply has disrupted fish supplies from these areas to other parts of the country. The fishing effort has therefore been intensified along the western, southwestern and southern coasts through use of motorized boats, smaller mesh nets and devices like light purse fishing. Several rich fish habitats such as the Negombo and Lunawa lagoons and Bolgoda Lake have been damaged by industrial effluent, by reclamation (filling) of wetlands; by change in salinity levels of brackish water bodies (e.g Rekawa lagoon) or by physical destruction as in the case of coral reefs. The strategy for managing the fisheries resources must be strengthened to address the above issues.

**ii) Management strategy for shrimp farming**

Shrimp farming, located mostly in the North Western province has been a valuable source of foreign exchange and provides an estimated 10,000 direct and indirect jobs. In some cases shrimp farm development has also led to an improvement in local infrastructure, such as roads and electricity. Some productive agricultural land has also been converted to shrimp farms. However environmental considerations require that shrimp farming must be done in a planned manner that provides safeguards against land degradation and water pollution. The planning has often been lacking or weak, leading to high environmental costs through water pollution, and damage to seagrass beds and mangroves, which provide breeding grounds for fin fish and shell fish. Many of these shrimp farms have suffered from outbreaks of disease as a result of the same water body (often a lagoon or estuary) being used as the source of "fresh" water for the shrimp ponds and also as recipient of effluent from the ponds. Other major environmental impacts include changes in hydrology patterns; both through increased flooding (as the ponds prevent drainage of storm water) and increased salinity of groundwater. There have also been major social problems, primarily between larger farms usually based outside the area and the many smaller, often illegal, operators who are generally residents of the area.

**iii) Strategy for sustainable ornamental fish exports**

Ornamental fish exports include both freshwater and marine fish species. Some of the freshwater fish come from fish farms, but all the marine fish are obtained from the wild. This is an important industry that generates large export revenues and employs many people in rural areas. It is also rapidly expanding. There is however a need to ensure that the rate of harvesting does not exceed the natural rate of regeneration and that destructive fishing

methods such as "moxy" nets are not used. It is noted that a strategy for ornamental fish exports has been developed by Ministry of Fisheries and Aquatic Resources. However the strategy needs to be improved.

**iv) Environmentally damaging tourism development**

Sustainable development of tourism includes preservation of beaches, lagoons and coral reefs; maintaining water quality of coastal sea, lagoons and estuaries; and prudent conduct of water sports and control of turtle hatcheries. Most foreign tourists come to Sri Lanka for the sun, surf and sand. They spend the greater part of their time at a coastal resort and then go on a round tour to visit the other attractions. It is therefore necessary that both the near shore sea and the beach are kept clean. Many "beach" hotels and guesthouses have no effective sewage disposal systems and release their sewage and other wastewater into the nearby sea, estuary or lagoon. Power operated boats carry tourists to view the corals in the marine sanctuary. Some of the boat operators drag these boats on the corals, encourage tourists to walk on the corals and allow oil from the boats to spill into the sanctuary waters. Many of the coral formations in the sanctuary have been damaged as a result. Some of the boats used in water sports have by their excessive speeds damaged the riverbanks and at times injured to and even killed swimmers.

**v) Coast erosion**

Dragging of sand from the beach into the sea by returning waves and its replacement with sand brought down by rivers are two continuing and opposing actions. The beach is stable when the two processes are equally matched. The balance is upset when sand is extracted in large quantities either from the beach or from the riverbed on its way to the coast. Such removal of sand particularly from rivers to meet the needs of the building boom in recent years has

deprived the coast of replenishment supplies of sand. The result has been coastal erosion and loss of valuable beaches for tourists and local residents alike. Extraction of coral limestone from offshore fringing reefs is another major cause of beach erosion.

**vi) Marine pollution**

Oil spills from the large fleet of tankers skirting the southern coast of Sri Lanka to carry oil to East Asia present a continuing hazard to the country's beaches and coastal waters. Marine pollution is also caused by waste dumped into the sea from ships. The resulting water pollution can damage the coastal fishery.

### **11.3 Recommendations**

**i) Introduce strategy to protect fishery resource and habitat**

The new Fisheries Act focuses much more on management of fish stocks through a licensing program. A large awareness program and innovative approach are needed to implement this Act. In particular the relationship between Fishery Cooperatives and the Fishing Societies proposed in the new Act needs to be clarified.

The two largest export fisheries in Sri Lanka are shrimp and ornamental fish. Both these industries can be environmentally sustainable, but are not, because of current practices in Sri Lanka. Separate strategies are needed for dealing with these two fisheries, which have significant economic value as well as possible damaging environmental side effects.

**ii) Implement strategy for sustainable shrimp farming**

Shrimp farming generates economic benefits for Sri Lanka, but can also impose

substantial economic costs in terms of environmental damage if not managed properly. The National Aquatic Resources Agency (NARA) possesses the technical capability to advise shrimp farmers on how to avoid disease among shrimp. Many farms that were practicing intensive shrimp culture have already switched to semi-intensive farming. Guidelines have been issued on how effluent should be treated prior to discharge. However there is a need for a strategic process to rehabilitate the areas of the North Western Province that have been degraded by shrimp farming and to ensure that the mistakes made there are not repeated in the South, North and the East where considerable extents of land with potential for development of aquaculture are available. The strategy should be implemented both through the existing regulatory framework, but with a greater focus on economic incentives, such as a cess on exports to fund sustainable management efforts. The banking sector also should play a pro-active role.

**iii) Implement a strategy for sustaining ornamental fish exports**

The ornamental fish industry is a major export success story, and many rural areas have benefited from the extra income provided by freshwater fish breeding. However in order to avoid the industry destroying its own natural resource base and to ensure the protection for the country's rich biodiversity a strategy for sustainable management must be designed and implemented collaboratively by the private sector and the relevant state agencies. Collection of data on natural stocks of available ornamental fish has already begun. This strategy should rely on economic incentives such as assistance to promote freshwater fish farming so that collection of threatened freshwater fish

from the wild can be stopped. Higher fines should be imposed on people found guilty of smuggling threatened species out of the country. The restricted species of fish published under the Flora and Fauna Ordinance should coincide with those stipulated under the Fisheries Act.

**iv) Promote alternatives to sand and coral mining**

The CCD with assistance from the Police has from time to time attempted to stop the illegal mining of coral and sand, but have met with only limited success. The demand for such materials must however be significantly reduced. Promoting the use of available alternative materials available can do so effectively.

Technology should be developed or purchased for using Miocene or Dolomite limestone to produce lime of a quality and at a cost that would enable it to replace coral lime in construction work. Other alternatives to sea coral lime suggested for promotion include masonry cement, chemical additives, and inland coral. Alternatives to river and beach sand to be explored are offshore sand and, to a much smaller extent, quarry dust. There may also be ways to shift demand for sand from the heavily mined downstream areas of rivers around Colombo to less heavily exploited areas upstream or to other rivers. If public sector building projects are required to shift to these alternatives, it would have a major beneficial effect.

R&D work should be sponsored to identify economically viable alternative materials that can be used in place of sand in building construction. An R & D project should be mobilized to formulate architectural or engineering methods that would avoid the use of so much sand in building construction. Masons and others employed

in the construction industry should be provided training and information on the alternative materials.

**v) Formulate a strategy for environmentally sound tourism development**

Most hotels are located in coastal areas to enable tourists to enjoy the sea, sand and coral reefs. However unplanned tourism development without provision for sewage treatment and other environmental safeguards continue to damage the environment. This is illustrated by the contrast between Bentota, which is a planned tourist development and Negombo and Hikkaduwa where tourism has developed with little planning. A common waste treatment plant is now planned for the Bentota resort hotels. The Government of Japan has signed an Agreement to provide the infrastructure for coastal tourist hotels between Marawila and Galle. Planning for tourism development also reduces the social conflicts between tourism and other sectors. Fishermen in particular complain that their traditional rights of access to and use of the beach are hindered by tourist hotels.

The CCD has applied the Special Area Management (SAM) technique with some success to improve tourist planning in Hikkaduwa and Rekawa. In this approach the local community is responsible for the planning and implementation of the project with the CCD and other resource persons contributing only technical assistance. The scope for developing innovative forms of tourism such as nature tourism with snorkeling, diving, and turtle, dolphin and whale watching.

**vi) Implement Action Plan for marine pollution prevention**

A Marine Pollution Prevention Authority has now been set up for this purpose. It will

need base data on marine pollution to identify the most effective interventions.

**vii) Implement National Wetlands Policy**

The various stakeholders involved in managing wetlands have developed a National Wetlands Policy that now awaits approval by the Cabinet of Ministers. This will pave the way to implement priority actions to preserve Sri Lanka's rich wetland ecosystem. It will include streamlining the legal and regulatory structure and embarking on innovative conservation and development plans in key wetlands. This has already begun at Muthurajawela marsh and Negombo Lagoon. The relationship of the National Water Resources Policy to the Wetlands Policy should be taken into account in implementing the latter policy.

**viii) Ratify the Marpol Convention**

for the management of ship-generated waste and the International Maritime Organisation (IMO) Convention on marine pollution.

**ix) Formulate Contingency Plans for disasters such as large oil spills.**

**x) Strengthen institutional capacities and technical capabilities of govt agencies, provincial and local authorities concerned with coastal resources and also the coordinating mechanisms of government agencies concerned with the use and management of coastal resources.**

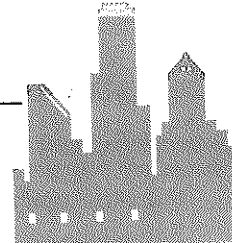
**xi) Provide economic incentives for designated activities that promote conservation of coastal resources**

**xii) Launch education and awareness creation programs on coastal resources.**

**xiii) Promote investment in activities that promote the sustainable use of coastal resources;**

**xiv) Support applied research in areas that support conservation of coastal resources.**





## 12 INDUSTRY

### 12.1 Overview

The industrial sector has emerged as the country's most vibrant economic sector growing at the rate of 10 per cent per annum during 1995 - 1996. Industrial pollution is the one major drawback of the manufacturing sector. Such pollution is conspicuous because factories are point sources of pollution which are easily identified. They are therefore also easier to control. For this same reason public attention and environmental legislation are directed mainly at industry and tourism.

#### Strengths:

Manufacturing industry is growing rapidly and should therefore be able to generate funds and skills to reduce environmental damage. Industry contributed 23 percent to national GDP in 1996, and industrial products accounted for 75 percent of the total value of exports in 1996. Nearly 15 percent of employed persons were engaged in industry. Industrial development is supported by several strong institutions. The Ministry of Industrial Development facilitates industrial development by providing an environment that promotes such growth. It provides incentives, and also facilities like industrial estates and industrial parks. The Board of Investment (BOI) provides foreign investors with attractive fiscal incentives and facilities like Export Processing Zones (IPZs).

Strong environmental laws and institutions are in place to ensure that industrial development while economically productive does not harm the country's environment or its natural resources. Industrial consultant firms are being established to advise industry on pollution control and design and the manufacture of equipment for the purpose.

The following measures taken to control industrial pollution are showing success:

- The Environmental Protection Licensing (EPL) Scheme
- The Environmental Impact Assessment (EIA) procedures, and
- Locating polluting industries in industrial estates.

The proposed amendments to the NEA will require EPLs only for highly polluting industries.

Standards and tolerance limits have been set by the Standards Institution for effluents discharged at the request of the CEA:

- into inland surface waters;
- into irrigated agricultural land;
- into marine coastal waters;
- from rubber or textile factories into inland surface waters;
- from tanneries

Standards have been developed by CEA for emissions into the atmosphere and for noise. Manufacturing industry is supported by a number of strong institutions that have developed over the past few decades. The Ministry of Industrial Development concentrates on facilitating industrial development through the provision of incentives and the facilities like establishment of industrial estates.

#### Weaknesses and Threats:

Industrial effluent continues to pollute surface and ground water. Industrial pollution is particularly severe in the Colombo and Gampaha Districts where more than 70 percent of all registered industrial units are located (Central Bank, 1996). Particularly heavy concentrations of

industrial units are located in the Moratuwa-Ratmalana and Ekala-Ja-Ela areas. Surface waters so affected include the Kelani River, Negombo Lagoon, Lunawa Lagoon and Bolgoda Lake where the fisheries are threatened. Spent wash from distilleries in the Kalutara district has affected ground water quality. Severe pollution is caused by the tanneries and the paper (pulp) mill. Most tanneries today use chromium compounds as the tanning agent. Electroplating is often done on a very small scale on shop verandas but involves the use of deadly poisonous chemicals like potassium cyanide. Vapours and particulate matter including asbestos fibres released into the atmosphere by industries pose a health hazard to people in the neighbourhood. The noise emitted by the operation of factory machinery can also cause serious disturbance to neighbours. Solid waste from factories can be a public nuisance.

Regulation by itself has proved inadequate to arrest industrial pollution. Problems relate to lack of incentives for compliance, lack of appropriate technology and the absence of a strategic phased program for compliance. Many industrialists have difficulty in obtaining technical assistance for pollution minimization in choice of technology/ technology assessment; in design and installation of equipment and in effecting changes in manufacturing procedures;

Industries face difficulties in adopting effective pollution control measures because of financial constraints, and the lack of technical skills and capabilities in operating such measures.

#### **Opportunities:**

Industry is now starting to take a more proactive approach to environmental management, and the regulatory authorities

are showing a greater willingness to appreciate the concerns of industry. Industry is now focussing on selecting low polluting technologies and installing pollution minimizing measures at the project design stage.

International assistance is available for efforts to reduce industrial pollution. Steps are being taken to establish with World Bank assistance common effluent treatment facilities in the Ratmalana and Ekala-Ja-Ela areas where pollution levels are very high.

## **12.2 Issues**

### **i) Industrial Estates Program**

The government has made a policy decision to locate high polluting industries wherever possible within industrial estates provided with effluent disposal facilities. The Export Processing Zones (EPZs) of the Board of Investment (BOI) provide central effluent treatment facilities at their Katunayake and Biyagama Export Processing Zones. One private industrial estate also has treatment facilities. It is planned to set up treatment plants in Moratuwa-Ratmalana and Ekala-Ja-Ela where there is a very high concentration of industries.

Work on nine new industrial estates has begun (out of a total of 27 sites selected for establishing industrial estates). This includes an industrial estate of international standard at Seethawaka. The tanneries in all parts of the country will be moved to the industrial estate at Bata Atha. These are important steps, but the industrial estate program currently has some shortcomings. A consistent decision must be made as to which industries the industrial estate wants to attract. The payment of heavy subsidies by the state to some industrial estates undermines the incentives for the private sector to develop cost-effective estates.

Finally there needs to be a consistent package of incentives to attract industry to locate away from the many advantages of Colombo.

**ii) Difficulties faced by the private sector in obtaining clean technology**

Assistance is available, often free of charge, to industrialists in the choice of low polluting technologies and the identification of their sources of supply. At the international level, UNIDO and UNEP, and ESCAP's Division of Environment at Bangkok and ESCAP's Asia and Pacific Centre for Transfer of Technology (APCTT) located in Delhi provide such information. Within Sri Lanka, CISIR, some Universities and a number of private sector organizations also now offer consultancy services.

There is also some assistance available on clean technology, which is cheaper and more efficient than end of pipeline treatment. The UNIDO/UNDP/CEA Industrial Pollution Reduction Program (IPRP) Project has been promoting good housekeeping in factories, training of trainers (industrial consultants), monitoring and demonstration projects on waste minimization and effluent treatment at the arrack distillery, Seeduwa and elsewhere.

However despite these developments, many industrialists wishing to implement pollution minimization measures find difficulty in obtaining the required technical assistance. They particularly need help in identifying low polluting technologies, in locating the suppliers of such technology and in selecting a cost-effective low polluting technology from among a number of alternatives.

The main problems are the nature of the developing environmental technology

market in Sri Lanka, with the lack of regulation of contractors some of whom are substandard. The industrialists, for their part, must provide accurate discharge data to the contractors. Price should not be the over-riding factor in the choice of technology. The availability of skills needed to maintain imported pollution control equipment is another factor to be considered.

**iii) Financial constraints to environmental compliance**

The cost of installing pollution control measures can be high in some sectors, although generally it is less than one per cent of the company's profits (IPS, 1995). Introducing pollution control equipment into existing factories pose problems of space, installation and high costs. The introduction of pollution control measures at the design stage of a project is much simpler and far less expensive than modifying either the plant or the manufacturing process in an already established factory where questions arise regarding space or the replacement of equipment that has already been installed.

The Pollution Control and Abatement Fund (PCAF) funded by the German Government through KFW provides funds at concessionary rates to industrialists for obtaining technical assistance and for meeting the costs of designing and installing pollution control measures. The Pollution Control and Abatement Fund (PCAF) offers financial assistance at concessionary rates and grants to industrial enterprises for waste minimization, recovery of resources and control and abatement of pollution. The PCAF consists of a non-repayable technical assistance grant and a low interest credit component. The PCAF will reimburse up to 75 percent of the cost of

pollution control measures with an upper limit of Rs.600,000. The fund is administered by the National Development Bank together with DFCC, Commercial Bank, Hatton National Bank and Sampath Bank.

The PCAF has proved very effective in enabling more than fifty firms to install waste treatment using Rs 200 million obtained from it. Industries who have received assistance are mostly agrobased (18 firms), followed by textiles and garments (12 firms), hotels (6 firms), metal / chemicals / plastics (6 firms), rubber and leather (6 firms) and wood and paper (3 firms). More recently a number of aquaculture farms have applied for funding. However while the fund is successful and has now been replenished, there are still a few procedural bottlenecks to be cleared.

There are also some schemes to help new firms afford pollution control including duty waivers and tax holidays for clean technology. These were announced in the 1995 budget and continued in 1996 and 1997.

While funds and assistance are available for environmental compliance, these are often not well publicized so not many firms know about them.

**iv) Regulatory structure and regulatory procedures**

The Central Environmental Authority has faced a difficult task responding to the growth of industry and public complaints of deteriorating environmental quality. It is now recognized that a more strategic reform is needed. This would seek to ensure that the main regulatory instruments - the Environmental Impact Assessment (EIA) and the Environmental Protection License (EPL)- are used as effectively and constructively as possible to promote environmentally sound development.

There have been improvements to the CEA. These include delegating powers for EPL for low and medium polluters to the local authorities, updating the database on EPL issues, conducting training courses on the EIA process for regulators and developers and creating a separate unit for public complaints which have been rapidly increasing. Most of these reforms have so far been ad hoc. The effectiveness of the EPL and the EIA procedures now need to be assessed.

The CEA has administratively delegated some environmental functions to selected local authorities.

The EIA process is being reviewed to examine the potential for sectoral environmental assessment (SEA) which lays emphasis on anticipating and minimizing environmental damage. SEA is proactive unlike project EIA that only reacts to development proposals rather than anticipate them. Spatial planning in respect of a defined geographical area with a focus on resources management have been seen as imperfect first step towards SEA (Nanayakkara, 1997). Other planning efforts aimed at conserving the environment and natural resources include Master Planning, (Water Resources Master Plan, Water Resources Master Plan and Coastal Erosion Management Master Plan), Area Management (for Coastal Resources in Hikkaduwa and Rekawa), Spatial Planning and Zoning (for selected urban areas) and Land Use Planning.

Greater willingness is now shown towards taking a more strategic vision about what the role of the CEA and how best the private sector, local authorities and the public can help.

### 12.3 Recommendations

#### i) Increase private sector access to clean technology by establishing a Cleaner Production Center

The environmental engineering sector needs more training and funds for developing low cost pollution control equipment. A clearer institutional arrangement is also required, as many firms are sole suppliers of one type of equipment so it is difficult for industry to obtain an unbiased recommendation. One suggestion is that industry federations provide more information to their members. Another suggestion is to develop a "Cleaner Production Centre". This could either be a stand alone institution or be housed in an existing agency such as CISIR.

#### ii) Encourage locating or re-locating high polluting industries in industrial estates.

Government has taken the responsibility for providing the infrastructure necessary for the disposal of industrial pollutants in new industrial estates and in Industrial Processing Zones managed by the Board of Investment (BOI). This strategy is highlighted in a Cabinet Paper signed by the Ministers of Industry, Environment and Science and Technology. The 25 industrial estates now existing have many unoccupied sites, and few have high polluting industries. The policies and investments required to promote these estates include:

- Coordination of allocation of these estates and advertising to be improved with a Committee chaired by BOI given stronger legal backing (eg Industrial Estate Management Authority) to coordinate rational allocation and level playing field between private and public industrial estates
- CEA to issue EIA and EPL to the entire industrial estate and exempt industries

located in them from individual EIA or EPL.

- Tax and other incentives to be provided to industries locating in estates which are more advantageous than for industries locating outside estate
- Private sector to be encouraged to set up industrial estates by being granted the same concessions as the public sector.
- Public sector estates to be set up only after a clear survey of demand.
- Category A or high quality estates to be promoted for accommodating high polluting industries only.

#### iii) Government to take initiative in developing environmental infrastructure for existing industry

Liquid and solid waste disposal is a problem for industry. The construction of planned common treatment plants for Moratuwa and Ja-Ela is behind schedule. There is still no sanitary landfill site or hazardous waste disposal system in Sri Lanka. These projects must be given the highest priority because of the serious consequences for health. The main obstacles seems to be disagreement among the various stakeholders on long term viable mechanisms for financing construction and operation, and problems in site selection due to protests from people near the chosen site.

#### iv) Strengthen national and subnational agencies to implement pollution control regulations more effectively and with greater participation

- Identify clearly the areas where the local authority, private sector and public can be involved in CEA activities ;

- CEA to be reorganized to focus more on monitoring of EPL and EIA compliance;
- CEA to devolve some functions to local authorities, provide training and monitor progress;
- Regulations to be developed following greater consultation with the private sector, streamlining of regulatory burden and development of environmental dispute resolution mechanisms (eg Environmental Tribunal or Mediation Boards)
- Innovative mechanisms to be developed to promote EPL compliance including self-regulation by firms and use of public information. In Indonesia industries are assigned a publicly announced rating in terms of low, high and medium compliance. This procedure aims to generate public pressure for improved compliance;
- Working closely with the banking and finance sector to develop ways to encourage environmental concerns to be included.
- EPL process to focus on high polluting industries, with a load based license fee and be issued under oath in appropriate circumstances
- Selected activities to be contracted out to private sector on an experimental basis;

- Develop sectoral environmental assessment for key areas.

v) **Promote the establishment of a revolving fund for private sector environmental management financed by the private sector**

There are a number of schemes ongoing, primarily the Pollution Control and Abatement Fund for environmental investments by the private sector. However this fund is currently funded by donors and may therefore not be sustainable in the long run. The most effective source of funding is the private sector itself. This would also ensure that the private sector could use the money as it wishes. A revolving fund could be set up using the revenue generated from EPL license fees, environmental fines and other charges.

A publicity campaign should be launched to make known the assistance (of different forms) available for implementing pollution control.

The scope of the fund could be broadened out from a narrow focus on pollution control. There are many new environmental products and services, which the private sector is developing, such as organic products or nature tourism. These ventures are new and often involve some risk. There may be a need to have access to low interest loans to develop these innovative environmental products.

- vi) **Promote private sector self-regulation through environmental management systems, an Environmental Entrepreneur of the year award and environmental clearance by the Banking and Finance sectors.**

As the private sector develops, a more pro-active partnership is developing towards environmental management. This arises from greater awareness, realization of the marketing potential and pressure from domestic and international customers and shareholders. This should be taken advantage of to promote greater self-regulation by the private sector by environmental audits, ISO 14000 and other environmental management systems.

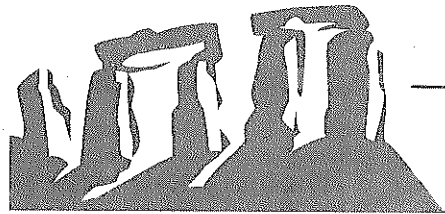
- vii) **Encourage Community participation in control of industrial pollution**

Local communities can make a significant contribution towards control of industrial

pollution. Community groups can play an important role in conducting public awareness and education programs, carrying out surveys and research also assisting in the enforcement of environmental laws and regulations.

- viii) **Improve environmental dispute resolution mechanisms**

Many environmental disputes have led to protracted legal proceedings between the affected parties often under the Public Nuisance Laws. This has led to delayed settlements, and bitter legal and social conflicts. It would be more effective to have a more flexible dispute resolution mechanism. This would provide faster relief to aggrieved members of the public and a more predictable, technically competent mechanism for industrialists.



## 13 MINERALS

### 13.1 Overview

Sri Lanka has reasonable endowments of mineral resources in relation to its size. The most economically valuable are the gemstones, which accounted for more than 90 per cent of all mineral exports in 1994. Other important minerals include clays, vein quartz, silica sands, feldspar, Apatite rock phosphate, Miocene limestone, dolomite, coral, monazite, ilmenite, zirconium, graphite and granite. A number of these minerals support important industries. Most of these minerals are still mined artisinally without large scale mechanization, except graphite, ilmenite, clay and some of the metal quarries. Environmental Impact Assessment (EIA) is not required for the exploration phases for any mineral as it has little or no impact on the environment.

#### Strengths:

Clays used in the manufacture of bricks and tiles, pottery, ceramicware, cement and paper are abundant. The deposit at Boralesgomuwa near Colombo is estimated to contain more than one million tonnes of clay. Refined kaolin and ball clay are found in Mitiyagoda and Dediya-wela. A rich vein of Miocene limestone runs along the northwest coast from Kankesanthurai to Puttalam. Miocene limestone and clay are used in cement manufacture in factories at these two locations.

Silica sands of high purity found around Marawila and Naththandiya are used to produce glassware. Beach mineral sands found along the northeastern, southern and southwestern coasts contain ilmenite, rutile, zircon and monazite. The largest beach mineral sand deposit is located at

Pulmoddai on the East Coast. The ore is enriched by modern separation methods for export. Inland deposits of coral found along the coast from Ambalangoda to Matara are mined legally and although mining of offshore coral reefs is illegal, it takes place in a small way to provide lime for the building industry. The seashell deposits lying along the coast between Hambantota and Hungama yield a lime containing more than 98 per cent calcium carbonate. This lime is used for plastering walls and the production of poultry feed. Dolomite limestone found in the Matale district is used as a fertilizer, lime and soil conditioner. Large quantities of sand extracted from riverbeds are used in building construction. A deposit of apatite rock phosphate located at Eppawela near Anuradhapura is estimated to contain about 25 million tons of phosphate.

There are strong state institutions that have been streamlined and refocused to provide a clear regulatory framework to the private sector. The State Gem Corporation established in 1971, now the National Gem and Jewellery Authority (NGJA) has been regulating and controlling all aspects of gem mining, processing including polishing, and marketing of gems and associated jewellery. The NGJA issues about 4,000 licenses for gem prospecting ("gemming"). Each licensee is allowed to operate up to four gem pits at a time. He is required to make a refundable security deposit to ensure that he will fill back the pit and restore the soil and the surface as far possible to its original condition at the end of his operation. Some licensees fulfil their promise and reclaim their deposit. The horizontal tunnels dug in the case of deep mines are as a rule never filled back. Other



forms of mining are regulated by the Geological Survey and Mines Bureau (GSMB) with the assistance of the local authorities.

#### **Weaknesses and Threats:**

Many forms of mining currently used including river sand mining, sea coral mining and riverbed gem mining, are environmentally damaging. Appropriate mitigatory measures should be taken to minimize negative environmental impacts.

#### **Opportunities:**

The mining sector in Sri Lanka is still largely artisanal, but is now starting to shift to a more mechanized level. It is important to have an appropriate environmental framework in place as this shift to mechanization develops. A strong regulatory framework is in place in the form of the EIA regulations coupled with the 1992 Mines and Minerals Act.

### **13.2 Issues**

#### **i) Environmentally damaging extraction of river sand**

River sand is mined for use in the building industry. In a few locations it can even be beneficial by lowering the banks and reducing flooding. Current levels of extraction in inappropriate locations have however led to serious environmental impacts. Sand mining has damaged river banks, deepened the rivers and increased coastal erosion. Coastal erosion arises because river sand replaces sand lost from the beach by receding wave action. Sand mining by lowering the riverbed facilitates the intrusion of seawater. Salt water intrusion upstream during the dry season along the Kelani has come up to the water intake points for Colombo city at Ambatale and along the Nilwala Ganga to affect the Matara town supply. In many other areas

in the Southern and Western Provinces, intruding salt water enters irrigation systems destroying crops. In addition, the water table can become saline and affect wells.

The National Sand Study (1992) estimated that a little more than 3 million cubic metres of sand were extracted in 1991 from the Maha Oya, Kelani Ganga and Kalu Ganga riverbeds; and that about 0.1 million cubic metres of sea sand was removed from the coasts that are replenished with sand brought down by these rivers. If the present rate of sand extraction continues, all the sand available in these riverbeds and the sea beach are projected to be exhausted within 25 years.

The Sand Study reported an estimated loss of about 12 ha of land each year caused by the deepening of these rivers and consequent erosion of the banks. The reduction in the quantity of sand available for beach replenishment caused by extraction of river sand and the (sea) sand removed from the beach was estimated to cause the coastline to recede by 0.4 to 0.5 metres each year. This recession represents a loss (erosion) of 5 to 6 hectares of land each year. The total extent of land lost each year would therefore be 17 to 18 hectares. This means that more than 150 hectares of valuable land are lost over a ten-year period.

The University of Moratuwa carried out a study on alternatives to river sand. This report has not been finalized yet. It is understood that it identifies off-shore sand as the most feasible alternative to river sand.

#### **ii) Mining of sea corals**

Mining of sea corals is forbidden owing to the environmental damage it causes. It however still continues because of the high

demand for sea coral, which is almost pure lime and the limited alternative employment opportunities available to the miners. The mining of live offshore coral reefs promotes coast erosion, because these reefs act as the first barrier against powerful ocean wave forces which dissipate their energy on striking the reefs. This subject is dealt with at in the chapter on Coastal Resources.

**iii) Need to rehabilitate abandoned gem, clay and inland coral mine pits**

Gem, clay and inland coral are mined in pits which need to be rehabilitated on the average, a gem pit is calculated to involve the excavation of 50 cu.m. of soil and the destruction about 60 sq.m. of vegetation. On this basis a total quantity of 1 to 1.5 million cubic metres of soil are excavated and 120 to 150 ha of vegetation are destroyed each year. Part of the excavated soil is washed away by rain. The excavation of pits also adversely affects the water table.

Clay mining for brick and tile and pottery manufacture and mining of inland coral for lime kilns are also carried out in pits. The quantities of soil excavated and the extents of vegetation destroyed during these operations are estimated to be of similar magnitudes as for gem mining. More than half the land directly affected by mining for gems, clay and inland coral is considered to be permanently lost to agriculture, while the remainder needs to be rehabilitated.

Unfilled gem pits, inland fossil coral pits and clay pits provide breeding grounds for mosquitoes. The material excavated in digging gem pits is always stockpiled at the pit head, while the excavated clay and coral are removed elsewhere for further processing. The clay and coral pits should be rehabilitated; otherwise they remain as craters on the landscape.

**iv) Mining of river beds for gems**

Almost all the rivers in the Ratnapura District are affected by gem mining. This has damaged the rivers, led to severe siltation and affected ground and surface water. Large scale gem mining was first allowed on 666 hectares of state land in the Matale district and later prohibited. A subsequent proposal for mining the bed of the Kaluganga was also rejected after an EIA found it to have unacceptable environmental impacts also.

**13.3 Recommendations**

**i) Review regulatory framework in the mines and minerals sector to address environmental concerns**

A number of important reforms have been carried out in the Minerals Sector. They include the creation of the National Gem and Jewellery Authority and the Geological Survey and Mines Bureau (GSMB), and the enactment of the new Mines and Minerals Act and the 1995 Amendments to the Forest Ordinance. These reforms have also included environmental issues such as raising the security deposit to rehabilitate abandoned mines. The regulatory framework should be reviewed to gauge the extent to which the new arrangement has been successful in addressing environmental concerns. Amendments should be proposed to the regulatory framework as necessary.

The construction industry should be requested to adopt practices that avoid excessive use of lime in building structures. This recommendation may be incorporated into the new Act proposed for the Construction Industry. The launching of a country-wide awareness program on the rational use of lime is also recommended.

**ii) Fund for rehabilitation of gem pits**

Regulations should be enforced and financial incentives offered to artisan gem miners to persuade them to use methods of prospecting for gems that would be less harmful to the environment than the methods presently used.

Participation of the local community should be obtained (through awareness programs on environmental damage) to pressurise all gem miners to minimize environmental damage by restoring the land to its original condition.

Programs should be conducted to create awareness among the local community on the threat posed to the community's health by the breeding of mosquitoes in unfilled abandoned gem and clay pits.

**iii) Strategy for sustainable river sand mining**

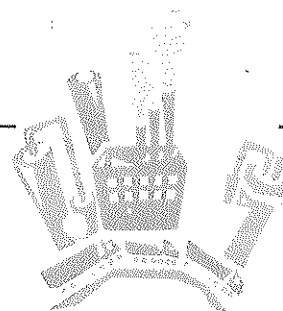
River Sand mining can be allowed if very large quantities of sand are not extracted

from fragile or sensitive areas. With 103 river basins, there are still many areas where river sand is still available, but because of the lack of an effective regulatory framework mining is restricted to a few rivers close to Colombo.

This situation needs to be reviewed and a regulatory framework drawn up to encourage mining in less sensitive locations where sufficient sand is available. A suggestion was made at the NEAP Workshop that permits to mine sand should be issued by only one government authority.

**iv) Sustainable exploitation of mineral deposits**

The community must be fully compensated for any direct and indirect losses/damages. A community focused EIA should be required for mining activities and minerals processing plants prior to commencement of mining or mineral processing.



## 14 ENERGY

### 14.1 Overview

Sri Lanka's annual per capita energy consumption is 4GJ, compared with 9GJ for India, 8GJ for Pakistan, 2GJ for Bangladesh and 1GJ for Nepal. This reflects the low level of industrial development achieved by Sri Lanka. Biomass provides about 70 percent of the total energy used; petroleum products account for about 25 percent and electricity about 5 per cent. The distribution of energy consumed in 1996 by source is given as follows: Petroleum products 32 percent; Hydropower 11 percent and Biomass 57 percent. Domestic consumption accounts for about 65 percent of total energy consumption and industry for about 13 per cent. Transportation accounts for 13 per cent of energy used and 52 percent of petroleum products.

Hydropower currently provides the bulk of the electricity used. About 48 per cent of households are presently provided with electricity. Of the total installed electrical power generating capacity of 1,564MW, 1,137 MW was hydro- and only 427 MW was thermal. Electricity demand is increasing by about 10 per cent per year. More thermal power generating plants are being installed or planned. The main energy users are the domestic, industrial and transport sectors.

#### Strengths:

Biomass supplies approximately 70 per cent of total energy consumed in Sri Lanka. It is used in most homes for cooking and in many industries. The large scale industrial uses of biomass include brick and tile manufacture, baking bread and manufacture of smoked sheet raw rubber.

Biomass for energy generation is projected to be available in sufficient quantities since wood and crop residues from home gardens and coconut and rubber plantations, and paddy husk will continue to be available and fuelwood continues to be an unpriced good in rural areas.

The Forestry Sector Master Plan updated in 1995 presents a projected fuelwood supply and demand scenario from 1995 to 2020. Total fuelwood consumption is projected to be 9.7 million tonnes in 2020, while the supply is expected to be 10.1 million tonnes if present practices continue and 10.6 million tonnes if the Master Plan recommendations are implemented.

Hydro-electricity the only other "indigenous" source of energy has in most years supplied between 80 and 98 percent of the electricity demand in the country. The use of hydroelectricity is non-polluting, hydro power reservoirs change the ecology of the area, and enhance its scenic beauty but they can also cause environmental damage. Biomass and hydroelectricity are both indigenous sources of energy.

#### Weaknesses and Threats:

The demand for energy is increasing. Electricity demand is increasing at a rate of about 10 per cent per annum.

The energy efficiency of the traditional open firewood hearth is less than 10 per cent. More energy efficient hearths have been designed in many countries but have never been able to supplant the traditional hearth.

Hydropower reservoirs are known to have some environmental costs. For example dam construction across the Mahaweli inundated some of the country's fertile land in the Dumbara valley.

The installation of more thermal power plants will lead to increased atmospheric pollution from the burning of petroleum fuels, coal and, even natural gas.

Loss of power during transmission and distribution is in the region of 17 per cent, which is comparatively high as achievable losses are thought to be around 12 per cent..

The number of motor vehicles especially motor bicycles vans, and their use in traffic congested conditions continues to increase. This increases emissions of gases and particulate matter.

#### **Opportunities:**

The rise of the private sector in the energy sector allows the government to insist on the use of clean technology in future BOT projects. A number of innovative methods are available for increasing the availability of biomass and the efficiency of its use. These include establishment of village woodlots and the use of stoves having higher fuel efficiency

- Manage growth of electricity demand through
  - promotion of energy conservation programs;
  - reduction of system losses, and
  - use of less power consuming equipment,
  - use of non-traditional sources of energy: wind, solar, biomass (paddy husk, saw dust, wood waste, etc.). and
  - recycling urban / municipal biodegradable wastes

## **14.2 Issues**

### **i) Biomass**

Biomass usage for energy generation involves:

- deforestation resulting in loss of habitat and reduced biodiversity as well as increased soil erosion, flash floods and droughts;
- atmospheric pollution by smoke (from burning biomass) components including particulate matter, carbon monoxide, carbon dioxide, oxides of nitrogen and carcinogens in tar residues.

Domestic use of biomass is expected to remain constant because increases due to population growth are counter balanced by greater use of efficient stoves and more affluent consumers switching to other sources of energy. Commercial and industrial use of biomass is however reported to be increasing at the rate of 3 to 4 per cent per year. Though adequate supplies of biomass are projected for the next two decades, localized shortages can occur especially in urban and semi-urban areas.

### **ii) Hydropower generation**

Nearly all the sites for large scale hydropower generation are being developed.

Only a few sites identified as suitable for generating hydropower on a medium scale remain to be tapped.

### **iii) Growth in fossil fuel energy**

Coal and oil based power plants and internal combustion engines release oxides of carbon, nitrogen and sulphur, as well as smoke containing particulate matter and carcinogens. Such plants also discharge hot water from their cooling systems into the sea or other water body. The negative

environmental impacts associated with Coal-fired power plants: include environmental damage caused by unloading of coal, transporting of coal in lumps and pollution from coal ash.

**iv) Transport Policy**

The transport sector is responsible for most of the air pollution in the country and especially in the Greater Colombo and other urban areas. There is seemingly uncontrolled import of private vehicles, namely cars, vans and motorcycles and also of three wheel vehicles. The only restraining factors on their use are traffic congestion and limited parking facilities. If parking facilities are increased and road capacity enhanced by widening of existing roads, construction of new roads and traffic management measures, the volume of traffic and the exhaust emissions will increase.

**14.3 Recommendations**

**i) Overall Energy Sector**

Carry out an environmental assessment for the entire Energy Sector.  
Encourage energy auditing.

**ii) Biomass promotion**

Encourage establishment of village woodlots where possible with private sector participation, and home gardens.

Intensify the promotion of fuel efficient stoves. Several designs of fuel efficient wood stoves have been designed and marketed. In rural areas where biomass is still unpriced, these stoves may be promoted for improving indoor air quality.

Develop collection, storage and processing of urban biodegradable wastes for bio-gas

generation, and develop technologies for bio-gas storage and use.

**iii) Hydropower generation**

Develop all available sites for hydropower generation. They should include the following sites identified by the CEB. Upper Kotmale; Broadlands; Gin Ganga; Belihul Oya; Moragolla.; Uma Oya; and Kukule. Effective environmental Safeguards should be provided in all cases.

**iv) Thermal power**

Use thermal power technologies that cause minimum air pollution and use "cleaner" fuels such as low sulphur oils and coal.

In considering alternative technologies and alternative sites for coal and oil fired power generating plants, select cleaner fuel types, less environmental sensitive sites and technologies that will cause minimum environmental damage.

Take effective steps to reduce power losses during transmission and distribution.

**v) Design and implement a Transport Policy**

The need for a transport policy that supports environmental conservation has been explained under "Issues". Such a policy should consider air pollution in particular. A mass transit railway system should also be considered.

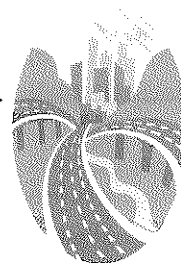
The present implied policy of CARS FIRST should be replaced with an express policy of priority for public transport, bicycles and pedestrians. Lessons should be taken from Singapore's policies and programs for restraint in the ownership and use of private vehicles. Such restraint should be supported by positive steps to improve train and bus

services. These steps should include both physical and fiscal measures. A start should be made on electrifying the suburban railways, re consolidating the fragmented ownership and operation of buses, compensating bus operators for restrictions on fare increases and positive priority for

buses on urban roads, including the location of bus terminals and bus stops in the interest of bus passengers.

**vi) Renewable Energy Sources**

Encourage new and renewable sources of energy (wind, solar, biomass, etc.).



## 15 BUILT ENVIRONMENT

### 15.1 Overview

The urban population remains low at under 25 percent of the total population and growing at 1.3% a year (UDA, 1996). Most of the urban population is concentrated in the Western Province, Central Province and in the Jaffna Peninsula. However a number of semi-urban areas are developing into towns. The urban population is expected to increase more rapidly in the future, reaching 40 per cent of the total population by 2030 (WHO, 1996).

#### Strengths:

Most urban households have access to water and sanitation and solid waste collection. Air pollution in Colombo remains at a relatively low level when compared with other Asian cities because of the stability of the atmosphere resulting from the city's proximity to the sea and the relatively low volume of vehicles (compared with many Asian cities) as a result of high import duties and low per capita income. A long tradition of urban planning and urban government and a well-laid out institutional structure, that extends from the technically skilled Urban Development Authority to political bodies such as municipal and urban councils, has helped maintain some environmental services including draft zoning plans and development guidelines in many areas.

#### Weaknesses and Threats:

The level of urbanization is expected to significantly increase as industrial growth continues at more than 5 percent a year. Various economic and institutional shortcomings especially insufficient planning (including the fact that only Colombo M.C. area has a gazetted Urban Development Plan) have led to urban

degradation including the spread of low income settlements. These shortcomings include the distorted land market and failures in the credit market, which restrict the poor from access to land and money to improve their homes. Already one third of the urban population in the Western Province live in low income settlements, which lack services provided to the other groups: They receive water from a standpipe or unprotected well. They have inadequate sewerage facilities and tend to discharge their sewage directly into canals and water bodies. There is no regular collection of solid waste from these settlements. Such settlements are overcrowded and create unpleasant surroundings, being affected by floods, noise and mosquitoes. Such conditions impose significant health and social costs on the residents and also adversely affect others through pollution of water. Water quality in the main urban water bodies is poor, while air pollution is evident from the content of particulate matter and sulfur in the atmosphere being well above WHO recommended levels.

Significant vehicular air pollution also occurs in pockets or stretches, e.g. at congested town junctions and along major highways connecting important urban centres, particularly the Colombo-Kandy road.

Ad hoc urban sprawl has led to excessive reclamation of wetlands adjoining the major urban centres along the West coast, encroachment of beach and waterway reservations, urbanization on high quality agricultural lands and even intrusion into certain vital hill-country forest areas (e.g. around Nuwara Eliya) as well as conflicts in landslide prone areas.



### Opportunities:

A number of innovative mechanisms have been adopted to upgrade urban settlements in response to this challenge, with a focus on self help schemes and community involvement. The Government is committed to providing basic urban services in order to improve the living conditions of low-income settlers. There is also a growing trend towards involving the private sector in providing urban environmental services, such as the planned Colombo sanitary landfill to be built by the private sector. Even where services are provided by government agencies, finances are being generated to fund the provision of improved services by such means as the recent increase in water rates. will reduce Air pollution is expected to be lowered by early next century by discontinuing the use of leaded petrol, and by the reorganization of bus companies, which may lead to more fuel efficient vehicles operating on the roads.

### b. Issues

#### i) Inadequate policies and investments to upgrade environment of low income urban settlements

People living in low income urban settlements suffer from many problems, due to poor environmental conditions such as poor drainage, lack of potable water and sanitation, vector borne diseases and other health problems. Lack of adequate sanitary facilities in low-income settlements also affects other urban residents. The Urban Development Authority (UDA) estimates that about 35 percent of the population or about 550,000 people in the Western Province live in such uncongenial areas. The UDA estimates that 52,000 families comprising about 312,000 people

(representing 50 percent of the total city population) now live in low-income settlements within the Colombo Municipal Council (CMC) area. Of this number, 64,000 live in shanties (temporary structures on encroached land), 61,000 in slum gardens (old deteriorating houses other than tenements), 127,000 in slum tenements (rows of about 15 houses built originally for workmen), 23,000 in local authority workmen's quarters and 37,000 in relocated settlements ("nava-gamgoda" or new areas of state-sponsored resettlement).

Improving sanitation in low-income settlements and relocating some of them are the most important intervention to reduce water pollution in Colombo. While industry produces some chemical and toxic pollution, the main cause of organic water pollution in Colombo (eg Beira, Lunawa and most canals) is raw sewage, mostly from low-income urban settlements. Even in a heavily industrialized area such as Ratmalana almost three times as much domestic waste is produced as industrial wastewater. Low-income settlements have inadequate sewerage facilities and tend to discharge straight into the canals and water bodies.

The key issues are to relocate low-income settlements or mobilize them to generate better planning and management of their environment according to the suitability of the terrain concerned and to more effectively lobby government agencies for assistance. The main community institution are the Community Development Councils (CDCs), which were encouraged by the government to act as mediators within the local community. However while these CDCs were once beneficial, many are now dormant. The state institutions involved

also need to participate more actively. The National Housing and Development Trust (NHDA) has taken some important steps to encourage community participation.

**ii) Poor Waste Management**

It is estimated that more than 1,000 tonnes of solid waste are currently generated per day in the Colombo Municipal Area and this is expected to increase as consumption levels increase. Waste collection serves about 90 percent of households in the CMC, but much less in other Municipal Councils. Waste is currently disposed into about 15 open dumps without any environmental safeguards. Houses around such dumpsites suffer year around as a result of diseases (especially of children), water pollution, flooding and the use of protective measures such as fly spray.

A sanitary landfill is planned with an organic composting unit, for the "Colombo Metropolitan Area" but its commissioning has been delayed by protests from local area residents.

At present there is no hazardous waste treatment facility, despite hazardous wastes being generated each year by hospitals, mostly in the Colombo area.

A hazardous waste treatment system is now planned.

The planned landfill and hazardous waste treatment system by themselves would be inadequate. Colombo city and the country need to have a National Waste Management Strategy. Currently waste disposal, recycling and composting are being carried out in a haphazard ad hoc manner.

**iii) Flooding in Colombo and other urban centers**

Flooding due to poor drainage systems and location of settlements in flood plains is a major problem in Colombo and certain other towns such as Ratnapura and increasingly so in other urban centers. Such floods affect households every year, but seem to be forgotten and ignored soon after they recede. However, millions of rupees are spent on compensation for flood victims, and on disease control. The causes are linked to the earlier problems of waste and low-income settlements as the drainage system is blocked by solid waste, illegal sewerage connection and canal bank erosion. However the most important underlying causes are the spread of urbanization into flood prone areas and the filling of marshy land for building. While the Sri Lanka Land Reclamation Board has embarked on very costly engineering solutions to the problem there is a need to consider possible softer solutions such as controls on land filling and to base stormwater management on storage and recharge rather than on conveyance. A transparent consultative process involving the local community should be followed in arriving at decisions.

**iv) Rising Levels of Air pollution**

Air pollution levels are high in some locations of the country especially in respect of particulate matter and sulfur which exceed the current ambient air quality standards and WHO recommended levels. Motor traffic is growing at about 07 percent a year, especially diesel powered vans, helped by the relatively low price of diesel. While steps have been taken to import

unleaded petrol, and to process unleaded petrol following the rehabilitation of the Refinery, this should be introduced with a cross-subsidy as in most other countries.

### 15.3 Recommendations

#### i) **National Urbanisation Policy to be developed and implemented by Regional Structure Plans and Development Plans for Local Authorities**

At present urbanisation is proceeding in a haphazard manner, Ribbon development along major roads leads to severe traffic congestion and lack of service facilities for the hinterland. A clear policy must be developed on what type of urbanisation is required in Sri Lanka and what spatial planning and other strategies should be used to promote this. Although the Urban Development Authority has made some progress, only Colombo has a legally binding legally proclaimed development plan (since 1996)

The urbanization pattern could be improved by the use of lands inherently suited to urbanization for establishment of compact urban settlements with large proportions of medium and high density building development while allowing for adequate street-widths, street planting, pedestrianways, parks and cycle ways and leaving sufficient land for agriculture and forestry.

Environmentally sensitive areas such as flood plains, landslide prone areas and vital upper watershed areas should be avoided. There should be timely provision of transport routes serving ecologically preferred urban growth centre locations, combined with expansion of rail services and also introduction of efficient mass transport systems within urban areas. Scenic assets should be wisely used for urban design, recreation and tourism purposes.

A policy measure for "on-site upgrading" in fast growing urban centres by a detailed

cost-benefit analysis of such an intervention. The existing high demand for and high cost of urban land have been a constraint to healthy urban growth and have led to deteriorating environmental quality in urban areas. Policy measures should therefore be innovative in order to promote conservation of the living environment, and urban growth to be complementary activities.

#### ii) **Introduce policies and incentives to upgrade environmental conditions in urban settlements**

While some self-help schemes are ongoing or being planned to reduce these problems by upgrading low income settlements (UN Sustainable Cities Project and Clean Settlements Project), an overall policy framework and innovative investments are needed. One of the key issues is how to secure tenure. Many agencies such as the UDA and NHDA cannot work with residents of low-income settlements because they are encroachers. Past attempts at providing tenure have resulted in the occupants selling the land.

Possible approaches towards addressing the problem include the following:

- Develop and implement a strategic urban housing policy, particularly for low income settlements
- Ensure community participation in urban planning and infrastructure
- Encourage Community Development Councils, Municipal Councils and other local bodies to be pro-active in responding to community needs.
- Reform existing laws to increase supply of affordable rental accommodation
- Provide adequate compensation to displaced low income dwellers;
- Entrust public facilities like standpipes, wells and latrines to

community management and self-financing maintenance system.

- Provide loan schemes to pay for incremental home improvements

**iii) Improve and implement the draft national solid waste management strategy**

A waste management strategy has now been formulated by the Ministry of F & E in consultation with other relevant agencies. Although waste management is a devolved subject, many local authorities often lack the technical skills and exposure to the many innovative approaches to waste management.

Policies should highlight innovative measures to be adopted by local government authorities for effective handling and management of solid waste within their areas. This is indeed one of their primary functions.

It should also focus more on ways to finance improved solid waste management. At present the local authority pays for solid waste collection out of property taxes. As a result low-income settlements are often ignored in formal waste collection systems. The limited sums provided also mean that little money is available for effective waste disposal. In many developing and developed countries, the private sector has been encouraged to provide waste collection and disposal.

**iv) Strengthen Environmental Infrastructure to ensure healthy urban expansion (Presidential Task Force on Housing and Urban Development)**

Provide sewerage facilities for high density urban areas such as low-income settlements and ensure piped water supply for all urban areas.

**v) Identify and implement policy measures for sustainable operation and maintenance of environmental services to ensure effective use and further development of infrastructure with both private and public sector participation.** Such policy measures should take into account the legitimate functions of local government bodies in the operation and maintenance of capital assets.

**vi) Focus on a Cost effective Drainage and Flood Control Strategy including an Environmentally Sound Canal Development Programme**

The canal system of Colombo and other cities remains one of Sri Lanka's most under valued resources. The canals serve both for drainage and flood control, for absorbing and moving pollutants and are a potential recreational resource. There is an urgent system to revitalise the canal system. In the short term this would improve flood control, and reduce vector pests. In the longer term a clean canal system could provide a recreation facility and a clean and cheap transport system.

Stormwater Management Plans including "Water budget" studies and conservation of flood plains should be prepared for each catchment containing urban settlements, with a drainage design being based on storage and recharge rather than conveyance, while the 50 year and 100 year flood recurrences should be taken into account for designing.

Local Authorities should be assisted to obtain/revise and implement drainage masterplans, including establishment of drainage system monitoring and repairing squads.

Flooding and poor drainage impose high costs on the Colombo region, but no clear management strategy has yet been developed. The Sri Lanka Land Reclamation and Development Board has taken some steps, but is itself only one of the stakeholders. The Flood Control and Environmental Project covering the Greater Colombo area is being implemented in three phases. What is required is to identify the gaps. For example, the policy measures required for the sustainable operation and management of the new structures created through these projects, and policy recommendations to be adopted particularly by the stockholders, the local government. There is also a need to examine the underlying causes of flooding and design soft solutions, such as more focused planning policies, to complement the current hard engineering approach. The natural drainage network and the flood detention concept coupled with aquifer recharge should be emphasized, considering that Sri Lanka has a tropical monsoon climate.

**vii) Revise Clean Air 2000 Air pollution strategy**

The Clean Air 2000 Action Plan was formulated in 1992 and endorsed by the Cabinet of Ministers. The Plan included 50 actions under seven major issues:

- vehicle inspection and maintenance,
- fuel reformulation,
- pricing and fleet mix,
- emission inventory and monitoring,
- standards setting, institutional setting and regulatory compliance,
- economic instruments and transportation planning and
- traffic management.

A National Task Force was appointed and chaired by the Secretary, Ministry of Environment. Only 4 of the original 50

actions had however been implemented fully by June 1996 owing to lack of funds, lack of institutional capacity and lack of infrastructure. The Plan needs to be updated and the vehicle emissions components should be expedited. The updated action plan should also focus on economic instruments as attempts at regulation have largely failed, and also there should be greater integration with the transport institutions.

In the meantime a number of short-term policy measures can be taken to:

- Enforce no parking on all major arterial roads, with tax incentives to private sector to develop car parking space
- Encourage shift of more public offices to Sri Jayawardenepura
- Introduce unleaded petrol with a cross subsidy to encourage all vehicles to switch to it
- Introduce low sulfur diesel with a cross-subsidy
- Require an annual Motor Operation Test (MOT)
- Encourage conversion to alternative fuels
- Improve the public transport system, particularly the railway.

**viii) Urban Greenery Programme**

Urban greenery (parks, open spaces, live fences, trees etc.) is being rapidly lost through urbanisation and rising land prices. Urban greenery plays a vital natural role in regulating air pollution and even micro-climates. Parks are often referred to as the "lungs of a city". There is a need to ensure that a minimum area of urban greenery is available in each local authority area. Ecologists have cited 40% greening (minimum) of the urban area as a guideline. A first step would be identify the status of existing urban greenery areas and then develop guidelines for maintaining these areas.

One of the underlying causes of dwindling urban greenery is the lack of a suitable range of urban planting material in appropriate sizes and quantities.

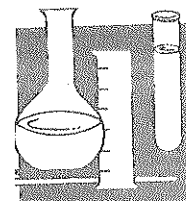
**ix) Training of Personnel and Institutional Strengthening**

Relevant personnel and cadre are insufficient. More University courses at both UG and PG level should be established in the fields of Urban Design, Landscape Architecture, Town Planning and Urban Environmental Planning. Provincial Council cadre should be enhanced by the inclusion of such personnel while ways should be found to improve the technical capacities of urban local authorities. The practice of

consulting professionally qualified private sector design specialists should be established.

**x) Public Awareness Programmes and Community Involvement**

Programmes on all current urban environmental issues should be begun immediately, starting with the topics of solid waste management, conservation and economic utilization of low-lying lands without reclamation for building, overall stormwater management, pollution of water supply, clean transport and avoidance of building on unsuitable terrain.



## 16 ENVIRONMENT AND HEALTH

### 16.1 Overview

Public health covers a large area which includes clean water and sanitation, food safety and hygiene, health impacts of solid waste dumps and industrial pollution, vector borne diseases, health impacts of air pollution and noise, and occupational health issues. Since several of these aspects are covered in other chapters, this chapter will focus on:

- Clean water and sanitation;
- Vector borne diseases;
- Indoor air pollution;
- Pesticide poisoning; and
- Noise pollution.

The impact of the environment on people's health is a high priority environmental issue. A 1992 survey of public environmental concerns found that 90 percent of the people interviewed felt that the environment was a major community concern, and identified environmental health as a major issue. Surveys of low-income settlements in Colombo also recognized environmental factors affecting health such as poor drainage, sanitation and vector born diseases as the main health issue.

#### Strengths:

Sri Lanka's population has relatively easy access to basic health and social services. Life expectancy is about 71 years. This figure is considerably higher than other countries at Sri Lanka's annual per capita income level of about \$750 in 1997. Health improvements have been achieved by continued high investments in health services, the relatively easy availability of such services to the population, and to trained and committed health care professionals. Public health has been protected by the dedicated key primary health care workers. The institutional structure has been improved by decentralizing the health services to the

Provinces. Both the curative and preventative staff now work under the direction of the Provincial Director of Health Services.

#### Weakness and threats:

As is the case with health services in many countries, preventive health care does not get the attention it deserves. Public health issues are best tackled by preventive measures as they are caused by environmental factors. The separation of the preventive services from other health services has limited the effective coordination between the prevention and treatment sub-sectors.

The lack of focus on preventive issues often arises from a variety of policy, administrative and institutional causes since these issues are often outside the control of the Ministry of Health.

#### Opportunities:

The health sector is being reformed and a number of innovative mechanisms are being developed for public-private partnerships, more community managed health care, devolving health budgets to the Provincial level and greater emphasis on cost effectiveness. The Ministry of Health is also developing the capacity to better manage preventive care by establishing an epidemiological unit and by concentration on environmental issues.

### 16.2 Issues

#### i) Pesticide Poisoning

Pesticide poisoning includes suicide, accidents and contaminated food. In 1995, pesticide poisoning was the sixth main cause of hospital deaths being responsible for 1,571 deaths. Suicide, though a major cause of concern, is outside the scope of the NEAP. It has been estimated that about

25 percent of pesticide related deaths are accidental, although the supporting data is weak (Jayaratnam, 1982). This suggests, even on a conservative estimate that at least about 10 percent of pesticide deaths are accidental. This means that more than 150 deaths in 1995 were due to accidental pesticide poisoning. This would make accidental pesticide poisoning the highest priority environmental health issue in 1995, with more deaths than those caused by bad water, lack of sanitation or by vector borne diseases. Much more work is needed to determine how the accidental poisoning occurs and how to prevent it. Poisoning occurs during distribution and transportation of the pesticides, when proper storage practices are not followed or when appropriate protective clothing is not worn during pesticide spraying.

Pesticide poisoning through food is probably another major issue, although little data is available to support such a statement. There is anecdotal evidence of high pesticide residues in fruit and vegetables, and of the use of pesticides to preserve fish.

**ii) Access to clean water and sanitation**

Lack of access to clean water, and poor sanitation are major health issues. In 1995, 24 percent of all households lacked a private toilet, and 13 percent lacked even a shared toilet. The situation was especially bad in the North Western, North Central and Uva Provinces where 20 percent or more of the households lacked access to even a shared toilet. In 1995, one third of all households lacked access to safe water. They range from 5 percent in Colombo to 55 percent in Moneragala. (Ministry of Health, 1996).

The health implications of this situation have been recognized by the Ministry of

Health which spent Rs 27 million in 1995 on the construction of toilets. Water-borne diseases include diarrhoeal diseases (shigellosis, typhoid and para-typhoid) viral hepatitis, and cholera. In 1995 there were 18,488 cases of shigellosis, and 54 deaths, 5,974 cases of typhoid and para-typhoid and 5 deaths, and 6,370 cases of viral hepatitis with 25 deaths. Thus there were at least about 80 deaths due to poor water supply and sanitation in 1995. The outbreak of cholera in 1997 claimed 11 lives.

Despite the many programs, many households still do not have a toilet. Funds are available from a number of sources including up to Rs 1500 from the Ministry of Health on a certificate from the Public Health Inspector. However the coverage is still poor owing to several factors.

**iii) Mosquito related disease control programs**

The important mosquito borne diseases are malaria, filaria, dengue fever and Japanese encephalitis. A total of 46,648 cases and 77 deaths from vector borne diseases have been recorded. Malaria is common in the Dry and Intermediate Zones. Filariasis affects teenagers and young adults, especially in the southern and southwestern coastal belts. Dengue haemorrhagic fever occurs mainly in Colombo and other urban areas. Japanese encephalitis is transmitted through pigs. Malaria, Japanese encephalitis and dengue have shown a decline, but filariasis has been on the increase. The Anti Malaria Campaign was substantially reorganized in 1993 to focus on decentralization, early detection and focused interventions.



**iv) Community awareness programmes**

Public apathy towards preventive health programs necessitate the launching of public awareness programs.

**v) Indoor air pollution**

Very little information is available on indoor air pollution, and it has not been treated with the attention it deserves as it mainly affects rural women. However as 90 percent of rural households use biomass for cooking, indoor pollution is likely to be significant. Mortality figures show that deaths due to "other diseases of the respiratory system" include the highest ratio of female deaths compared to male deaths (MoH, 1996). This result is also borne out from work in other countries, where bio-mass is also widely used for cooking.

**vi) Noise and vibration**

Noise pollution has been a major cause of complaints to the Central Environmental Authority and the Environmental Unit of the Police Department. Sources of noise and vibration include traffic, construction work, industrial and commercial activities and religious activities. Although the CEA has published noise standards in the Government Gazette, these are often breached and enforcement is difficult.

**16.3 Recommendations****i) Upgrade and focus activities of Primary Health Care Workers**

The 950 Public health inspectors are in the forefront of preventive health activities, representing an average of only 5 inspectors per 100,000 population (MoH, 1996). Their wide mandate includes water pollution, food safety, vector control and natural disasters. A training to work with CBOs and NGOs will maximise their effectiveness.

**ii) Introduce a National Sanitation Week**

A coordinated program is needed to provide a standard grant and a simple design to each household needing to construct a toilet. The week would be presented along the lines of the national Immunisation day with wide publicity and education programs.

**iii) Reduce the incidence of pesticide poisoning**

Greater understanding of the causes of the high level of accidental pesticide poisoning and finding means of drastically reducing it are urgently needed. The use of protective clothing must be promoted and farmers instructed in the correct use of pesticides. The best long term strategy however remains the promotion of integrated pest management.

**iv) Review vector control program to focus on cost effective preventive interventions**

Examine whether there is a need for separate programs covering malaria, filariasis, dengue fever and Japanese Encephalitis. More cost effective alternative interventions for reducing mosquito breeding should be explored.

**v) Interventions to reduce indoor air pollution**

Indoor air pollution can be reduced by the use of low cost efficient stoves. An awareness program of the effects of indoor air pollution should be launched by women's groups and other NGOs.

**vi) Noise pollution**

Noise pollution standards have been officially published, but enforcement is weak. Better land use planning with zoning can avoid industrial and other enterprises from being located in residential areas.

Noise pollution from loudspeakers is a growing menace in urban areas that needs to be curbed by the Police.

cities and towns leading to health hazards. This need has been explained in the chapter on Energy.

**vii) Transport Policy and Reduction of Air Pollution**

The proposed new transport policy should focus on air pollution in Colombo and other

## ABBREVIATIONS AND ACRONYMS

AD	-	Agriculture, Department of
ADB	-	Asian Development Bank
ASD	-	Archaeological Survey
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
EAIP	-	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	-	Finish 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 International Corporation Agency
LA <sub>s</sub>	-	Local Authorities
LDO	-	Land Development Ordinance

LUPPD	-	Land Use Policy Planning Division
MADR	-	Ministry / Agricultural Development & Research
MFE	-	Ministry / Forestry & Environment
MEC	-	Ministry / Energy Conservation
MEHE	-	Ministry/Education & Higher Education
MEIP	-	Metropolitan Environment Improvement Programme
MEPA	-	Ministry / Environment & Parliamentary Affairs
MFA	-	Ministry of Foreign Affairs
MFAR	-	Ministry of Fisheries & Aquatic Resources
MFIMD	-	Ministry/Forestry, Irrigation & Mahaweli Development
MPCLG	-	Ministry of Provincial Councils and Local Government
MID	-	Ministry of Industrial Development
MHIM	-	Ministry of Indigenous Medicine
MHC	-	Ministry / Health & Women's Affairs
MIST	-	Ministry / Industries, Science & Technology
ML	-	Ministry/Lands
MMA	-	Mines & Minerals Act
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	-	National 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 & Jewelry 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	-	People's 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 Standard Institution
SLSS	-	Sri Lanka Scientific Service
STC	-	Sri Lanka 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