

REGIONAL PROGRAMME OF ACTION

FOR SOUTH ASIAN SEAS REGION

FOR

PROTECTION OF MARINE ENVIRONMENT

FROM

LAND BASED ACTIVITIES

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INDEX

		Page No.
1. Foreword		3 - 4
2. Chapter I	- Marine Environment Status in South Asia	5 - 8
3. Chapter II	- Regional Programme of Action	9 - 24
4. Annexures I	- Bangladesh	25 - 31
	II - India	32 - 41
	III - Maldives	42 - 47
	IV - Pakistan	48 - 55
	V - Sri Lanka	56 - 62

FOREWORD

The UN Convention on the Law of the Sea, which came into force on November 16, 1994, contains several environmental provisions in its Part XII. Many of them are already parts of state practice and the entry into force of the Convention has underlined their fundamental importance in the environmental law of the sea. There are about 59 provisions of environmental significance in Part XII out of which 14 deal generally with the prevention, reduction and control of marine pollution from land-based activities.

Chapter 17(b) of Agenda 21 adopted in the UN Conference on Environment & Development contains provisions in paragraphs 17.24 to 17.29 regarding prevention, reduction and control of degradation of the marine environment from land-based activities.

In the intervening period between the signing of the UNCLOS in 1982 and adoption of Agenda 21 in 1992, many agreements have been concluded for protection of marine environment against pollution from land-based activities like the Paris Convention for the Prevention of Marine Pollution from Land-based Sources, the Helsinki Convention and the Athens Protocol.

In response to the UNEP Governing Council decision 10/24 of 31 May 1982, the Montreal guidelines were provided as recommendatory prescriptions for the member governments to adopt or elaborate upon to meet the needs of specific regions.

In the aftermath of the Earth Summit, the UNEP has taken up a programme to organise a structured preparatory process for an inter-governmental meeting in late 1995 for adopting a programme of action for the protection of the marine environment from land-based activities. In the meeting of the government designated experts held in June 1994 in Montreal, a decision was taken that a framework for the preparation of a pragmatic programme of action to be presented in the next meeting in Reykjavik, Iceland in March 1995 should be agreed upon. A Global Programme of action for the protection of the marine environment from land-based activities is under formulation in UNEP to which the members of different Regional Seas Programme have been asked to give necessary inputs.

For the South Asian Region, the UNEP has asked the South Asian Cooperative Environment Programme(SACEP), to prepare a Regional Programme of Action which will be used as input in drafting the Global Programme of Action to be presented for review and revision in the meeting of government designated experts at Reykjavik, Iceland, in March 1995.

As a parallel activity, the Action Plan for the Protection and Management of the South Asian Region as a part of the South Asian Regional Seas Programme was taken up for revision in a Meeting of National Focal Points in Colombo in November 1994. The representative of UNEP informed the meeting about the Global Programme of Action mentioned above and offered financial support to prepare a regional position paper and an action programme for consideration by UNEP. He also mentioned that the Regional Programme of Action so prepared would also be used as the IVth Annex to the draft Action Plan under the South Asian Regional Seas Programme which will be presented for final approval in a Meeting of the Plenipotentiaries of the five countries of the South Asian Seas Region in New Delhi in March 1995.

The UNEP and SACEP have designated me as the expert for carrying out a study of the state of the marine environment in the five South Asian countries and prepare a paper outlining the regional action programme for protection of marine environment from land-based activities. Within the short time given to me for this work, I undertook a tour to Pakistan, Bangladesh, Maldives and Sri Lanka from January 25 to February 7, 1995 and prepared the regional position paper containing details of the state of the marine environment and a suggested Regional Programme of Action which are given in the following pages.

The report consists of an overview of the marine environment in the South Asian Region given in Chapter I followed by a suggested Regional Programme of Action in Chapter II. Details of the state of marine environment in individual countries are given in Annexures I to V at the end of the report.

I thank the UNEP and SACEP for giving me this opportunity for preparing the report on the status of marine environment for the region to which I belong. I also thank the Governments of India, Pakistan, Bangladesh, Maldives and Sri Lanka for giving me all help, assistance and information at very short notice without which it would not have been possible to prepare the paper in such a short period of time.

I am grateful to the Honourable Minister of State for Ocean Development, Shri Eduardo Faleiro and Secretary of the Department, Dr.P.Rama Rao, for kindly allowing me to take up this assignment in the midst of pressing official work in the Department.

I also thank my personal staff led by Shri K.S.Subramanian for putting the report together by working even on holidays.

J.V.R.PRASADA RAO

CHAPTER - I

MARINE ENVIRONMENT STATUS IN SOUTH ASIA

1. The maritime countries of South Asia can be categorised into two distinct geographical groups. While Maldives and Sri Lanka are island nations, Pakistan, India and Bangladesh are situated on the Asian mainland. India has two groups of islands in the Arabian Sea and Bay of Bengal, whose problems are similar to that of Maldives and Sri Lanka. The northern Indian Ocean with its adjoining seas, Bay of Bengal and Arabian Sea form the common marine boundary for the five South Asian nations. The total land area covered by these countries is about 4.5 million sq.km. having a population of about 1.1 billion. The population density varies from 26 per sq.km. in Sri Lanka to 591 per sq.km. in the Maldives. The region except Sri Lanka has a high rate of population growth of more than 2%. Nearly 20 to 25% population of these countries are directly or indirectly dependent on the sea for living. The length of the coastline and the area of EEZ and other basic information for these countries are provided in the Annexures I to V.
2. The region is characterised by the location of some of the largest population concentrations in the world in the five mega cities of Karachi, Bombay, Madras, Calcutta and Dhaka and a large number of medium-sized towns and cities along the Indian and Bangladesh coasts. The capital of Sri Lanka, Colombo, and the city of Jaffna are situated on the coast. The entire island nation of Maldives has a coastal marine environment.
3. The cities and urban agglomerations situated on the coast are the single largest polluters of the sea. The most significant contaminants are bacteria and viruses arising out of human activities. In India alone, more than 50×10^6 cubic m. of sewage and effluents from the cities and towns are added to the sea every year. Substantial increase in phosphate/phosphorous concentration in the near shore waters has been observed in the metropolitan cities of the region. Dissolved oxygen concentrations have decreased to almost zero in these areas. The fishery life has practically become extinct in areas adjacent to the metropolitan cities because of highly toxic waste disposals. The cities and towns also generate large quantity of solid waste and garbage which is not entirely collected by the municipal authorities. In the process much of this garbage also finds its way into the marine environment through rivers, canals, etc. during the rainy season.

4. Pollution from untreated effluents from a large number of industries situated on the coast is the second most important cause of pollution in this region. Toxic heavy metals and organo chloric residues of high levels have been observed in different segments of the marine environment. The pollution levels are high because of discharges from traditional industries like textiles, jute, leather making, sugar, distilleries, chemicals and fertilizers using outmoded technologies. Many of the industries do not have proper effluent treatment plants for treatment of wastes and the untreated effluents are directly discharged into the marine environment.
5. Large number of small scale units in high polluting sectors like tanneries, ship breaking, etc. also contribute to the high pollution levels.
6. The South Asian countries are pre-dominantly agricultural countries and use a large quantity of fertilizers and pesticides and the run off from the agricultural fields also adds to riverine and marine pollution. The ports and harbours in the region have inadequate facilities for collection of wastes from ships anchoring in the harbours. Many of these vessels discharge their wastes into the channels leading to the ports. The countries are aware about their responsibilities under the MARPOL guidelines but are not able to implement them because of financial constraints. The navigation channels leading to the ports are dredged continuously and the dredge spills are dumped not very far from the shore. They may contain toxic materials harmful to marine life. As a result of this dumping activity fisheries near several harbours in the region have virtually disappeared.
7. The Arabian Sea and parts of Bay of Bengal lie on the oil tanker route from the Gulf to Japan and other far eastern countries. The oil tankers and merchant ships sailing along this route are therefore an important source of pollution in the sea. Roughly about 400 million tonnes of crude oil and products are transported along this tanker route. There are many cases of medium and small sized oil spills in the coastal waters and ports and harbours in this region.

8. Marine Habitats

- 8.1 The coral reefs and mangroves are the most important ecosystems threatened by pollution from land-based sources. In India, the north-west and the south-east coast and the island groups possess coral reefs and atolls of great significance. In several areas, the coral reefs have become extinct because of marine pollution and human interference. In Maldives, mining of sand and extraction of corals for construction purposes have been responsible for depletion of coral reefs in number of islands. At present extraction of corals is regulated in the country. Sri Lanka has coral reefs along its southern coast which is also used as a raw material in construction industry. There are no coral islands in Pakistan and one island namely St.Martin Island exists in Bangladesh.

8.2 Mangrove forests on the east coast are found in the Sunderban areas in the Ganges delta in India and Bangladesh and in the estuaries of Mahanadi and Godavari and Krishna rivers. On the west coast, mangrove farms are found in the Sind delta and a small area in Baluchistan. Sri Lanka's mangrove area has been estimated to be of the order of 1500 sq.km. There has been a decline of areas under mangrove because of over exploitation by human settlements, port construction, aquaculture farming, camel browsing, siltation and pollution.

8.3 Fishery is an important marine resource for the coastal populations in India and Pakistan and the most important source of food for Bangladesh, Sri Lanka and Maldives. There has been depletion of fishery wealth in the coastal areas upto a depth of 60 mts. because of over exploitation at times crossing the maximum sustainable yield. The deep sea resources have not been exploited to the desired extent because of lack of capital, entrepreneurial and infrastructural support in these countries.

9. INSTITUTIONAL FRAMEWORK

9.1 Environmental awareness has come in rather slowly in the region from the early 70s only. In India, the Water(Prevention and Control of Pollution) Act was enacted in 1974 establishing pollution control boards at the national and state level. The Environmental Protection Act was enacted in 1986 providing a comprehensive legal framework for protection of environment. The Sri Lankan government is the first one to address the problem of coastal environmental protection in a comprehensive manner because of pollution and erosion problems on the west coast. The Coast Conservation Act of Sri Lanka is an important piece of environmental legislation. The Act attempts to regulate human intervention in the coastal areas to protect the marine environment. In Pakistan, Bangladesh and Maldives, environment legislations have appeared in the late 70s and early 80s.

9.2 However, effective implementation of these environmental laws in the region have only started in the late 80s and has picked up momentum in the aftermath of the Earth Summit of 1992. All the countries have set up Ministries/Departments in the Government dealing with environment matters and enunciated National Conservation Strategies and Environmental Action Plans listing out specific programmes for implementation. Environmental authorities have been set up at the apex level and in some cases powers have been delegated to provincial authorities.

Following are the constraints faced by the countries in the South Asian region for tackling the problem of marine pollution from land-based activities:

- (1) The magnitude and severity of urban pollution in mega cities and other growth centres as a result of cumulative neglect;
- (2) Inadequate information on the status of marine environment, levels of pollution and its short and long term effects;
- (3) Inadequate skilled manpower and lack of training and research facilities in the field of marine environmental management;
- (4) Lack of finances for providing support to governmental organisations to address the problem of disposal of municipal wastes and industrial wastes in the cities and towns of the region; and
- (5) Lack of regional effort towards sharing of information and evolving common programmes of action to help each other.

10. FUTURE TRENDS

Presently the threat to the coastal and marine environment in the South Asian Seas region is highly localised to the areas of high urban and industrial concentration. However, the threat is increasing because of the high rate of population growth of 2% per year in the region and the migration of population from the interior to the coast in search of employment in the new growth centres. There is growing awareness among the people and the government of the value of a clean environment which can be translated into effective action through a mass movement in favour of environment protection. Effective implementation of the environment action programmes of the countries will be able to arrest the deterioration of the marine environment. A Regional Action Programme for the countries of the South Asian region is proposed in the following pages as the input for the Global Programme of Action for the protection of marine environment from land-based activities.

CHAPTER - II

REGIONAL ACTION PROGRAMME

A. STATE'S OBLIGATIONS ACCORDING TO EXISTING AGREEMENTS

1. Global

1.1 The UN Convention on the Law of the Sea 1982 came into force on November 16, 1994 and its universality has been ensured by means of an Implementing Agreement relating to Part XI of the Convention which was opened for signature in July 1994. The Convention has specific provisions relating to conservation and management of the marine environment namely, conservation and management of living resources, pollution prevention, reduction and control, transit management and general provisions relating to protection of marine environment in the EEZ and the Area. All the countries of South Asian region are signatories to this umbrella Convention which regulates the activities of nations in ocean sector both within and outside national jurisdiction. The process of ratification of the Convention has also been initiated in some of the countries and it is expected that all the five countries which took active part in finalising the Convention in 1982 will also become contracting parties by ratifying it.

1.2 Collectively, the five maritime countries of the South Asian region have also adopted the programme of action outlined in Chapter 17(b) of Agenda 21 adopted in the UN Conference on Environment and Development (UNCED) at Rio relating to marine environmental protection. The objectives and the coordinating profile as reflected in Articles 17.22 and 17.24 to 17.29 have been incorporated in their national conservation strategies and environmental plan of action. The important objectives which have been adopted in the environmental policies of the countries are:

- (1) Integration of protection of the marine environment from land-based activities into general environmental and economic developmental policies.
- (2) Development of economic incentives to apply clean technologies and adoption of other means like the 'polluter pays' principle.

1.3 The following priority programmes identified in Chapter 17(b) also find mention in the national policies and legislations of these countries:

- (1) Extending the Montreal guidelines on prevention of pollution from land-based activities to specified areas
- (2) Review and revision of action plans where necessary to prevent and control marine degradation caused by land-based activities
- (3) Develop means of providing guidance on technologies to deal with major types of pollution
- (4) Incorporating sewage concerns into developmental plans
- (5) Promoting environmentally sound treatment facilities for domestic and industrial wastes.

1.4 The island nations of Sri Lanka and Maldives have adopted the Barbados Programme of action contained in the Report of the Global Conference on the Sustainable Development of Small Island Developing States held in Barbados in April/May 1994. The important issues which finds mention in the programme of action are:

- (1) Developing ways of minimising wastes and/or converting wastes such as sewage into resource;
- (2) Limiting important of non-biogradable and hazardous substances;
- (3) Changing community attitudes to the disposal and use of sewage and development of alternatives;
- (4) Development of in-country skills and expertise in the areas of waste management and monitoring.

1.5 The South Asian countries are contracting parties to the RAMSAR Convention on Wetlands and the Convention on Hazardous Waste Movement, 1989. Even though, the MARPOL Convention has not been ratified by the South Asian countries except India, efforts are on to implement some of the provisions of the Convention like creation of reception facilities at ports and harbours for collection and disposal of effluent discharge from vessels, etc. The MONTREAL guidelines for the protection of marine environment against pollution from land-based activities are proposed for revision and updating as per the decision in the meeting of government designated experts in MONTREAL in June 1994. The countries of the South Asian region are in agreement with the need to revise some of the guidelines such as:

- (1) Liability and compensation for pollution damage;
- (2) Development of guidelines for tackling pollution emergencies;
- (3) Monitoring and data management;
- (4) Scientific and technical cooperation.

2. Regional

2.1 The South Asian Seas Regional Programme for Protection and Preservation of the Marine Environment in the South Asian Region provides a framework for protection and continued development of the South Asian Seas Region. The Action Plan developed under the Regional Seas Programme has the following goals:

- (1) To promote policies and management practices for the protection and development of marine and coastal environment at national and regional level;
- (2) To prevent deterioration of the region's marine and coastal environment resulting from activities within and outside the region;
- (3) To strengthen and encourage regional collaboration among the institutions within the region which are involved in the studies of marine and coastal resources;
- (4) To improve training, technical assistance and scientific and statistical data at all levels; and
- (5) To stimulate the growth of public awareness at all levels of the society in the region regarding the vulnerability of its marine and coastal environment.

- 2.2 The draft Action Plan was revised by a Group of Experts drawn from the region and is scheduled for adoption in a meeting of the Plenipotentiaries of the region in March 1995.

B. PROGRAMME OBJECTIVES AND METHODOLOGIES

1. As outlined earlier, the countries of the region have some of the highest population growth rates and population densities especially in the coastal areas. It is also one of the most backward regions with average literacy level less than 50% with the exception of Sri Lanka and Maldives. In view of the tremendous pressure on the coastal and marine environment from population growth, unplanned urbanisation and industrialisation, the following objectives have to be set forth for a regional action programme:

- (1) A time bound and co-ordinated action programme to address the special problems of waste disposal from domestic and industrial effluents and solid waste in the five mega cities of the region namely, Karachi, Bombay, Madras, Calcutta and Dhaka, whose population will be more than 10 million each by the turn of the century.
- (2) Ensure environmentally sound and sanitary disposal of waste in the other urban areas and newly emerging growth centres on the coast;
- (3) Categorisation of industrial units according to the severity of the pollution from their effluents and adopt a time-bound programme to make them comply with environmental regulations for effluent disposal;
- (4) Formulate and enforce strict environmental standards and regulations for all newly established industries in the large, medium and small scale sectors.
- (5) Develop necessary technology and infrastructure for setting up common effluent treatment plants for the large number of small scale industrial units which are a distinct feature of this region;
- (6) Organise and carry out on a regional basis a marine pollution monitoring and assessment programme by networking existing or newly set up monitoring institutions in the five countries of the region;
- (7) Establish regional co-operation network for capacity building and manpower development to train and equip the technical manpower for manning critical positions in governmental agencies working in the field of marine environmental protection.

- (8) Adopt and implement regional oil spill contingency plan to monitor, control and combat marine pollution caused by oil in the coastal environment of these countries;
- (9) Develop and assist in capacity building for preparation and implementation of integrated coastal zone management plans on a pilot scale and then on a larger scale in which the concerns of protection of marine areas from land-based activities should be specifically addressed; and
- (10) Develop a marine environmental information network in the region for exchange of data and information regarding trans- boundary movement of pollutants and hazardous and toxic substances in the coastal seas.

C. INSTITUTIONAL STRUCTURES AND CO-ORDINATION

1. Global

At the global level, the important organisations involved in management of land-based sources of marine pollution are the United Nations Environment Programme (UNEP), the United Nations Development Programme (UNDP) and the International Maritime Organisation (IMO).

1.1 United Nations Environment Programme (UNEP)

Monitoring, prevention and control of pollution is one of the important concerns of UNEP and in the marine sector the organisation operates through the Regional Seas Programmes which are managed by the OCA/PAC Division. The South Asian Seas Regional Programme was promoted by the UNEP and the action plan under the programme is in its final stages for adoption and implementation.

1.2 United Nations Development Programme (UNDP)

The UNDP has strong presence in the five countries of the South Asian region as an organisation providing assistance in the form of studies, technical assistance and funding. A very limited amount of funding has been done by UNDP in the marine environment sector.

1.3 International Maritime Organisation (IMO)

The IMO's major initiative is the International Convention for the Prevention of Pollution from Ships (MARPOL Convention 1973). The Convention contains regulations for preventing pollution from oil, chemicals, harmful wastes and sewage. A protocol was added in 1978 regarding crude oil wash, inert gas systems and segregated balanced tanks for oil tankers. The Convention on Oil Pollution Preparedness, Response and Cooperation, International Convention on the Establishment of a Fund for Oil Pollution Damage (Fund Convention), International Convention on Civil Liability for Oil Pollution Damage (CLC Convention 1969) are some of the IMO Conventions containing important provisions relating to protection of marine environment. The IMO has recently agreed to revise and update the regional oil spill contingency plan for South Asian region in keeping with the latest developments in regional co-operation in South Asian Region.

1.4 Economic and Social Commission for Asia and Pacific (ESCAP)

The ESCAP, with its Headquarters in Bangkok, has recently taken a strong initiative to develop priority programmes for regional co-operation in the field of protection of marine environment in the South Asian Region. In a Workshop held in Colombo in December 1993, the following priority areas were identified for regional co-operation among the maritime countries of South Asia:

- (1) Development of a regional project and a pilot project in each of the five countries for integrated coastal zone management;
- (2) A Regional project for oil pollution contingency plan; and
- (3) Regional project for developing centres of excellence for manpower development in the region.

1.5 Global Environment Facility (GEF)

The GEF which was set up to fund programmes relating to protection of environment has not yet identified marine pollution from land-based activities as a priority area for global funding. Its main area of concern is global climatic change, global warming and sea level rise. However, as the threat to marine environment from human intervention being more immediate and apparent, it would be necessary for the GEF to include programmes relating to protection of coastal and marine environment as a priority area for funding.

2. Regional

2.1 South Asia Co-operative Environment Programme (SACEP)

The SACEP, Colombo, founded by UNEP for the South Asian region is the co-ordinating agency for all environment related matters in the South Asian Seas Region. It is the South Asian component of the UNEP Regional Seas Programme. It is financed by annual contributions from member governments which cover the operating costs. The SACEP has started a number of initiatives for identifying programmes in the South Asian countries for funding from GEF, UNEP and ESCAP. It has also set up regional environmental information system (RENRIC) to collect, archive and disseminate environmental information relevant to the five South Asian maritime countries. The SACEP has also taken strong initiative to revise and update the Action Plan in association with UNEP which is at the final stage of approval.

3. National

3.1 The concern for preservation of environment in general has prompted the South Asian countries to go in for establishment of institutional structures to deal with environment related matters starting from the 70s. In all the countries, a Ministry/Department has been set up at the federal level as the chief co-ordinating authority for taking care of the policy framework relating to environment. The marine environment has been addressed with greater concern in Maldives and Sri Lanka in the national policies because of their situational characteristics. The marine environment and its protection and preservation has become an important area of concern for the governments of India, Pakistan and Bangladesh mainly because of the increased levels of pollution caused by the big metropolitan cities and industrial complexes which have witnessed large scale population explosion in the last two decades.

3.2 In all the countries an Environment Council as the supreme policy-making body with a political head as its chief is a common characteristic. The countries have come out with National Conservation Strategies as policy statements on environment and development in preparation for the Earth Summit in January 1992 and have since formulated Environmental Action Plans for tackling specific issues. In some countries like Pakistan and Bangladesh, the action programme is still awaiting approvals at the highest decision making level.

- 3.3 The common feature is that the subject of environment, because of its various facets, is dealt with in a number of government Ministries and departments and coordination is often the casualty. The following are the three important government agencies which address the problem of marine environment:
- (1) Ministry/Department of Environment and the Environment Authorities like the CEA or the Central Pollution Control Boards set up under the Environmental Acts of the country;
 - (2) The National Maritime Agencies which essentially deal with pollution from vessels and ports and harbours and offshore installations. These are generally under the Ministry of Shipping and Transport; and
 - (3) Ministries of Urban Development which are mandated to address the problem of disposal of urban wastes in the Metropolitan cities and towns.
- 3.4 In India, the implementation of plans and programmes is generally at the state(provincial)level with the State Pollution Control Boards as the chief functionaries for enforcement of the legislative provisions and guidelines. Devolution of such authority at provincial level has only started recently in Pakistan and Sri Lanka while in Bangladesh and Maldives, environment is mostly addressed at the national level.
- 3.5 Programmes for monitoring and surveillance of marine pollution have not been developed to a high degree of sophistication in these countries except to a certain extent in India. Monitoring of coastal waters, estuaries and rivers is taken up as an intermittent activity in these countries and there is no systematic collection and archival of marine environmental data. In India, a national programme, Coastal Ocean Monitoring and Predictive Systems (COMAPS)' has recently been started to monitor the marine environment in the coastal waters and to collect and disseminate data on pollution levels to the State governments and the polluters.
- 3.6 There are no dedicated institutions for manpower development and research in the field of protection and preservation of marine environment in these countries. In India and Pakistan, there are National Institutes of Oceanography and centres of excellence in marine sciences in select universities. There is, however, a severe shortage of technically skilled manpower in the governments at the national and provincial level.

- 3.7 The plans and programmes relating to marine environment protection are in most of the countries subsumed in the sectoral plans and programmes of line Ministries, Departments and Agencies. The marine environment component is not specially brought out as a Special Component Plan for the purpose of formulation and implementation of the Action Plans in any of these countries. It is at times difficult to quantify the material and monetary support extended by these governments for tackling the problem of marine pollution from land-based activities. An Apex Committee to exclusively address the problems of marine pollution exists only in India. A Marine Pollution Control Board has been set up in Pakistan only recently. Such co-ordinating mechanisms are yet to evolve in other countries.

D. SPECIFIC ACTIONS AT NATIONAL, REGIONAL & GLOBAL LEVELS

I. National Action

- (a) The countries of the region should immediately finalise their Environmental Action Plans/Programmes in physically and financially quantifiable terms. In some countries, the Action Plans lack focus especially with regard to addressing the problems of protection and preservation of marine environment while addressing issues like industrial pollution, urban waste management, water quality monitoring, etc. It would be useful if the countries of the region can develop a Special Component Plan out of the Action Programmes finalised by them to specifically address the problem of marine pollution from land-based activities. The implementing agencies in the line Ministries/Department may be asked to clearly specify the activities in physical and financial terms that are specially directed towards addressing these problems. As major expenditure on environmental protection in these countries comes from government sources, it will give a clear-cut idea of the physical and financial inputs earmarked in these countries for addressing the specific problem.

National efforts in the field of protection of marine environment can be effectively co-ordinated by a National Co-ordination Committee or Board with representation from all concerned agencies operating in related fields of activity and led by a powerful entity either in the political or administrative hierarchy. The Committee/Board should be competent to discuss and finalise the special component of the national, regional and local programmes and financial outlays relating to the marine environment sector.

- (b) With regarding to pollution from industries, the countries have to adopt different strategies for:
- (i) existing industries; and
 - (ii) new industries to be set up.

The approach has also to be different for:

- (i) organised industrial sector (large, medium scale industries); and
- (ii) unorganised/small scale sector.

As regards existing industries, strict implementation of the government laws of the country would be necessary which may at times lead to closure of some of the highly polluting industries for not adopting correctional measures relating to effluent disposal. It is a comforting thought that the judiciary in some of these countries has been found to be quite favourable in their judicial pronouncements to the efforts of established governments in protection of environment. Some of the governments like Pakistan have given specific dates for all the industries to set up effluent treatment facilities without which they may face closure at the end of the grace period. A reward and punishment policy wisely used by the governments would help in bringing around organised industry to tackle the problem of land-based industrial pollution.

In the case of new industries, there is a consensus towards the necessity of an Environmental Impact Assessment prior to giving approvals for setting up of the industries. The economic liberalization policies adopted by the governments in the South Asian Region result in giving greater urgency to clearances for setting up of new industries. It is, therefore, necessary for the concerned organisations to address the problem of environmental impact assessment expeditiously with the help of experts drawn from concerned fields. Delay in environmental clearance often creates an adverse impression in the minds of the public at large that environment is progress resistant. Nothing can be more counterproductive than development of such an attitude.

- (c) A special feature of the South Asian region is the location of five of the largest cities of the world along the coast, namely, Bombay, Karachi, Madras, Calcutta and Dhaka. These cities will each have more than 10 million population by the year 2000. Effluents generated from their domestic and industrial wastes are the single largest cause of marine pollution in the three countries of Pakistan, India and Bangladesh. The problems of these cities have become too critical for the national governments and the provincial governments, not to speak of the municipal corporations, to handle. The national governments have to give high priority to the problem of these mega cities on the coast and try for special financing from global funds for construction, operation and maintenance of treatment facilities.
- (d) The problem of solid waste collection requires innovative methods like segregation of garbage according to the classifications of waste, setting up of waste recycling facilities and using of organic waste for biogas and electricity generation. The countries may also have to make necessary provisions in their legislations that recognise different categories of wastes and recommend appropriate disposal methods.
- (e) All the five countries in the region have important non-governmental organisations functioning in the field of environment. No agency, however, addresses the problem of marine environment specifically. It will be necessary for the government to build a movement in favour of environment among the peoples of the countries around the non-governmental organisations. Awareness campaigns should be designed to recognise the need to control pollution at the source and evaluate the reuse, recycling, and converting of wastes to resources. Environment should become an important part of school and college curriculum in these countries to generate awareness at the grassroots level.
- (f) To understand the severity of the problem of pollution of marine environment, it is necessary to generate specific programmes for monitoring of the levels of various pollutants in the coastal seas, rivers and estuaries emptying into the sea. No systematic monitoring programme exists in this region except in India. The governments in these countries should endeavour to set up collection and analytical facilities for regular analysis of water samples and generate and disseminate data on the pollution levels regularly to the line departments and agencies in the government for taking corrective actions. Small sized dedicated research vessels with onboard processing facilities would be very helpful and cost-effective in carrying out such programmes. Such vessels can be indigenously built within the region.

2. Regional Action

- (a) The South Asian maritime countries should take an important step towards preservation of their marine environment by approving the Action Plan of the South Asian Regional Seas Programme which contains specific guidelines for environmental monitoring, management and control.
- (b) The regional projects identified under the Action Plan for integrated coastal zone management, pollution emergency response and building of centres of excellences are priority areas and the implementation of the pilot projects will go a long way in ensuring regional cooperation for capacity building.
- (c) Even though no specific centre of learning exists in the region to address the problems of land-based sources of marine pollution, there are centres of excellence within the region which can be developed as regional centres for training and research in specified fields for technical personnel, middle level managers civil servants and representatives of NGOs in pollution prevention and management strategies. For the purpose of regular exchange of environment related information, a regional Marine Data Centre may be established at SACEP, Colombo, which can be networked with national marine data centres of the five countries for regular exchange of marine environment related information and data.

3. Global Action

- (a) Development and introduction of clean technologies and replacement of obsolete production technologies with more environment friendly ones is an important requirement in this region which is still technologically backward. A number of traditional industries like textiles, jute, leather making, chemicals and pharmaceuticals, sugar and distillery industries use outmoded technologies which result in generation of large quantities of effluents which are physically harmful to the environment. Replacement of these technologies with more environment-friendly ones require concerted global action with the active participation of countries from the North. Transfer of such technologies to the developing countries from the developed world should be looked at in the overall perspective of preservation and protection of marine environment and not as a trade-related bilateral issue.
- (b) The developed nations and the UN institutions like the World Bank, Asian Development Bank, etc. should try to help the countries of South Asia to tackle its problems of waste disposal from the mega cities and newly emerging industrial complexes located along the coast.

- (c) The industrialised nations should support strengthening of institutions in the South Asian countries for developing necessary technologies for prevention of pollution and in the handling, treatment and disposal of hazardous waste substances.
- (d) The small island states like Maldives and Sri Lanka should have the right to regulate, restrict and ban important products containing non-biodegradable and hazardous substances and to prohibit the trans-boundary movement of hazardous and radio-active waste materials within their jurisdiction.
- (e) While developing the global programme of action for addressing the issue of marine pollution from land-based sources, the area specific problems of South Asia require special consideration.

E. PROCEDURE FOR REPORTING OF PROGRESS

Even though the countries of South Asia have made rapid strides in developing a systems approach in planning and implementation of projects, proper information systems have not yet been fully developed in these countries. The reporting systems are mostly bureaucratic and outdated and require thorough revision. In countries like India with a 3-tier administration set-up at the national, state and district level proper reporting and sharing of information is a valuable tool. An agreed system of reporting at the regional and global level should also be developed with clear identification of focal points at the national levels for various programmes. Establishment of linkages with the activities of international programmes like GESAMP, GOOS and GIPME which are monitoring and assessing the state of marine environment would also help the South Asian countries in getting exposed to the latest technologies in the field of marine environment management.

F. NORTH-SOUTH CO-OPERATION FOR CAPACITY BUILDING

- 1.1 Capacity building includes technology transfer, education, training and access to information. To bring in an attitudinal change among the people and make them environment-conscious requires education and training in all sectors. For waste generators, the attitudinal shift should be from 'end of the pipe' focus to one of minimisation of waste through proper management and cleaner production technologies. Use of appropriate technology for prevention of pollution in water bodies also requires education and training.

- 1.2 This could be brought about most effectively by demonstration projects involving local participation. The countries of the North where such projects are existing can help in setting up these projects for spreading the message of protection of environment.
- 1.3 The countries of North can also help in meeting the training needs of the South Asian nations by allocation of seats in centres of excellence in the developed countries for trainees from the region and provide them with financial assistance during their training. This will help the governments which run on tight budgetary constraints in sponsoring sufficient number of personnel for training in management of marine environment in their countries. Non-governmental organisations working in the developed countries can help set up regional centres for training in specified fields relating to protection of marine environment. A recent example is the Operational Centre of the International Ocean Institute (IOI), Malta, set up in Madras. The Operational Centre regularly imparts training for middle level managers and planners and government officials from the developing countries in coastal zone management and related environmental issues.

G. FINANCING MECHANISM

I. Global

- 1.1 The problem of marine pollution from land-based activities is the result of cumulative neglect over the last few decades. In countries with large populations and high growth rates of population of which South Asia is a classic example, large scale effort would be needed to clear the backlog and bring the situation to satisfactory environmental standards. It will be beyond the means of these countries to tackle the problems on their own without global effort. The remedial measures are cost intensive and require large scale investments. It would, therefore, be necessary to set up international funding mechanism for construction and effective management of waste management systems. This requires high capital investment and hence stability and continuity in the programme of action. The Global Environment Facility which was set up for financing environment related projects, unfortunately has not been able to come up to the level of expectations for financing marine environment related projects. Marine pollution from land-based activities does not figure in the priority areas of GEF funding. It would, therefore, be necessary to set up a separate funding mechanism specifically to address this problem which is more immediate than global warming or sea level rise. Creation of such a global fund will help in transfer of technology, consistency of standards for waste disposal and management and generation of awareness and demand for higher environmental quality.

1.2 The World Coast Conference 2000 held in the Netherlands in 1993 states that global sea level rise is often not the most critical factor particularly in the most vulnerable areas such as small islands and delta regions especially in developing countries. It is, therefore, important to take the non-climatic factors also into consideration while tackling the issues relating to protection of marine environment and coastal zone management.

2. Regional

2.1 The South Asian Seas Action Plan envisages creation of South Asian Seas Action Plan Trust Fund to support the Action Plan. The Fund is to receive:

- (a) Annual contributions from the member states to meet the cost of institutional arrangements;
- (b) Contributions from member states as well as from UN and other organisations, agencies, etc. to meet the cost of implementation of projects identified under the Action Plan; and
- (c) Contribution from any other sources agreed to by the member states.

2.2 Regional and international agencies under the UN system may contribute to the proposed Fund which will help in meeting some of the immediate needs of the region in fields like training of personnel, manpower development, sharing of information and developing regional co-operation programmes for tackling pollution emergencies.

3. National

- 3.1 National governments within their limited financial resources should also try to give priority to projects and programmes which have direct relevance to protection of marine environment. Except in countries like Maldives and Sri Lanka which are situated in a marine environment, the priorities and programmes for the other three countries are more land-based in nature. The damage to marine environment is slow and not visible in the initial stages. This may put the government agencies into a false sense of security as happened in the case of the major metropolitan cities in the region. In the case of India, it was found that the marine environment beyond one km. from the coast is healthy even now. The exception is the Bombay Area where the pollution extends even 2 km. beyond the coast. If proper remedial actions are not taken, the same situation may occur in other areas also. There is already evidence of large scale depletion of fishery wealth along the coastal areas near urban centres like Karachi, Bombay, Dhaka, etc. Delicate ecosystems like mangroves and coral reefs are also facing threat of extinction from human interference. The concern for environment along the governments should be translated into effective action by allocation of resources and strengthening of the institutions responsible for the work. There is immediate need to develop perspective Plans on the lines of the Sri Lankan Coastal 2000, specifically for addressing the problem of marine pollution. Simultaneously, some of the incentives can be built-in to encourage industries to set up effluent treatment facilities. In India, the fiscal tool for environmental protection is the Water (Prevention and Control of Pollution) Act 1977, amended in 1991. Generation of internal resources through such levies from polluters follows the 'polluter to pay' principle which is an essential feature of environmental management.

BANGLADESH1. Background Information

Land Area	-	144,054 sq.km.	
Population	-	110 Million	
Length of the coastline	-	710 km(excluding major indentations)	
Exclusive Economic Zone	-	upto 200 nautical miles	
Area of EEZ	-	120,000 sq.km.	
Largest cities	-	Dhaka	Chittagong
Population	-	7 million	2.5 million

Geographically Bangladesh lies between the Indian and the Malayan sub-regions. Most of the country is low-lying, only about 10 mts. above the mean sea level. The entire coastline of the country has an intricate network of waterways which run in the North-South direction. Some of the world's biggest rivers like the Ganga, Brahmaputra, Meghna and Karnaphuli enter the Bay of Bengal through this estuarine system. The coast of Bangladesh is on the cyclonic track which form over the southern portion of Bay of Bengal and hit the coast almost annually causing severe damage to life and property. The coast of Bangladesh contains one of the largest mangrove ecosystems in the world with an area of 587,000 hectares. There is only one coral reef island, St. Martins Island in Bangladesh with an area of 7.5 sq.kms. Fish, both fresh water and marine is the most accessible living resource for the majority of the population.

2. STATE'S OBLIGATIONS ACCORDING TO EXISTING LEGISLATION

- 2.1 Bangladesh is a signatory to the UN Convention on the Law of the Sea, 1982. It took active interest in formulation of the Convention leading to its adoption in 1982. It has not yet signed the Implementing Agreement to the Convention which is open for signature in July 1994 nor has it ratified the UNCLOS. It is a contracting party to the RAMSAR Convention on Wetlands of international importance. It is not, however, a contracting party to the International Convention for the Prevention of Pollution from ships 1973 modified by the Protocol of 1978 (MARPOL-73/78), the International Convention of Civil Liability for Oil Pollution damage 1969 (Civil Liability Convention, the 1984 Protocol to amend the International Convention on Civil Liability for oil Pollution damage 1971, and the International Fund Convention. It has, however, adopted the Agenda 21 of Rio Summit as a guideline for formulation of its National Conservation Strategy and Action Plan.

- 2.2 Bangladesh enacted the Maritime Zones Act 1974 defining the territorial sea and the EEZ of the country which extends upto 200 nautical miles.

3. DOMESTIC LEGISLATION

- 3.1 The Environmental Pollution Control Ordinance of 1977 is the principal legislation relating to control, prevention and combatment of all types of environmental pollution. This, however, does not make any specific reference to marine environmental pollution or to pollution caused by ships. The Bangladesh Merchant Ship(Amendment) Ordinance 1988 contains control measures for regulating shipping activities even though the pollution control aspect is not dealt with in this Ordinance.
- 3.2 At present, two important legislations are in the draft stage, namely, the Protection of the Marine Environment of Bangladesh Act and the Environmental Protection Act. The first one deals with provisions of oil pollution caused from ships, offshore installations and seabed exploration and exploitation. There are specific provisions relating to installation of waste reception facilities in ports and harbours as prescribed under MARPOL. The Environment Protection Act which is also under draft stage contains provisions relating to environment impact assessment, industrial waste permit system and certain enforcement provisions. The relative jurisdiction of these two legislations has to be clearly specified to avoid both overlap as well as grey areas.
- 3.3 There is no separate policy focusing exclusively on the marine environment in Bangladesh. The National Environment Policy 1992 which was adopted recently by the Government of Bangladesh as a significant component for preservation of marine environment by controlling pollution from land-based and sea-based activities. The Industrial Policy enunciated in 1991 also mentions prevention of environmental pollution as an important policy objective. The policy emphasises the need to develop industrial growth centres in appropriate locations. Environmental quality standards for Bangladesh have been provided but are not yet adopted.
- 3.4 To achieve the objectives of the environmental Policy, an Environmental Management Action Plan has been drafted through the consultative process. It is regarded as a synthesis between government and people's perception of environmental issues and actions required to address them.
- 3.5 Bangladesh Government has also enacted the Coast Guard Act under the Ministry of Home Affairs to protect its maritime resources and for monitoring surveillance, combating and cleaning of pollution occurring in the sea.

4. PROGRAMME OBJECTIVES AND METHODOLOGIES

4.1 The pollution from land-based activities in Bangladesh is mainly of the following categories:

- (1) Pollution from municipal wastes;
- (2) Pollution from Industrial wastes;
- (3) Agricultural wastes; and
- (4) Oil Pollution.

4.2 Urban Pollution

4.2.1 The numerous rivers and tributaries in Bangladesh carry pollutants from the drainage area which are in the form of sediments, municipal and industrial wastes, agricultural wastes and pollutant discharges from ships and boats. The three large cities of Dhaka, Chittagong and Khulna are the major urban contaminators of the marine environment through municipal waste. Dhaka city with a population of 7-million adds a large amount of solid wastes and sewage which find way to the sea through the river Buri Ganga. The city has an underground sewage pipeline system connecting major parts of the city and leading to a sewage treatment plant. It can now serve only 25% of the total population of the city. The treatment method is also not based on advanced technology as a result of which the effluents from the treatment plants containing high BOD and suspended solids are discharged into the river. Solid wastes of about 1500 to 2000 tonnes per day are dumped in open low-lying sites which find their way into the water system during the rainy season.

4.2.2 The city of Chittagong has no sewage treatment facility at all and the entire solid wastes and sewage finds its way into the Karnaphuli river through open channels. The third largest city, Khulna has also no sanitation and collection facilities for domestic wastes.

4.2.3 It is, therefore, necessary to address the problem of treatment of wastes both solid waste and sewage in the three major cities. The sewage treatment plants in Dhaka must be enlarged and STPs should be set up to treat municipal sewage of Chittagong and Khulna cities if coastal environment has to be improved. The methods of collection of solid waste should be improved.

4.3 INDUSTRIAL POLLUTION

Even though, Bangladesh is not an industrialised country, traditional industries like textiles, tanneries, jute and iron and steel contribute significantly to the industrial pollution finding its way to the Bay of Bengal through the water bodies. About 1200 industrial units have been identified in 13 categories which are polluting the marine environment. The principal pollutants are ammonia, chromium and other heavy metals from fertilizer plants and tanneries, mercury from chloro alcohol units, phenols from pulp and paper mills and urea from the fertilizer plants. No systematic study on the flow impact of industrial pollutants has yet been carried out. Only a few industries have taken some pollution control initiatives which are nothing but simple neutralising and settling methods and effluent dilution. Majority of the industries do not have any pollution treatment facilities.

4.4 AGRICULTURAL WASTES

Fertilizer and pesticide residues contaminate the water and find their way into streams and rivers and ultimately to Bay of Bengal. The pollution load in the Bay deriving from Bangladesh in the form of pesticides is expected to be as high as 1800 tonnes per year.

4.5 OIL POLLUTION

4.5.1 Pollution by oil spills in the ports of Dhaka, Chittagong and Khulna is a potential threat to the marine environment. Frequently recurring cyclones add to this constant danger because of the possibility of vessels sinking in the port areas thus contaminating the port environment.

4.5.2 The ship breaking operation in Bangladesh which is an important economic activity also contributes its share to marine pollution. There are about 150 entrepreneurs engaged in this business who operate in Chittagong and Khulna areas. Pollution due to oil spillage, reduced materials of iron corrosion have also found to affect recreational beaches affecting tourism in Bangladesh.

4.5.3 To address the increasing problem of industrial pollution, it is necessary to direct major polluting industries to install effluent treatment plants and less polluting industries primary waste treatment plants like oxygen ponds. The Chittagong and Khulna ports must install bilge and ballast water treatment plants to reduce untreated discharges.

4.6 SHRIMP CULTURE

There is a tremendous boost to shrimp production in the coastal areas of Bangladesh and shrimp seed collection is an important activity giving employment to large number of people. Unrestricted expansion of shrimp farms also contribute to marine pollution as semi intensive aquaculture has been found to pollute the coastal and marine environment in other countries like Thailand, Taiwan, etc. It is, therefore, necessary to delineate coastal land areas most suitable for shrimp culture. Only they should be allowed saline water intake for shrimp cultivation. Shrimp farming should not be allowed at the cost of mangrove forest destruction. Regulatory measures should also be imposed and awareness campaigns conducted among fisher folk engaged in seed cultivation.

5. INSTITUTIONAL STRUCTURES

- 5.1 At the national level, the Department of Environment & Forests, is the nodal organisation dealing with all aspects relating to marine environment. It works as the technical arm of the newly formed Ministry of Environment & Forests. The other governmental agencies dealing with coastal marine affairs are the Directorate of Shipping, Ministry of Ports, Shipping and Inland water Transport, Department of Fisheries which oversees coastal and marine fisheries, survey, development and management and the Department of Science & Technology which looks after education and research in the marine sector.
- 5.2 There is no research institution in Bangladesh which specifically addresses the problems of marine environment. The Fishery Research Institute and the Forest Research Institute are engaged in environmental research but not in marine environment. None of the Universities of Bangladesh offer courses or conduct research in the marine environment except the University of Chittagong. The Institute of Marine Sciences under this University is the only one which offers post-graduate degree in marine sciences. The University of Khulna has recently established a Department of Marine Biology but its activities are yet to start.
- 5.3 Bangladesh has the distinction of having a very strong non-governmental organisational set up. There are about 13,000 NGOs working in different developmental areas in the country. The Bangladesh Centre for Advanced Studies (BCAS), the International Institute for Environmental Studies and Disaster Management (IIESDM) and the Association for Social Advancement (ASA) are some of the prominent organisations.

6. SPECIFIC ACTIONS AT THE NATIONAL LEVEL

The National Environmental Action Plan lists out the following specific areas to tackle the problem of marine pollution from land-based activities:

- (1) A special cell to be formed in the Ministry of Environment & Forests to monitor and coordinate the programmes for coastal and marine environment protection;
- (2) A national contingency plan should be developed for protection of marine environment from pollution caused from ship-based sources.
- (3) A special cell to be formed in the Ministry of Water Transport to regulate the discharge of wastes from ships and offshore installations into sea water.
- (4) Appropriate measures for stopping direct discharge of untreated toxic pollutants from industries and the municipal corporations of the three largest cities;
- (5) A marine water quality monitoring and surveillance programme should be initiated to detect the existing and potential pollution levels.
- (6) Delineation of suitable areas for shrimp cultivation.

The following actions are delineated for implementation at regional level:

- (1) Exchange of data on pollution levels at various points on the rivers flowing into Bangladesh from neighbouring countries.
- (2) A regional contingency plan for monitoring and combating oil pollution in the coastal waters and its dispersion in trans-national boundaries.
- (3) Training of technical manpower and capacity building in areas related to monitoring, control and combating of marine pollution.

7. FINANCE

The Department of Environment has specifically identified projects which are directly or indirectly related to the marine environment for approval by the Government. The implementation of these projects is, however, going to be a costly exercise and the Government would be hard pressed to locate suitable funding for implementation of these projects. Some of them like procurement of research vessel for environmental surveillance, development of industrial pollution control technology, etc. are going to be highly capital intensive. A three year ADB funded technical assistance project entitled 'National Environmental Monitoring and Pollution Control Project' is under way. ADB is also financing another project which will strengthen the Department of Environment's infrastructure and laboratory facilities enabling assessment and monitoring of marine pollution. However, compared to the enormity of the problems faced by Bangladesh, the commitment of funds both within the country and from outside is very limited. The fund constraint is going to be the biggest stumbling block for implementation of any action plan for control of marine pollution from land-based activities in Bangladesh.

INDIAI. Background Information

Land area	-	3.4 million sq.km.
Population	-	846 million(1991)
Length of the coastline	-	7516 l.km.
Exclusive Economic Zone	-	upto 200 nautical miles from the baseline
Area	-	2.02 million sq.km.
Population living in coastal areas	-	154 million (18.2% of the total population)
Major cities on the Coast	-	Bombay, Calcutta, Madras, Visakhapatnam and Cochin.
No. of coastal states	-	Ten
Centrally administered territories	-	Two
Industrial complexes located in the coastal areas:		

West Bengal	-	10
Orissa	-	3
Tamil Nadu	-	17
Pondicherry	-	4
Kerala	-	20
Karnataka	-	3
Maharashtra	-	20
Gujarat	-	17

2. Coastal Ecosystems

- 2.1 The Indian coastline of 7516 l.km. supports a number of fragile ecosystems and habitats like mangroves, coral reefs and wetlands. The brackish water areas including backwaters, inter and sub tidal, measure about 1.4 million hectares. They act as feed grounds for a variety of commercially important fish like prawns and crabs.
- 2.2 Mangroves exists in India along the islands of Andaman & Nicobar and Lakshadweep, deltas of major rivers like Ganga, Godavari, Krishna and estuaries and backwaters on the east coast of India. The total mangrove area is estimated at 0.7 million hectares.

- 2.3 Coral reef formations are found in the Palk Bay, Gulf of Mannar, Gulf of Kutch, Lakshadweep and Andaman & Nicobar Islands. Both mangroves and coral reefs have suffered from problems such as reclamation, deforestation, pollution and exploitation. The coral reefs of the Gulf of Kutch and Gulf of Mannar have been seriously affected because of industrial pollution and other forms of human interferences. Both mangroves and coral reefs are declared as ecologically sensitive under the Environment (Protection) Act, 1986.

3. STATE'S OBLIGATIONS ACCORDING TO EXISTING LEGISLATION

- 3.1 India is a signatory to the UN Convention on the Law of the Sea, 1982. It has strived sincerely to bring in universal acceptability to the Convention and took active part in the negotiations leading to the signing of the Implementing Agreement in July 1994. India is a signatory to the Agreement. Efforts are on to ratify the UNCLOS. India is also a Pioneer Investor under the UNCLOS and has been allotted an area of 150,000 sq.km. of mine site in the central Indian Ocean. Chapter 17 of Agenda 21 dealing with oceans in general and land based activities causing marine pollution in particular has been adopted by the country for formulation of its national policies and programmes. India is a signatory to the programme of action under Agenda 21 and has since taken several follow up measures.

- 3.2 So far as the other international agreements are concerned, India is a contracting party to the following Conventions:

- (1) International Convention on Civil Liability for Oil Pollution Damage, 1969;
- (2) International Convention on Establishment of Fund for Compensation for Oil Pollution Damage, 1971 (Fund Convention)
- (3) MARPOL, 1973/1978;
- (4) CLC, 1969;
- (5) 1976 Protocol to CLC, 1969;
- (6) 1976 Protocol to Fund Convention.

3.3 The MONTREAL guidelines for control of marine pollution from land-based activities have been taken up for revision in a meeting of government designated experts in June 1964 at Montreal. India has taken active part in arriving at a consensus to secure the revision of the guidelines and for formulation of global plan of action for implementation of the guidelines.

3.4 Domestic Legislation

3.4.1 The Indian Constitution has laid important stress in the Section on Directive Principles of State Policy by assigning duties for the States and all its citizens that the State shall endeavour to protect and improve the environment. Government of India enacted the Maritime Zones Act 1976 for the purpose of defining the various maritime zones of the country. Protection of marine environment and authorisation, regulation and control of scientific research for this purpose in the EEZ fall under the responsibility of the Government of India.

3.4.2 India has enacted its first environment legislation relating to marine pollution in 1974 - Water (Prevention and Control of Pollution) Act, 1974. This was followed by the Environment (Protection) Act 1986 which is the umbrella Act for all environment related matters in the country. The Government has issued Coastal Regulation Rules and notification under the Environment (Protection) Act, 1986 declaring certain regulations on setting up and expansion of industries, operations and processes in the coastal zone extending landward upto 500 mts. from the high tideline.

3.4.3 The Merchant Shipping Act, 1954 which deals with pollution caused by ships and tankers has also been amended making comprehensive provisions for dealing with oil pollution from ships, offshore installation, etc. in keeping with the guidelines under the MARPOL 1973/1978.

3.4.4 India being a federal country, the central government and the state (provincial) governments have got concurrent jurisdiction on some of the steps relating to protection of marine environment. The State Governments have jurisdiction for exploration and exploitation of fishery resources in the territorial waters and are mainly charged with the responsibility of protecting the marine environment from land-based activities in this zone. The responsibility of the Government of India for protection of marine environment runs concurrently with the State Governments in the territorial waters and exclusively in the EEZ.

4. STATE OF MARINE ENVIRONMENT

4.1 The demographic pressure, rapid industrialisation and urbanisation in the coastal cities and towns have created a number of environmental problems on the coast. Demographic pressure in the urban cities and towns resulted in the production of enormous amount of domestic waste materials which reach the marine environment either directly or indirectly through rivers, creeks, bays, etc. Domestic sewage contribute the largest amount to waste material. It has been estimated that approximately 12,600 million litres per day (MLD) of sewage reach the coastal environment of the country. Even though the quantity of these wastes vary from place to place, the chemical characteristics almost remain similar. The domestic wastes are mostly discharged in untreated condition due to lack of treatment facilities. Only primary treatment facilities are available in cities and towns where the population is more than 100,000. In Bombay, treatment facilities are available only for 300 MLD as against 1200 MLD of domestic waste generated. Due to such partial treatment, the chemical characteristics of the waste water retain almost their original feature and cause damage to the environmental water quality.

4.2 Disposal of solid waste is also a serious problem in the coastal states. The coastal population of India is expected to generate about 34×10^6 tonnes of solid waste per year which is mostly disposed off in the land fills as a reclamation measure. Large amount of uncollected garbage however finds its way into the marine environment through rivers, creeks, streams and backwaters.

4.3 The coastal waters and EEZ of the country are estimated to have a marine fishery potential of about 4 million tonnes. The potential is almost fully exploited in the 0 - 50 m. depth zone. There are reports of fall in the fish landings in some of the important fishing areas like Goa, Kerala Coast, Visakhapatnam coast, etc. due to over exploitation and killing of juveniles.

4.4 Industrial Wastes

4.4.1 Due to the concentration of a large number of industrial complexes in the coastal areas, an approximate amount of $.4 \times 10^9$ cubic mt. of effluents are discharged by the industries into the marine environment. Industrial cities such as Bombay, Surat, Cochin, Goa, Tuticorin, Visakhapatnam and Calcutta are situated on or near the coastline. Even though the large and medium scale industry is coming under the discipline of environmental laws of the country, a large number of industries which operate in the small scale sector are still not within the reach of law with regard to effluent disposal. The data collected on sea water quality for the past three years have shown that the problem of marine pollution due to discharge of land-based waste is highly localised and restricted to two to three km. into the sea. The water quality is, however, very low in creeks and enclosed bays like the Thane Creek and Mahim Creek in Bombay which receive large amount of waste.

- 4.4.2 There are 11 major, 16 intermediate and 78 minor ports in India. They all have navigation channels which are dredged continuously. Dredge spoils are dumped not very far from the shore and often contain materials toxic to marine life. Cargo ships and oil tankers visiting the ports also cause oil pollution in the harbour waters. Due to inadequate reception facilities in all the ports some of the bilge washings from the ships are also discharged into the navigation channels. This has led to the virtual disappearance of marine life in the port and harbour areas in the country.
- 4.4.3 Being on the major oil tanker route from the Gulf to the far east, the threat of oil pollution from the tankers is also very serious on the west coast of India and in the Andaman & Nicobar Islands. There have been several medium and small scale oil leaks in this area which could be contained because of the timely intervention of the Indian Coast Guard.
- 4.4.4 Even though India has a brackish water area of about 1.4 million hectares in the country, shrimp farming, by semi-intensive and intensive methods, has caught up only of late. High productivity levels attempted in some of the new shrimp farms has created a new threat to the coastal marine environment on the east coast and the Kerala coast of the Arabian Sea. The water discharged from the aquaculture farms is found to be highly polluted and in the absence of proper siting policies for these farms, severe crowding of aquaculture farms has been reported and in some of the estuaries in brackish water areas. The marine environment in the coast adjoining to these farms is now being regularly monitored to detect any increase in levels of marine pollution.

4.5 INSTITUTIONAL STRUCTURES

- 4.5.1 The Ministry of Environment & Forests is the nodal Ministry for formulation and enforcement of all environment related policies in the Government of India. Control of pollution, hazardous substances management are two of the important divisions under the Ministry. The Central Pollution Control Board is a statutory authority created to administer the Water(Prevention of Pollution) Act, 1974 and works under the administrative control of the MOEF. A National Environmental Council under the chairmanship of the Prime Minister acts as a think-tank on important environment policy matters and also provide planning and other inputs in an advisory capacity to the Ministry of Environment & Forests.

4.5.2 There has been a major policy decision recently on allocation of responsibilities to various Ministries in the Government of India on the subject of marine pollution. An Apex Committee on Marine Pollution with Secretary, MOEF, as chairman will function under the MOEF to address all important issues relating to land-based and sea-based activities causing marine pollution. While the Ministry of Environment, as the umbrella Ministry is responsible for control of pollution from land-based activities, scientific monitoring of the marine environment and generation of data and information on levels of pollutants is the responsibility of the Department of Ocean Development. The DOD administers an Environmental Monitoring Programme called COMAPS (Coastal Ocean Monitoring and Predictive Systems) and generates regular data on the pollution levels in the marine environment, identifies hot spots and give necessary feedback to the Pollution Control Boards for taking remedial action. The problem of marine pollution from ships, vessels, oil installations, etc. is the responsibility of various Port Trusts and public sector authorities managing the oil installations. The Indian Coast Guard functioning under the Ministry of Defence is responsible for surveillance and combating of oil pollution in the coastal waters and the EEZ of the country. A National Oil Spill Contingency Plan has been finalised and approved in 1994 to tackle emergency arising out of the oil spill accidents. To meet emergencies arising out of dumping of hazardous, toxic and radio-active wastes, a Central Crisis Group under the MOEF with representatives from other concerned Ministries and agencies in the Central Government has been set up. The duties and responsibilities of various agencies in the event of an emergency have been listed out in the emergency plan.

4.5.3 At the state (provincial) level, the Departments of Environment of the State Governments are responsible for protection and management of marine environment. The State Pollution Control Boards function under these Departments as autonomous agencies to address the problem of land-based pollution. Central Government also provides financial assistance to the State Pollution Control Boards for strengthening their technical manpower and procurement of scientific equipment. Financial support is also provided to the State Departments of Environment for additional technical manpower.

5. SPECIFIC ACTIONS AT NATIONAL, REGIONAL AND GLOBAL LEVEL

5.1 According to the policy statement for abatement of pollution key elements of pollution, prevention are adoption of best available clean and practicable technologies rather than end of the pipe treatment. One of the significant benefits in this economic approach is that when wastes are reduced or eliminated cost savings in material are automatically ensured.

5.2 National

The Environment Action Programme issued by the MOEF in 1993 contain important prescriptions for action at national level. Monitoring, control and prevention of pollution and management of hazardous substances form an important part of this document. The following are some of the important actions proposed at the national level:

- (1) Organisation and strengthening of central and state pollution control boards;
- (2) Monitoring of water quality for selected heavy polluting units;
- (3) Preparation of action plans for the combatment of pollution in highly polluting industries;
- (4) Notifying environmental standards for various industries.
- (5) Implementation of schemes on adoption of clean technologies to the small scale industries and to extend technical support to encourage modernisation of small scale units.
- (6) Setting up of infrastructure for interception, diversion and treatment of domestic/industrial sewage in 25 class I towns along the river Ganga under the Ganga Action Plan.
- (7) Pollution combatment schemes for the Yamuna and Gomati rivers which are tributaries to Ganga in 18 towns along these two rivers.
- (8) A national river action plan to support pollution abatement works in other major rivers in India.
- (9) Strategies for bringing down solid waste generation in cities.
- (10) Designing physical instruments for waste minimisation in respect of bio-degradable and non-recyclable packing materials.
- (11) Development projects for developing biodegradable packing materials.
- (12) Managing storm drains in cities.
- (13) Demonstration and dissemination of waste water treatment recycling and reuse technologies for water conservation.

- (14) Launching of a Technology Mission on cleaner production to coordinate activities for promoting cleaner technologies in the country through government policies strengthening of R&D institutions, financial institutions and regulatory agencies.
- (15) Identification of technologies developed in research laboratories/industrial units in India and abroad and facilitate their transfer and adoption in India.

5.3 Regional Level

- (1) Development of a regional programme for monitoring of marine pollution in the coastal waters of the South Asian Seas and islands and regular exchange of data and information on the trans-boundary movement of pollutants.
- (2) Development of a Regional Oil Pollution Contingency Plan to ensure regional cooperation for tackling oil pollution emergencies.
- (3) Development of regional centres of excellence for training and research in subjects relating to monitoring and management of marine environment. The SACEP, Colombo, can play the role of a nodal agency to bring in regional co-operation among the South Asian countries.

5.4 Global

5.4.1 Agencies like the UNEP, the SACEP, the International Union for Conservation of Nature and Natural Resources (IUCN), Global Environmental Facility (GEF) are some of the organisations associated with environment programmes in India. A limited progress was made during the pilot phase of GEF towards generating a steady pipeline of projects which meet the criteria stipulated by GEF. Control of pollution from land-based activities unfortunately does not fall under any of the priority areas of GEF.

5.4.2 The Government, however, received assistance from countries like Germany, Netherlands, Norway, UK and USA on bilateral basis and from UNDP, World Bank and ADB, for some of the bilateral and multilateral programmes. The important ones are:

- (1) Industrial Pollution Control Project - Phase I & II - aided by the World Bank.
- (2) Training of Indian scientists from Pollution Control Boards on modelling and surveillance, dispersion and movement of pollution - assistance from Norway.

- (3) Strengthening of pollution control laboratories in Central Pollution Control Boards and in the Coastal States of Karnataka and Gujarat - assistance from Germany.
- (4) Clean technology for identified small scale industries - assistance from UNIDO.

6. Reporting of Progress

The Central and State Pollution Control Boards are responsible for carrying out the functions entrusted to them under the provisions of Water (Prevention and Control of Pollution) Act, 1974. Legal action under this Act is taken up by the respective State Boards. The state wise information regarding the number of cases filed is compiled and analysed on a quarterly basis. The Annual Reports of the MOEF and DOD, the Central Pollution Control Board, contain information on the progress of work with regard to enforcement of measures under the action plan and various environment related legislations in the country. Annual Reports are laid on the table of the Houses in the Parliament and State Legislatures for the information of the people's representatives.

7. FUNDING MECHANISM

7.1 The MEOF and DOD, the two principal Ministries responsible for environment related matters together spend roughly about 4 billion Rupees yearly on policy planning and implementation of environment related programmes in the country. Out of this, about 1.8 billion is spent on programmes which have a direct or indirect bearing on protection of marine environment from land-based activities. The strict enforcement of anti-pollution laws has also prompted the industrial sector, both public and private enterprises, to invest on pollution control measures.

7.2 The most serious problem of funding for environmental management is in the following sectors:

- (1) Management of urban wastes and sewage disposal in mega cities and medium and small towns located on the coast; and
- (2) Pollution control from industries in the small scale sector.

- 7.3 Management of municipal wastes and sewage are the most challenging problems for environment management in India. Majority of the municipal corporations are hard up for finance as most of their funds go for maintaining the existing municipal services and for establishment cost. Setting up of waste management and solid waste disposal facilities is a costly exercise which is far beyond the capacity of any of the municipal corporations in the country. There is an effort to comprehensively address the problems of mega cities in India of which three are on the coastal region by arranging finances from international institutions.
- 7.4 So far as the small scale industrial sector is concerned, they are mostly scattered and unorganised. The answer lies in bringing them together and setting up common effluent treatment facilities. Some of the highly polluting industries like the tanneries, soap making, chemicals, etc. are in the unorganised sector and are not capable of funding their own waste management facilities. Bilateral and multilateral financial arrangements are of utmost necessity for taking up this work in small scale sector.
- 7.5 State Pollution Control Boards which are charged with the responsibility of enforcing provisions of the Water (Prevention of Pollution) Act 1974 are also facing shortage of funds and technically qualified personnel. The World Bank aided industrial pollution control project involves a line of credit for institutional development as an important component of the project. It aims at strengthening the monitoring and enforcement abilities of pollution control boards of five coastal states in terms of equipment, laboratory facilities and manpower training.
- 7.6 Monitoring of the marine environment also involves availability of coastal research vessels with onboard processing facilities which are also not available in the country. Efforts are on to procure two such vessels with government funds but bilateral support would be required for acquisition of more such vessels for monitoring the long coastline and EEZ of India.

MALDIVES1. Background Information

Land Area	-	300 sq.km (approx.) (1190 islands)
Population	-	2,45,000 (estimated in 1994)
Biggest urban concentration	-	Male
Population	-	70,000
Exclusive Economic Zone	-	90,000 sq.km.

- 1.1 In economic terms, Male is one of the least developed countries with a per capital GDP of approximately US \$ 700 in 1993. The population growth is at the rate of 3.4% and by 2010 the population is expected to double. The island of Male is over-crowded with more than a quarter of the total population living in a land area less than 2 sq.km. This has placed severe burdens on existing infrastructure and resources in Male. Tourism and fisheries are the most important sectors contributing 17% and 15% of the GDP respectively. The number of tourists who visited the country in 1994 is roughly about 30,000 which is more than the entire population of the country. These tourists are accommodated in about 74 resorts which are established on uninhabited islands. The resort development relies heavily on imported equipment, food stuff and skilled labour.
- 1.2 In the fishery sector, the tuna fishery is the basic economic activity and the total catch has reached about 82,000 tonnes in 1992.
- 1.3 Industry is in its infancy and includes garment production and fish canning units meant for export. In Male there is a concentration of safe drinking water manufacturing for local consumption, manufacture of PVC pipes, fibre glass boards, film processing units, toilet soap and food products. The country is rich in biological diversity and supports marine fauna with over 1000 species of fin fish, 140 species of coral and 63 species of marine algae.

2. STATE OBLIGATIONS ACCORDING TO EXISTING LEGISLATIONS

Maldives is a signatory to the UN Convention on the Law of the Sea, 1982, even though it has not yet ratified the Convention. The process of ratification has, however, been initiated by the Government. During the preparation for the Earth Summit in Rio in 1992, Maldives played a prominent role in ensuring that the particular concerns of small island nations were taken into consideration. The Association of Small Island States of which Maldives is a member, played a significant role in ensuring that the concern of sustainable development of small islands is included as a vital programme area in Chapter 17 of Agenda 21. The country took a prominent part in the Global Conference on the Sustainable Development of Small Island Developing States in Barbados in 1994 and is a signatory to the Barbados Declaration on Development of Small Island States. Even though, the country played a prominent part in meetings and conventions relating to climate change and sea level rise, it has not become a contracting party to any of the major conventions relating to marine pollution.

3. DOMESTIC LEGISLATION

- 3.1 The rapid changes which were taking place in the environment of Maldives prompted the Government to appoint a consultant to present a paper on the status of the environment of Maldives and to recommend further steps for its protection and preservation. The report by Dr. Kenchington was submitted in 1984/85. A National Council for the protection of environment was subsequently established by the Government in May 1984 and the Environment Section was established first in the Ministry of Home Affairs and then in the Ministry of Planning and Development with specific mandate to carry out the work of protection, preservation and management of the marine environment of Maldives. The overall umbrella legislation is the Environmental Protection and Preservation Act of Maldives which was passed as law in April 1993. The Act gives powers to the government to issue environmental guidelines, designate protected areas and natural reserves and make it mandatory to carry out environment impact assessment and also gives powers to terminate projects that are detrimental to the environment. The other legal instrument is the Fisheries Law of Maldives which gives powers to the government to formulate and enforce various legislations for sustainable development of marine living resources in the country.

3.2 The Ministry of Planning, Human Resource and Environment is overall responsible for the protection of the environment. However, regulatory guidelines are issued by various Ministries like the guidelines on solid waste disposal in tourist resort by the Tourism Ministry, housing guidelines by the Male Municipality, fishing guidelines by the Ministry of Fishery and Agriculture, etc. The Marine research section of the Ministry of Fisheries and Agriculture, the Environment Research units of the Ministry of Human Resource and Environment and the Maldives Water and Sanitation Authority under the Ministry of Health and Welfare are the three research institutions to deal with matters relating to coastal and marine environment.

3.3 Realising the need for an integrated environmental management plan, the Government with the help of UNDP and UNEP commissioned a study in December 1988 and drew up the National Action Plan, a document aimed at environmental management and planning in Maldives.

4. PROGRAMME OBJECTIVES AND METHODOLOGIES

4.1 The framework for action under the Action Plan contains specific programmes for assessment of the impact of marine and land-based activities on the quality of environment and proper management of these activities. It also involves development of suitable training and educational programmes to enable the government to effectively implement these aspects of the Action Plan. One of the major constraints identified in the Action Plan is lack of information on the resources, the fragility of the islands and the impact of land-based development activities on marine environment. Out of the priority areas identified for action, the following are relevant to the protection of marine environment from land-based sources:

- (1) Development of standards and control mechanisms for the regulation of land-based sources of pollution;
- (2) Development of a national programme to control litter problems giving primary consideration to recycling reuse and export of recoverable materials;
- (3) Development of a national data bank on environmental information;
- (4) Development of a national policy concerning the use of ground water resources; and
- (5) Development and implementation of appropriate guidelines, technologies and practices for waste disposal.

- 4.2 Action Plan contains specific projects in the work plan for solid waste management for the islands, resorts and few urban centres and assessment of sewage disposal alternatives in Maldives.

5. INSTITUTIONAL STRUCTURES

The Environment Section in the Ministry of Planning, Human Resource and Environment is responsible for the overall co-ordination of the Government's environment programmes. The Environment Research Units (ERU) under the Environment Section is entrusted with carrying out all research work and making available all relevant data for programme, planning, enforcement and regulating environmental matters. The marine research section, Ministry of Fisheries, is the research body to conduct research on major fisheries to assess and monitor the status of marine ecosystems, etc. The Maldives Water and Sanitation Authority is responsible for ensuring acceptable drinking water in Maldives and for taking care of Male's sewage system. The Ministry of Public Works and Labour maintains the harbour, jetties and sea walls and carries out dredging and harbour construction in Male and other islands.

6. SPECIFIC ACTIONS AT NATIONAL LEVEL

6.1 Disposal of Municipal waste in Male

6.1.1 The Male Municipality has a population of 70,000 concentrated in an area of 2 sq.km. About 70,000 cubic mts of effluents are generated per day and the disposal of the waste is by dispersion and dilution. Four marine outfalls located in four directions of the island at a distance ranging from 10 mts. to 180 mts. dump out untreated sewage into the open sea which is diluted and dispersed. There is no regular monitoring of the marine environment in these outfall areas but no significant damage to fisheries has been reported in this area. Setting up of effluent treatment plants will be prohibitively expensive for a small country like Maldives. So far as solid wastes are concerned, dumping sites are identified in an adjacent lagoon 'Thilafalhu' which is being filled with recycling rubbish transported from Male.

6.1.2 In the other islands and resorts solid waste disposal is by incineration and sewage through captive effluent treatment plants which are obligatory under the tourist resort regulations.

- 6.1.3 An important problem for Maldives is the availability of drinking water. At present in the capital town of Male, only 10% of the total demand of 100,000 cubic mts. per day is met by four desalination plants set up on the island. The rest of the water requirement is met from ground aquifer which is fast declining. With the current rate of decline, the aquifer will be exhausted in the next few years. Even though, the cost of setting up desalination plants is high, it might be necessary to set up more desalination plants to meet the growing demand of the national capital.
- 6.1.4 So far as pollution from oil is concerned, the government is trying to implement the MARPOL guidelines even though it has not yet ratified the MARPOL Convention. Reception facilities are being set up for lubricating oil in the vicinity of the capital and dumping is not allowed in the coastal waters. The Ports Authority and the Coast Guard keep a strict watch over bilge washing being dumped into the sea near the islands.
- 6.1.5 The major contributors to GDP namely, the tourism and fishing industries require protection from damage. So far as fisheries are concerned, the terrestrial run off from inhabited islands especially Male and Addu island situated on the southern tip may cause depletion of fishery resources in the long run. There is also a possibility that migratory fish when they enter the local water bring with them absorbed toxic substances from outside.
- 6.1.6 The following measures are important at the national level to control the identified problems:
- (1) An integrated coastal zone management plan for all the inhabited islands and atolls;
 - (2) Devising a system to take care of the sewage disposal meeting the effluent standards suitable for public health ;
 - (3) Laying and implementing strict guidelines on solid waste and effluent disposal in the tourist resort which are increasing in number year after year.

7. MANPOWER

The biggest problem so far as Maldives is concerned is the lack of adequate trained manpower. The country does not have established institutions which are capable of imparting training and research facilities for personal manning the various governmental organisations dealing with marine environment. There is also a need for a mechanism for constantly monitoring marine environment along islands and in the open ocean on a regular basis. This requires capability in terms of research vessel and adequately trained skilled manpower. A GEF project for manpower development has recently been undertaken in which six persons were trained in environmental sciences.

8. FUNDING

The biggest constraint for protection of marine environment apart from trained manpower is availability of finances. The country is totally dependent on donor community in implementing most of the programmes some of which are critical to environmental management. The national environmental action plan which was approved by the government and some of the projects under the plan were financed by the UNDP. Donors such as the ADB and UNDP should be able to assist the country in training manpower and provide infrastructural support for setting up facilities for waste disposal, desalination plants and environmental monitoring and information systems.

PAKISTAN1. Background information:

Land Area	-	882.000 sq.km.
Population	-	110 Million (approximately)
Population living on the coast	-	10 Million (approximately)
Largest City	-	Karachi
Population	-	9 Million (approximately)
Length of coastline	-	990 sq.km.
Exclusive Economic Zone	-	240,000 sq.km.
% of people living in the coastal	-	10% approximately area to the total population

1.1 Pakistan is the tenth most populous country in the world with the 14th highest rate of increase of population among countries with more than 1 million people. It covers only .67% of the world's land but contains 2% of the world's population which may become 4% in the next ten years.

1.2 The coastal belt of Pakistan with the exception of Karachi is among the most backward areas in the country which are scarcely populated. Karachi city with a population of 9 Million has large industrial complexes such as Sind Industrial Trading Estates (SITE), Landhi Industrial Trading Estate (LITE), oil refineries, Iron and steel industry, etc. apart from two large ports, the Karachi Harbour and Port Bin Qasim.

2. STATE'S OBLIGATIONS ACCORDING TO EXISTING AGREEMENTS:

2.1 Pakistan is a signatory to the UN Convention on the Law of the Sea (UNCLOS). It has signed Implementing Agreement to the Convention opened for signature in July 1994 but has not ratified the Convention. It is a contracting party to the Ramsar Convention on wetlands of international importance but has not yet signed the Convention on Prevention of Marine Pollution by Dumping of Wastes and other Materials and the MARPOL (Protocol relating to the International Convention for Prevention of Pollution from Ships). It has also adopted the Agenda 21 formulated and approved in the Rio Summit in 1992, and tried to frame its environmental management strategies in conformity with its recommendations.

- 2.2 Pakistan enacted the Maritime Zones Act, 1976 defining the territorial sea and the exclusive economic zone which extends upto 86 nautical miles offshore in the Sind area and 35 nautical miles offshore in the Baluchistan area.

3. **DOMESTIC LEGISLATION**

- 3.1 The 1973 Constitution of Pakistan includes environmental pollution and ecology as an important issue to be addressed through amendment by provinces along with concurrent federal action. For environmental protection and prevention of pollution, the Environment and Urban Affairs Division (EUAD) was established in 1976. The principal policy statement of the nation's commitment on environment is however, the Pakistan Environment Protection Ordinance 1983 which was issued for control of pollution and preservation of environment and for matters connected therewith. A high level council was envisaged under the ordinance chaired by the President. The Council, however, could only meet for the first time in July 1991. A new law, the Environmental Protection Act, 1995 is under draft and may get enacted very soon. There are no special environmental enactments for tackling the problem of specific environmental issues like air pollution, water pollution, etc. But the country has a number of incidental environmental legislations on water and air quality, the toxic substances, solid wastes, fisheries, etc. However, these laws lack a proper definition of the environment, quantifiable standards and implementation methodology.

- 3.2 The National Conservation Strategy prepared by the Government of Pakistan in collaboration with IUCN is the most comprehensive document with the three objectives of conservation of natural resources, sustainable development and improved efficiency in the management of resources. The Strategy emerged after consultation with some 3000 people in Pakistan from different walks of life over a period of three years(1988 to 1991).

The issues related to marine pollution especially from land-based activities have been carefully addressed in the document giving out the state of the marine environment and strategy for action. Out of the 14 programme areas for priority implementation, the two relating to prevention/abatement of pollution and management of urban wastes specifically address the problem of land-based sources of marine pollution.

- 3.3 The policies and measures of NCS are proposed to be incorporated in the Five Year Plans as well as into sectoral plans of different departments of the Government. Creation of an Environment Section in the Planning Commission with link cells in Provincial Planning and Development Department and creation of a NCS unit in the nodal Ministry are some of the important steps envisaged under the NCS.

4. PROGRAMME OBJECTIVES AND METHODOLOGIES:

4.1 The important marine resource of Pakistan is fisheries, the total landings of which are of the order of 400,000 tonnes (approx.) in 1992 - 93. The impact of effluent dumping and pollution and construction activities can cause serious loss to the fishery wealth by destroying their habitats. Pollution from land-based sources is broadly of the following categories:

- (i) Pollution through industrial waste water discharge;
- (ii) Domestic and human waste water discharge;
- (iii) Agricultural run off; and
- (iv) Pollution due to solid wastes.

4.2 Industrial Pollution

The major industries creating marine pollution are chemicals, fertilizers, pharmaceuticals, cement, electrical and electronic equipment, glass and ceramics and pulp and paper board. No systematic survey has been done of the source volumes and characteristics of industrial pollution in Pakistan although partial surveys have shown the seriousness of industrial pollution in a number of locations. The Karachi Industrial Area consisting of the two large industrial zones, SITE and LITE is largely responsible for marine pollution in this area.

4.3 Domestic Water Waste

4.3.1 The industrial city of Karachi housing some 9 million inhabitants discharges approximately 300 million gallons of sewage per day. There are two treatment plants with a combined treatment capacity of 40 million MGD of effluents and the remaining sewage goes untreated into the sea. Pollution is also caused from agricultural runoff, air pollution in Karachi city which ends up in reduced PH of the local waters and increased biocarbonate content, thermal pollution from the discharges of Karachi Nuclear Power Plan (KANUPP) located north- west of Karachi. Oil exploration in the offshore area, mining for sand, heavy mineral concentrates, etc. dredging in the Karachi Harbour also add to the land-based sources of marine pollution. Solid domestic wastes produced in Karachi city are dumped into low-lying land and municipal collection of solid waste is done only from 55% of households.

- 4.3.2 The problems of coastal and marine pollution are addressed by the Government through the Environmental and Urban Affairs Division (EUAD) within the Ministry of Works and Housing. From the existing environmental policy and legal framework of Pakistan, it emerges that enlightened use of the law can do much to achieve the objectives rather than adoption of draconian measures against polluters which may become counter-productive.
- 4.3.3 Absence of a proper definition, lack of proper environmental standards, non-availability of implementation tools and lack of awareness and political commitment are some of the deficiencies identified in the legal framework on environmental matters. As industry is critical to the economic progress of the country, there is a growing need to widen the industrial base. This is going to bring in greater pressure on the environment especially the coastal and marine environment of the country. The measures envisaged for existing industries are to identify the most worrying pollutants and establish realistic standards based on interim guidelines issued by the EUAD to reduce the identified major pollutants. A phased implementation of the reduction process is envisaged in the National Conservation Strategy document. It involves using relaxed environmental quality standards upto June 1996 for existing industries and implementing strict environmental standards for new industries. Financial incentives through budgetary regulations, support from financial institutions and proper siting policy for the industries are also envisaged as methodologies for reducing industrial pollution. The NCS recommends practical blend of regulations and incentives for control of pollution from land-based activities.
- 4.3.4 So far as domestic waste treatment is concerned, conventional waste treatment plants are costly to install and operate, yet some of the costs can be recouped. The untreated waste water should not be used for irrigation of crops grown for direct human consumption but it can be used to irrigate trees, cotton crops and animal fodder if it has been exposed to direct sun light for at least two days. This approach could be feasible in Karachi providing cheaper and safer treatment than conventional sewage treatment plants. The problem of heavy metals does not seem to be acute in Karachi as the existing municipal sewage system serves relatively few industries that generate heavy metals.
- 4.3.5 As regards the problem of solid waste disposal, the NCS calls for garbage collection to be privatised first on a pilot basis and to arrange for segregation of the recyclable waste at the source. The interest of private collector in segregated garbage could be translated into payment in terms of free garbage collection or cash payment for the segregated material. It is also visualised to incorporate marketing assistance for effective use of salvaging systems.

4.3.6 In the field of training and communication, the policy is to invest in specialised programmes to develop expertise in key areas by adopting measures for educators, communicators, decision-makers and women. The policy also is to develop a range of environmental information system and institutional arrangements to support this system at all levels. For this purpose, the proposed measures include setting up systems for wide spread dissemination of information to all natural resource users, use of inventories and satellite imagery for environmental monitoring and encouraging the non-government sector to develop capability for environmental reporting. The following are the expected outputs by 2001 of the Conservation Strategy:

- In the field of industrial pollution, a shift of about 10% in the composition of forthcoming industries towards biogradable or non-toxic process and waste and products;
- Compliance with the EPA standards by large scale industry in the post 1991 period;
- Compliance of the existing hazardous and moderately hazardous use with EPA standards;
- By the end of the grace period, 70,000 small industrial units in 10 industrial estates to be covered by a waste collective system;
- Operation of 10 central industrial waste treatment plants;
- In case of urban wastes, improve solid waste management and efficient use of solid waste in Karachi metropolitan area;
- Introduction of Werribee (Melbourne, Australia) type sewage farms and improved forms of effluent management;
- Capacity to monitor and absorb advanced world technology for recycling plastics.

5. INSTITUTIONAL STRUCTURES:

- 5.1 Apart from the Environment and Urban Affairs Division, the Government of Pakistan has set up a Marine Pollution Control Board headed by the Chief of Naval Staff of Pakistan Navy. The Board specifically addresses the problems of marine pollution from land-based and sea-based sources. There is also a proposal to set up a Marine Affairs Division in the Federal Government to deal with the problems of marine environment. It is also proposed to constitute special courts for trying cases of violation of marine related offences including environmental pollution. The Environmental Protection Agency hitherto had power for implementation for the entire country. Some of these powers including punitive powers have been delegated to Provincial EPAs for the purpose of effective enforcement of existing legislative measures. It is also proposed to create a Government Corporate Sector Forum for setting up environmental standards for different classes of industry and a forum of WAPDA, public health and live stock department, local authorities and private sector to facilitate collaboration between the industry, Federal government and local government for the use of effluents and for investment in the conversion of waste to energy.
- 5.2 Institutional development also involves capacity building in the Environment and Urban Affairs Division, the Provincial Environmental Protection Agencies and in the S & T Sector. Inter-Departmental coordination at various levels in the Federal Government and the Provincial Government, industry, local government and local enterprise is also involved for preventing/abating marine pollution and for management of urban waste.
- 5.3 While the Federal Government handles formulation of policy guidelines, financial allocations and preparation of an enabling framework, the Provincial Governments co-ordinate with community organisations on the activities and approaches relating to protection of marine environment. The other important function of the Provincial Governments is to establish provincial environmental councils with senior officers of the Provincial Governments, local bodies and non-governmental organisations. The local bodies are to develop working relationship with community organisations for formulation and implementation of development plans for environmental management.

6. CAPACITY BUILDING AND NORTH-SOUTH CO-OPERATION:

6.1 The important thrust areas in the field of monitoring and combating of marine pollution in Pakistan are the following:

- (1) Determination of heavy metals and toxicity tests of effluents.
- (2) Determination of fecal coliform levels in the Manora Channel near Karachi city.
- (3) Determination of organic pollution wherever large quantities of sewage and domestic waste enter the coastal environment.
- (4) Research on modelling of pollution dispersion and oil slick movement in the coastal and offshore waters.

6.2 The National Institute of Oceanography, Karachi, the Centre of Excellence in Marine Biology, University of Karachi, Department of Microbiology, University of Karachi and the Geological Survey Department, Pakistan, have got capabilities for marine pollution research. The National Conservation Strategy identifies the need to develop an independent Sustainable Development Policy Institute (SDPI) at the Federal level as a source of expertise and advisory services on government, private sector and non-government initiatives. There is, however, a general shortage of trained and qualified manpower in the field of marine pollution monitoring, control and combating which has to be addressed as a priority area. Organisations like ESCAP, UNDP and SACEP can help the country in capacity building by selective training of its personnel in various fields of marine pollution research within the country and abroad. The need for North-South cooperation in the field of research and capacity building has been identified but no specific programmes have yet been taken up for collaboration in identified areas of marine pollution research.

6.3 In terms of environmental information systems, there is a need to improve collection, storage and retrieval of environmental data both at the federal and provincial level pertaining to land-based sources of marine pollution. Even though, some information exists in an isolated fashion no organised system of networking of environmental data centres has yet been attempted.

7. MECHANISM FOR FINANCING

- 7.1 The Conservation Strategy for tackling the problem of marine pollution should be based on carefully considered project obligations. The projects should not be tailored to what have been perceived to be donor priorities. The important aid-giving agencies are the World Bank, the UNDP, bilateral agencies of Switzerland, Canada and the Netherlands, who have shown interest in increasing their allocations related to environment. The World Bank has initiated a US \$ 57 Million Programme for environmental conservation and management. The Asian Development Bank has a US \$ 5 Million technical assistance programme to upgrade skills of environmental functionaries with respect to environment. It would be more efficient to set up a forum to co-ordinate flow of funds from different donor agencies instead of various government agencies setting their own priorities and agencies. The Global Environmental Facility could also provide finances for implementation of the Strategy.
- 7.2 Another category of proposals involves levies on trade to raise money for environmental expenditure which should be paid by consumers in importing countries. Such levies on trade are an extension of the 'polluter pays' principle since consumption demand in industrial economies is a major source of global pollution. So far as domestic resources are concerned, the following methods could be used for raising funds:
- New Tax measures
 - * Pollution tax could be added to the existing tax structure
 - * Industrial units discharging damaging emissions could be taxed
 - Price adjustments for utilities like raising of water charges, a fossil fuel tax to encourage conservation, and
 - Encouraging private capital investment in environmental related industry based on government influence of private sector investment. Credit lines in nationalised banks can be established for financially viable sustainable development projects.

SRI LANKA1. Background Information

Land Area	-	65,610 sq.km.
Population	-	16.67 million (1986)
Coastline	-	1760 kms.
Continental Shelf	-	28,000 sq.km.
Exclusive Economic Zone	-	2,30,000 sq.km.
Largest City	-	Colombo
Population	-	600,000 (approx.)

- 1.1 The marine habitats of Sri Lanka consists of mangroves spread over an area of 10 to 13 thousand hectares situated both on the east and west coast and coral reefs which are located in undisturbed shallow waters mostly in the south-western part of the country and the Gulf of Mannar. The coastline of the country consists of 45 basin estuaries and 40 lagoons with a total area of 40,000 hectares. Marine fishery is very important to Sri Lanka and 65% of the animal protein in the country is from fish. The fishery sector contributes roughly 2% of Sri Lanka's GDP.
- 1.2 All the marine habitats and the fishery resources are facing threat from waste disposal, aquaculture and mechanised fishing boats, urbanisation and industrialisation of Colombo and other coastal areas.

2. STATE'S OBLIGATIONS ACCORDING TO EXISTING LEGISLATIONS

Sri Lanka is a signatory to the UN Convention on the Law of the Sea 1982 and took active part in its formulation in the earlier stages. It is the only country in the region which has ratified the Convention and has been a champion of the integrity of the Convention and its objective of declaring the ocean as a common heritage of mankind. The country has also taken active part in the Rio Summit on Environment & Development in 1992 where specific provisions were made in Chapter 17 of Agenda 21 to protect the interests of small island nations. It is a contracting party to the Convention on Hazardous Waste Movement 1989 but has not yet ratified the MARPOL Convention.

3. DOMESTIC LEGISLATION

- 3.1 Article 27 of the 1978 Constitution of Sri Lanka assigns the Government broad responsibilities to protect, preserve and improve the environment for the benefit of the community.
- 3.2 The domestic legislation in Sri Lanka on marine environment can be classified into three categories:
- (1) Fisheries and Marine life
 - (2) Marine Pollution control
 - (3) Coast conservation
- 3.3 The National Environment Act to make provisions for protection, management and enhancement of the environment and to maintain its quality was first enacted in 1980 and subsequently amended in 1988. The Central Environmental Authority has been set up under the National Environment Act as the chief coordinating agency for all environmental related matters.
- 3.4 The Central Environmental Authority is advised by the Environmental Council comprising representatives of the government, NGOs and professionals. A recent interim measure to provide the much needed coordination among various institutions in the government is establishment of a broad based high level National Environment Steering Committee (NESC). The Committee meets monthly and is responsible for review of proposed environment strategies including the Environmental Action Plan.
- 3.5 The National Environmental Action Plan lists out important objectives to address issues relating to land-based activities causing marine pollution under the categories - coastal resources, urban pollution, industrial pollution, environmental education and institutional capacity.
- 3.6 Even though responsible institutions have been established in early 80s in Sri Lanka, implementation of the pollution control regulations have not started still recently. Comprehensive industrial pollution licensing and environmental assessment requirements were enacted only in 1988. The industrial licensing procedures and environmental impact assessment procedures have been taken up for implementation only after 1990. Resource constraints, inadequate skilled staff, change of its location within the government have constrained CEA's efforts to address its broad pollution control and environmental assessment mandates.

3.7 Environment related matters are mostly dealt with by the Federal government and only recently some of the functions like giving of environmental pollution licences have been delegated to the Pradeshiya Sabhas at the provincial levels. The other important piece of legislation is the Marine Pollution Prevention Act 1981 which deals with prevention, reduction and control of pollution in Sri Lankan waters caused by ships and offshore installations. The Marine Pollution Prevention Authority set up under this Act is responsible for the administration of the provisions of the Act. Out of the Conventions listed out in Section 17(2) of the Act, the Sri Lankan government has since ratified the BASEL Convention. For implementation of provisions under MARPOL, the Ministry of Shipping and Ports has drawn an action plan which envisages creation of reception facilities in ports and harbours and making it mandatory for all the ships to discharge their wastes at the reception facility as per the provisions of MARPOL.

3.8 Another important piece of legislation is the Coast Conservation Act of 1981 which is unique in the South Asian Region. The Act is meant for preparation of a coastal zone management plan to regulate and control developmental activities within the coastal zone and implement schemes for coast conservation. The Coast Conservation Department set up has formulated elaborate guidelines for coastal zone management through a permit system. Sri Lanka has recently prepared a document 'Coastal 2000', a resource management strategy for Sri Lanka's coastal region for 2000 AD.

4. PROGRAMME OBJECTIVES AND METHODOLOGIES

4.1 The land-based activities affecting marine environment in Sri Lanka can be classified as follows:

- (1) Domestic wastes
- (2) Industrial Wastes
- (3) Agriculture
- (4) Aquaculture
- (5) Seabed exploration, and
- (6) Shipping

4.2 Domestic Wastes

The environmental impacts of urban growth are mainly from the urban concentration in Colombo area which recorded high growth rate in the last two years. The principal environmental issues in the urban sector are inadequate domestic and solid waste disposal, loss of urban storm water basins and inadequate planning tools and institutional framework for addressing these problems. In Colombo sewage is screened and then pumped directly into the ocean without any treatment through two ocean outfalls located in north and south of the city. The sewage system is connected to only 25% of the residences in Colombo in 1986. The outfalls have only helped in transferring the pollution problem from land to the marine environment. About 1200 tonnes of solid wastes are generated in the Colombo area per day. Most of the collected garbage remains unattended for considerable period creating health hazard. Low lying lands are used as disposal sites and much of the waste finds its way into drains and water courses.

Jaffna is the second important coastal city in the North which does not have any waste treatment facilities and the entire sewage gets into the sea through open drains.

4.3 Industrial Pollution

4.3.1 There are approximately 60,000 industrial establishments in Sri Lanka from large scale to small scale. 80% of them are concentrated in Greater Colombo area. Three export processing zones have been established under the Great Colombo Economic Commission. Two of them at Katunayake and Biyagama have provisions for common waste water treatment facilities. The third one at Koggala does not have any central waste water treatment facility and the effluents are proposed to be discharged into the sea through a marine outfall.

4.3.2 Among the small scale and cottage industries, coconut and copra and coconut fibre production industry, licenced and illicit distilleries are the major pollutants.

4.4 Tourism

As most of the tourist resort areas are distributed in the coastal zone of Sri Lanka, the discharge of sewage and waste water from these resorts are also responsible for increasing coastal pollution.

4.5 Aquaculture

Most of the shrimp culture sites are located in the north-western coastal belt of Sri Lanka. The impact of aquaculture on marine environment is production of toxic metabolites like ammonia, hydrogen sulphides, increase in metal concentrates and suspended solids, acidification of soil and water and salination of the land.

4.6 Agricultural Activities

Pesticides are extensively used in agriculture in Sri Lanka. However, the use of organo pesticides is banned. Information on the levels of pesticides in water and organisms is not available.

5. National Environmental Action Plan

5.1 The National Environmental Action Plan has the following methodology to tackle the problem of urban and industrial pollution from land-based sources:

- (1) Conducting a cost benefit analysis of Colombo's two sewage disposal options and construction of pre-treatment plants/lengthening the ocean outfalls;
- (2) Preparation of a strategic plan for solid waste management in the Colombo urban area;
- (3) Conducting a study to determine existing water pollution levels in selected urban sites outside Colombo like Jaffna;
- (4) Develop EIA guidelines and criteria for industrial development projects including estates;
- (5) Review and update existing discharge standards and pollution control guidelines for all centres of industry;
- (6) Study and propose mechanisms for financing pollution abatement through subsidies, incentives, loans or grants;
- (7) Conducting an assessment of the requirements for pollution control technologies for the worst polluting industries in Sri Lanka;
- (8) Strengthen the research capabilities in appropriate research organisations on waste treatment technologies; and
- (9) Provide designs of free treatment facilities for at least 20 major polluting industries in the Colombo city.

5.2 Environmental impact assessment regulations of June 1993 seek to regulate discharge of effluents from major industries in Sri Lanka. For this purpose, the industries are categorised into major, medium and small. In the case of major and medium scale industries, an Environmental Impact Assessment(EIA) has to be carried out before the project is submitted for approval. The EIA report is then evaluated in a public hearing and approvals are given. In the case of small scale industries, however, initial environmental assessment would be enough for obtaining clearances.

5.3 The Government's policy with regard to industrial pollution include the following:

(1) Introduction of environmental protection licensing scheme covering existing industries. Under this scheme, existing industries must obtain a licence from the CEA which includes conditions regarding control of effluents to an agreed level within a specified time period. Already about 360 industries received licences during the first year of implementation. With proper enforcement strategy and adequate number of trained staff, the scheme is likely to cover more industries in future.

(2) Mandatory environment impact assessment of all proposed new industrial ventures involving potential pollution. National regulations for environmental impact assessment have been framed for this purpose.

6. INSTITUTIONAL RESPONSIBILITIES

6.1 The Central Environmental Authority is a statutory body under the Ministry of Environment & Parliamentary Affairs and is the overall coordinator for all environment related matters. The National Planning Department under the Ministry of Policy Planning and Implementation is required to ensure that environmental policy guidelines are incorporated in the government's annual and five year plan programmes.

6.2 The Coast Conservation Department is responsible for implementation of coastal management policies which also have a direct bearing on protection of marine environment. The Marine Pollution Prevention Authority deals with pollution problems at sea caused by ships and offshore installations. The National Aquatic Research Agency (NARA) is responsible for carrying out monitoring of the marine environment at selected priority areas along the coast and in the lagoons and estuaries. The Agency has a research and analytical laboratory and a research vessel for carrying out these studies. The Agency also prescribes standards for water quality and pollution levels for various pollutants in marine environment. The Lanka Hydraulic Institute is responsible for conducting hydrographic and oceanographic surveys in the sea for the purpose of selecting suitable locations for marine outfalls etc. The Institute has also been identified as a focal point for estuarine modelling under the LOICZ Programme of the Intergovernmental Oceanographic Commission.

- 6.3 There is, however, a shortage of qualified scientific and technical manpower in Sri Lanka for carrying out various activities envisaged under the National Environment Action Plan and the programmes of various government agencies. There are no dedicated research institutions in the country to address the environmental problems in the marine sector and for developing technical capabilities within the country. A post-graduate level course leading to M.Sc is conducted in the University of Colombo and a course on Environmental Engineering is conducted at the Moratuwa University. The need for professional capabilities has led to some of the universities adjusting to serve these needs. A course on Environmental Impact Assessment leading to diploma will be introduced in the Kelaniya University. Lack of adequate funds and resources however, limit the capability of the Universities to take up such initiatives. The absence of a central institute to collect and disseminate environmental data is very much felt in the country.

7. FUNDING

- 7.1 Sri Lanka has been able to attract funds from World Bank and under bilateral programmes for some of its projects. The National Development Bank of Sri Lanka, has recently obtained financial assistance of 7.5 Million DM from the German Government in grant and loan form for installation of effluent treatment plants in industries after preparation of project documents. The loan is upto 200,000 DM per industrial unit with 8.4% interest repayable within seven years. The government is also trying to obtain finances for implementation of the urban master plan for Colombo city.
- 7.2 A Reef Management Plan for Hikkaduwa reef has been formulated under the Coastal Reef Management Project to be funded by US AID. A reef management plan is being developed by NARA with the assistance of SAREC. A Coral Ecosystem Research Programme has also been initiated by NARA with financial assistance from SAREC.
- 7.3 There is greater need for bilateral cooperation within the region and outside for capacity building in government agencies, research institutes and universities for which necessary finances have to be obtained.