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STATE OF THE COASTAL AND MARINE ENVIRONMENT IN THE REGION AND NATIONAL STRATEGIES AND ACTIONS

(Item 5 of the provisional agenda)

Note by the secretariat

CONTENTS

INTRODUCTION

This document presents a summary of the findings of the country-studies on coastal environmental management of Bangladesh, India, Maldives, Pakistan and Sri Lanka, prepared by national experts and presented in the ESCAP/UNEP/SACEP Workshop on Management Strategies for the Protection of the Coastal and Marine Environment in the South Asian Seas Region, held at Colombo, from 20 to 23 December 1993.

The information provides a concise background on major environmental and development issues in the coastal areas of the participating countries and an overview of relevant instruments of the national planning systems, as well as major capacity building requirements identified in the country reports.

I. BANGLADESH

1. Definition of coastal area

The coastal environment of Bangladesh is composed of the delta Ganges–Brahmaputra and Meghna rivers. The coastline is divided into the eastern, central and western regions of which the central region is the most dynamic in the sense that most of the land accretion and coastal erosion occurs here. The Central region has a highly broken coastline and a series of island formed by sediment deposits. The east coast on the other hand is unbroken, most of it forming a 145 km. long sand beach. The west coast is stable and covered by dense mangroves, the Sundarbans. Considering the coastal low lands and islands, the intertidal area, salt marshes, wetlands, beaches and the

immediate coast, the coastal areas of Bangladesh comprises the districts of Chittagong, Cox's bazar, Bhola, Noakhali, Barisal, Patuakhali, Barguna, Bagerhat, Satkhira and Khulna.

2. Overview of coastal resources

Ecosystems and habitats

The coastal areas of Bangladesh have vast stretches of mud flats, swamps and newly emerging islands, which are all specialized habitats of great ecological interest. Some of these are the Sundarbans swamps with the largest mangrove forest block in the world and many deltaic islands in the estuary. The mangroves of the Sundarban, cover 5,993 km2 in the tidal plains (12.5 per cent of the total forest cover and 4.2 per cent of the total land area of the country). The only known coral reef area in Bangladesh occurs around St.Martin's island. There has so far been only very limited exploratory work for offshore oil and natural gas in the coastal water and prospects of any commercial yield have not been very promising so far. Radio—active materials have been found in heavy sand along the beaches south of Cox's bazar. Deposit of Monazite, Ilmenite, Rutile and Zircon have been reported.

Inland fisheries account for about 90 per cent of the total annual fish catch in Bangladesh, because of the deltaic nature of the country and the existence of vast stretches of natural inland water bodies. But very little aquaculture is being practised in the country in a systemic manner, although several modern advanced techniques have been demonstrated in recent years. The Government is aware of the vast potential for developing aquaculture in the coastal regions to boost the supply of protein in the country. About 18.0 million people live in the coastal areas, and about 5.0 million live in high risk zone that may be submerged by a depth of 1 meter storm surge. Present

population growth rate in the coastal belt is slightly lower (2.06 per cent) than the national population growth rate.

Utilization practices

Excepting for the Sundarban reserve forest area, the rest of the coastal land is used for traditional paddy cultivation. In recent years shrimp cultivation is on the increase and being grown in paddy fields. The mangroves of the coastal areas of Bangladesh are showing signs of degradation. The fresh water zone of the mangroves experiences top—dying of the trees during the dry season starting in November when the flow of freshwater in the Ganges—Gorai almost dries up. The increased salinity affect forestry, agriculture and aquaculture. In recent years water salinity in Khulna region reaches as high as 28,000 micro—mhos per cm in dry season, which is causing problems in supply of water for domestic as well as industrial use.

Two thirds of the country's more than 70,000 ha shrimp farms needing brackish water for culture are in conflict with poor rice farmers as rice farmers need freshwater for irrigation. The shrimp farms are encroaching upon more agricultural land and mangroves. Most of the Chakaria Sundarbans occupying around 7,500 ha has been encroached upon by shrimp farmers and salt producers. However, the per capita fishery production is fast depleting in the country. Overexploitation, water development/flood control projects, biocide application, toxic chemical pollution from untreated industrial effluents and deforestation are being considered reasons for fish declining. The only coral reef around St. Martin's island is also under threat of destruction due to indiscriminate exploitation. The other most important issue is marine pollution arising out of movement of oil tankers. Oil pollution from oil spillage and bilge waters from oil tankers are regular phenomenon. Accidental spillage from such tankers make the situation more vulnerable. Moreover, there is also a potential risk of illegal dumping of toxic wastes in the bay, due to absence

of regular surveillance.

Damage due to natural calamities

Bangladesh is prone to natural calamities. Floods are recurrent phenomena. Storm surge associated with tropical cyclone is one of the most serious problems in the coastal region which may hit any part of the coast. On an average, bordering countries of the Bay of Bengal (e.g. India, Myanmar and Bangladesh) suffer three or four severe cyclones a year. Bangladesh has in the recent past experienced storm surge with severe intensity. In November 1970 one such storm is thought to have killed over three hundred thousand peoples. The latest over 29th April 1991 was also catastrophic which killed about 138,000 people of the Chittagong area. Due to these natural calamities, the coastal resources of the country incur colossal damages.

3. Economic indicators of coastal resources

The coastal zone and its resources have a very important bearing on the national economy. Two of the four largest metropolitan cities in the country, viz Chittagong and Khulna are situated along the coast. There are large number of industries which had come up around these cities contributing substantially to the Gross National Product of the country. The major industries include fertilizer, cements, oil refineries, paper and pulps, etc. These cities are also harbouring the port facilities which are the major gateway for national imports and exports.

In terms of fisheries resources, the contribution from marine catch is increasing every year and it has further potentials. In terms of foresty production the coastal zone has a larger share than that of inland forests.

4. National planning system

Administrative boundaries are based on twelve coastal Districts. The planning system is weak and highly centralized. Planning is not yet a mandatory exercise and there is no coastal zone management plan approved by the Government yet. Land use planning is almost absent. Development initiatives mainly support the Government sector and focus on infrastructure development, rather than capacity development. The status of implementation of development schemes is also poor. Despite successive Government's efforts, the private sector's contribution to the overall economic development has been marginal. People's participation in the planning process is also negligible.

5. Planning and management resources and capabilities

Data availability is limited, especially for remote coastal areas. The preparation of computerized database of natural resources would be a priority to build effective planning capabilities. However, the paucity of data availability should not obstruct the attempt to develop management plans. The Government has formulated in 1992 a Concept Plan for Integrated Coastal Protection and an Integrated Coastal Zone Management Strategy has been produced in 1993. It includes recommendations for the formulation of public policies, the establishment of interagency coordination mechanism, the development of planning instruments based on land suitability analysis and the implementation of pilot studies at local level.

As regards to the scientific and technical manpower, the coastal zone has quite a good

number of educational and research institutes working in the field of marine science, forestry and related technology development.

6. Identified key resource management and development issues in coastal areas

To effectively implement a coastal zone management programme, through capacity building and balancing sustained economic development needs and priorities with risk management and environmental protection, the following are the priority areas which deserve immediate attention:

- Natural resources management should include development and environmentally sound management of fishery resources, maintenance of biodiversity, wetland resources, forest, mangroves, coral reefs, environmentally sound land management and healty coastal tourism;
- pollution control should include development of monitoring capabilities, adequate pollution response capabilities in the ports, oil spill contingency plan, coast guard for combating pollution form sea bed sources and appropriate institutional and regulatory mechanisms for pollution control from land based sources.
- cyclone security should include physical arrangements including embankments, shelter, green belts, etc.

For implementation of an Integrated Coastal Zone Management Strategy the need for integration among government agencies as well for inclusion of communities in the planning process is seen also as essential.

II. INDIA

1. Definition of coastal areas

India's coast is 7,500 km long, 6,000 km in the mainland and 1,500 km in the two groups of islands in the Arabian Sea and the Bay of Bengal. Ten states and two union administered territories form part of the coastal region. Sixty districts in these states and union territories have areas along the coast, most of them extending to a distance of 60 km from the coast. About 55 per cent of the coast has beaches including spits and barriers and the rest constitutes deltas and overhanging cliffs.

Even though it is recognized that coastal zone is an interactive zone extending towards both land ward and seaward sides of the coast, its definition under the national legislation is now limited to the land ward side only. The Environment Protection Act, 1986 and the Notification issued thereunder, specify a zone up to 500 meters inland from the high tide line and the land between high tide and low tide lines as a coastal regulation zone.

2. Overview of coastal resources

Ecosystems and habitats

India supports a rich diversity of wetland habitats and 36 per cent of the total area under wetlands are waterbodies. Mangroves are found along the deltas, estuaries and backwaters and in the islands. The total mangrove area is 681,976 hectares. Coral reef formations are found in the south and northwest coasts and in the island groups. 342 species of corals belonging to 76 genera

have been identified. They are declared as endangered ecosystems as several of them have suffered damage because of human intervention and oil pollution. The coast is also characterized by a number of beaches which are areas of tourist interest and recreation.

Living Resources

Marine fish resources are categorized based on depth zones. In the 0—50 m depth zone the estimated marine fish potential is 2.21 million tonnes, and in 50 m—200 m depth, 1.69 million tonnes. While there is over exploitation in the 0—50 m zone, the full resource potential in the 50—200 m zone and beyond is yet to be fully exploited. Brackish water area of 1.4 million hectares along the coast offers immense opportunities for modern semi— intensive aquaculture, which has already reached productivity levels of 8,500 per hectare in selected areas. Sea weeds are also an important resource along the coast whose potential for exploitation is slowly being realized.

Non living resources

The coastal offshore areas are rich in placer mineral deposits, which are found in commercially exploitable quantities in the southwest and northeastern regions. Petroleum and natural gas are important resources found in the off shore areas accounting for 62 per cent of the total production in the country. 18.2 per cent of India's population live in the coastal areas. The natural resources and aesthetic value of the coast are direct inputs to the development of these human settlements. Agriculture, fishing, industry, trade, commerce and communications are major areas of human intervention in the coastal environment.

Nature also takes a heavy toll in the form of natural calamities like cyclones, storm surges, coastal erosion and salt water intrusion in specific areas. The east coast is more vulnerable to natural disasters.

3. Economic indicators of coastal resources

(i) In terms of fishery resources the contribution of marine fisheries is 2.5 million tonnes out of a total of 4.2 million tonnes of national fish production.

(ii) The total production of cultured shrimp is about 30,000 tonnes contributing 52 per cent by volume and 72 per cent by value of seafood exports of the country.

(iii) Major ports located along the coast carry cargo of 158 million tonnes which is 60 per cent of the freight handled by Indian Railways for the entire country.

(iv) The offshore petroleum resources account for 62 per cent of the country's crude oil production.

(v) Major industrial networks are situated around metropolitan cities like Bombay, Calcutta, Cochin, Visakhapatnam and Madras along the coast.

4. National Planning System

India's Constitution lays stress on protection and preservation of environment through Articles 48a and 51A(9) of the Directive principles of State policy. The Territorial Waters, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Act 1976 defines the rights and jurisdiction in various maritime zones of the country. India is a signatory to the United Nations Convention on the Law of the Sea and is striving towards universal acceptance of the Convention. India has ratified 22 international conventions on environment.

The Environment (Protection) Act 1986 deals with all matters relating to protection and preservation of environment including the coastal zone. The Notification on Coastal Regulation

Zones issued under this Act imposes certain regulations on the setting up and expansion of industries, hotels and other activities. The Ministry of Environment and Forests at central level and the Departments of Environment at the state level are responsible for monitoring and enforcement of the provisions of notifications issued under this Act. While the Ministry of Environment is the nodal agency for all environment related matters, other ministries like Agriculture, Food Processing, Ocean Development, Mines, Petroleum, Water Resources, Surface Transport and Defence also have sectoral jurisdiction concerning various activities relating to coastal and marine environment.

For sustainable development of the islands an Island Development Authority functions under the Planning Commission. Horizontal interaction between various Ministries and other agencies is achieved through national committees and working groups. The cabinet committees and the committee of secretaries are coordinating authorities at policy level.

As India is a federal country, the State Governments are key actors in area development, the protection and preservation of environment and enforcement of laws. Devolution of funds from Central Government and generation of resources by the states contribute to the economic activity at the state level. While protection of environment on land is concurrently addressed by both central and state Governments, protection of marine environment is mostly the responsibility of the central government.

5. Planning and management resources and capabilities

Government of India attaches considerable importance to promotion of technical, research and educational institutions for technological and manpower development. The allocations for science and technology is 9.3 billion rupees in the Eight Five Year Plan period (1992–97). The

science and technology infrastructure includes a chain of national institutions under the Council of Scientific and Industrial Research, Indian Council of Agricultural Research, Indian Space Research Organization, Institutes of Technology, etc. A number of them deal with sustainable development of coastal areas and exploration and exploitation of marine living and non–living resources. Nongovernmental institutions are also considered for funding from government and for developing as centres of excellence.

The coastal area has a large number of scientific and technical institutions including national laboratories of the Council of Scientific and Industrial Research Council of Agricultural Research Institutes of technologies, Universities etc. contributing to manpower development in various areas relating to coastal and marine sciences.

With the liberalization of the economy, the government has taken a number of initiatives to re–orient research programmes and to develop and enhance linkages between industry and research institutions. Fiscal incentives were also announced for promotion of cleaner technologies and healthier environment.

The need for a comprehensive information base about the health of the marine environment has prompted the government to evolve national programmes for monitoring of pollution levels in the coastal waters on a continuous basis. Identification of areas of high pollution levels (hot spots) and dissemination of data to State Level Pollution Control Boards to identify the polluter on land is an integral part of this programme.

For surveillance and combating oil pollution in the Executive Economic Zone, the government has approved a National Oil Spill Contingency Plan. Efforts are on to augment the capabilities of combating agencies in terms of vessels, aircraft and equipment despite financial constraints.

Development of appropriate technologies for sustainable development of coastal resources is also a priority area for the Government. Technologies like marine remote sensing, modern tide guages for monitoring sea level rise, generation of power from waves, winds and thermal gradients in oceans, development of marine instruments for measuring various oceanographic parameters desalination technology, study of coastal process like shore line changes, salt water intrusion, sedimentation etc. are now under various stages of development and operationalization.

6. Key resource management and development issues in capacity building

- Mapping of the coastal belt, 25 km wide, on a scale of 1:25,000, and preparation of detailed contour maps. The necessary aerial photography will be a prerequisite.
- Collection of continuous data on the oceanic side to satisfy information requirements for coastal planning.
- The State Governments will have to play a key role in Intregated Coastal Zone Management in India: Comprehensive inventorization of coastal resources to build on the already acquired information in respect of fragile ecosystems such as mangroves, coral reefs, estuaries, seagrass beds, by the State Governments will be a pre—requisite.
- Establishment of training facilities in centres of excellence in India or in the first instance at some selected locations in the region to provide training facilities in Intregated Coastal Zone Management in a manner that it could get incorporated into university curricula.

In addition to the basic capacity building requirements at the national level, the following recommendations are for harmonization with regional programmes with international funding:

- Developing the National Institute of Oceanography, Goa and Indian Institute of Technology, Madras, on the west and east coast respectively, as centres of excellence for manpower development in the South Asian Seas region.
- Upgrading of the National Ocean Information System by supplementing computer networking facilities.
- Acquisition of coastal research vessels for the east and west coast with the capability of operating at depths of 2 –3 m.
- Modernization of tide gauges for monitoring sea–level rise and data networking with the Survey of India for processing and storage of data.

India also endorses the viewpoint expressed at the World Coast Conference 1993, the Netherlands, 5 November 1993, that there can be no single "blueprint" type approach to ICZM in all countries. All ICZM efforts have to be designed (or evolved) to suit the requirements of a particular country. The choices in approach could be (framed in a mutually exclusive framework):

- Top down versus bottom up.
- High tech versus low tech
- Impact based versus subsistence based.

III. MALDIVES

1. Definition of coastal area

Maldives, collection of several islands, is extremely sensitive to even slight changes in the global environment. There are no official definitions of coastal zone to date in Maldives. However, for purposes of Construction of Coastal defences and other infrastructure in the Coastal zone, various concerned authorities like Ministry of Atoll Administration, Fisheries and Agriculture, Tourisms etc. adopt their own criteria with consultations among themselves.

2. Overview of coastal resources

Ecosystems and habitats

The land areas is about 300 km2 and constitutes less than 0.01 per cent of the total area within the exclusive economic zone, the balance being the sea. Maldives' support coral structure and islands are within the lagoon itself. Most of the land is concentrated on the outer reef which surrounds the lagoons. The diversity of coraline structures within the lagoons enhances overall atoll productivity.Here coastal and marine habitats predominate. The economy is sustained through them by two main sectors: fisheries and tourism.

Living and non—living resources

Among the non—living resources, coral rocks and coral sand find prominent place. Soils are relatively young, shallow and alkaline. Surface fresh water is generally lacking, though beneath

many island there are unsurveyed fresh water aquifers. Living resources include cultivated plants, 1,000 reef fishes, 140 species of coral, 63 species of marine benthic algae and about 12 species of nesting sea birds. The total human population of the country, at present is 238,000 with growth rate of 3.4 per cent. Fisheries sector has traditionally been the back bone of the economy. Agriculture is on subsistence level and is restricted by availability of good arable land. Mangroves vegetation is usually found on low lying marshy areas of the lagoon side of larger islands. The resources of timber have depleted to the extent of requiring importation. Coral reefs and sand are mined for construction purposes. Corals and fresh water resources are stressed by over utilization.

The Maldivian archipelago is fortunate in not living in a cyclone belt. Even strong wind and gale are very rare. Although a degree of coastal flooding have been experienced in the past, risks of flood damage, resulting from long distance swell propagation with high tides, have increased in recent years.

3. Economic indicators of coastal resources

The fisheries sector has traditionally been the backbone for the economy. It accounts for 15 per cent of GDP, over 70 per cent of export earnings. However, due to the peculiar nature of this island country, economic activities taking place in the coastal areas are of utmost relevance for the overall economy of the country.

4. National planning system

The responsibilities of formal planning in the Government of Maldives is carried out by the Ministry of Planning, Human Resources and Environment (MPHHRE). The National Commission for the Protection of Environment with its Secretariat in the Environment Section of the Ministry has representation from all government departments dealing with the environment. Even clear links in the field of coastal management were established between MPHRE and the Ministries of Agricultures, Construction and Public works, Tourisms, etc.

Several legal instruments could be sighted in the area of coastal management in Maldives. The overall umbrella legislation Environmental Proteciton Act, 1993 provides extensive authority to the concerned government agencies to formulate various regulations for the protection of environment. Other relevant legal instrument is the Fisheries Law regulating sustainable exploitation of marine resources. EIA exercises are mandatory for clearing any project under the Environment Protection Act. There are also regulatory guidelines on tourism, solid waste management, housing, etc.

5. Planning and management resources and capabilities

Three noteworthy research institutions have been established under three ministries which deal with matters of coastal zone management. The first being the Marine Research Section (MRS) of the Ministry of Fisheries and Agriculture, the Environment Research Unit (ERU) of the MPHRE and thirdly the Maldives Water and Sanitation Authority (MWSA) under the Ministry of Health and

Welfare.

MRS has covered monitoring of impacts of coral mining on reef fish populations, giant clam resources, reef fish resource survey, assessment of pollutions hazard on fisheries, cleaner fishing harbour, sea–cucumber resource surveys and a long term coral reef monitoring programme. MWSA has considerable knowledge about quality and quantity of fresh water. ERU also has carried out relevant research activities.

The present data collection activities of various departments vary from sector to sector. Data collected by different departments is analyzed and synthesized within the individual agencies. There is no centre for technology development and application.

6. Identified key resource management and development issues in coastal areas.

Maldives are dominated by oceanic influence and as a result, coastal area planning and management involves total and integrated management of entire islands. The capacity building required in Maldives, nevertheless may be ascribed to two broad classes of problems: marine related and land related. The former include problems arising from human interference as well as from natural phenomena and processes. Human induced problems related to the coastal area include:

- engineering structures for beach protection based upon inadequate understanding of currents;
- coral mining contributing to: (a) reduced coastline protection against normal tide and wave induced erosion, and (b) increased coastal vulnerability as a result of increased water depth and hence storm induced erosion and flooding;
- marine pollution: some problems such sewage and solid waste disposal are adequately understood while others such as hydrocarbons from fishing craft are inadequately

understood;

- tarballs on beaches of northern islands, related to oil tanker route;
- enhanced turbidity effects on corals;
- potential overexploitation of fish stocks, if unmanaged;
- tourist, diver and boat damages to reefs.

Natural phenomena of concern within the framework of reef and island management include:

- Coral bleaching
- Population explosions of the crown–of–thorns starfish and reef predation.
- Reef cracking (causes inadequately understood).
- High wave events causing flooding

Problems associated with the human/terrestrial environment include:

- Population growth (3 per cent annually) as the overarching issue.
- Urban drift and carrying capacity
- Coral mining for land reclamation and loss of natural defence
- Solid waste disposal
- Soil degradation
- Sewage disposal
- Fresh water availability
- Air pollution
- Agricultural production in relation to island carrying capacity
- Inadequacy of the environmental database for planning.
- Manpower and training for addressing existing management problems.
- Research programmes and institutions that would lead to enhanced indigenous capacity.

Taking into consideration the wide range of perceived problems, at a national level, the following actions are deemed as necessary:

1. Encouragement of activities and developments that required minimal use of freshwater aquifers and energy, incorporating new low–cost technologies where appropriate.
2. Promotion of food self–sufficiency (i.e., utilization of reef fish) in some instances and promoting alternatives to other forms of resource use such as reef mining.
3. Provision of land for construction of concrete building blocks and for other projects that conserve important local resources.
4. Creation of policies to manage urban migration.
5. Active promotion of population control policies.

IV. PAKISTAN

1. Definition of coastal area

Pakistan's coast is about 990 km bordering the Northern Arabian Sea. The maritime area of Pakistan extends up to 200 km offshore covering an area of about 240,000 sq. km of the exclusive economic zone (EEZ). The coastal zone of Pakistan has two main parts -- the Sindh coastal zone and the Baluschistan coastal zone.

No official definition of the coastal zone is available in Pakistan. In the Indus Delta tidal creeks penetrate inland to about 30 km. This may be considerd the landward limit of the coastal zone from a natural point of view and for management purposes, such as for the development of

IV. PAKISTAN

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infrastructures for combating seawater penetration. On Baluchistan coast raised beaches up to about 20 km from the sea may be considered the natural limit.

2. Overview of coastal resources

Ecosystems and habitats

In the Indus delta the continental shelf is conducive habitat for demersal fish and small pelagic fish. Most of the Sindh coast is covered by the Indus river delta which is characterized by the fifth largest continuous mangrove forest in the world. There are about 613,000 ha of mangroves. The vast intertidal area has potential for aquaculture development. The Baluchistan coast is sparsely populated and has shortage of water and rocky and sandy substrata which have poor suitability for vegetation.

Living resources.

Annual fish landing amounts to about 0.436 million metric tons. Stocks of molluscan resources and seaweeds are considerable even though not fully assessed yet. Backwater and swamps areas of the Sindh province are estimate to produce 50,000 metric tons of fish.Shrimp wild stocks are considered over-exploited, while shrimp mariculture has high potential for development. Mangrove forest have been considerably reduced during the last decades due to increased human demand for resources and reduction in water flow and sediment load from the Indus river. Local communities are based on fisheries and forestry production through traditional utilization practices. Off-shore fishing resources are still largely unexploited. Vast uninhabited areas are considered waste lands.

Non-living resources

Pakistan has considerable resources of minerals, sea salt and estimated a few billion barrel of oil and a few trillion cubic feet of gas. The coastline has high potential for developing ports, landing jetties, industrial infrastructures and tourism. Water shortage is a common feature in vast areas and water resource management is therefore a critical issue.

3. Economic indicators of coastal resources

- The coastal areas of the country, with the exception of Karachi are the most backward and underdeveloped areas. Average population density is 1,785/sq km; Karachi has about 9 million inhabitants.
- The fishery sector employs about 300,000 people (1987) and fisheries export amounts to about Rs. 2,000 million.
- Fisheries products account for 0.8 per cent of gross domestic product (GDP) and fish exports account for 3-5 per cent of national export earnings. While these figures do not appear significant in the national economy, the sector has fundamental importance in the provincial and local context.
- Forestry provides considerable subsistance to the local coastal communities.
- The oil and gas, minerals, transport and tourism potentials are not being exploited because of inadequate exploratory surveys and lack of infrastructures
- Karachi has large industrial complexes and important transport infrastructures.

4. National planning system

The seaward coastal zone up to 12 nm from the coastline is under the jurisdiction of the two provinces of Sindh and Baluchistan. Provincial governments have responsibility for legislation and enforcement for sectors such as fisheries, forestry, etc. However, the protection of the environment and the conservation of natural resources is the responsibility of the Federal Government, which has also the necessary expertise.The Federal Government has also responsibility for the Exclusive Economic Zone. The elaborate central planning system has the highest level in the Executive Committee of the National Economic Council, where projects up to Rs. 120 million are approved by the Central Development Working Party. Traditional tribal/feudal systems are in practice in most of the coastal zone.

The umbrella legislation in the environmental field is the Environmental Protection Ordinance 1983, which has provisions for mandatory Environmental Impact Assessment. Sectoral legislative instruments for fisheries, pollution control and forestry are also available. The complex distribution of responsibilities among Federal Government bodies, provincial governments and local agencies of the Federal Government would require an effective coordination mechanism to address coastal problems and resource management issues. No legislative framework exists for the formulation of planning instruments in the coastal areas.

5. Planning and management resources and capabilities

Agencies responsible for planning and enforcement of the law are often poorly equipped with

necessary resources, especially at provincial level. Major research institutions are the National Institute of Oceanography and the University of Karachi. Expertise is available in a number of fields including fisheries research, physical oceanography, pollution monitoring and control. A significant number of projects in the field of forestry resource management, fisheries resource management, marine resource assessment and pollution assessment and control have been carried out, mainly through development assistance.

A coastal environmental management Plan for the entire coast of the country has been prepared with the support of ESCAP to assess issues and problems of coastal areas, but no integrated management plan has been actually implemented. A Coastal Recreation Development Plan has been prepared for Karachi.

6. Identified key resource management and development issues in coastal areas.

a. Small coastal communities and coastal towns should be involved in development programs to broaden the economic base, to enhance fishing skills and boat building skills, to introduce low cost and appropriate fishing technologies, to promote alternative energy sources for desalinization of sea water for domestic use and improved fish preservation and to provide adequate sanitation.

b. Major capacity building requirements relate to marine resource mapping and monitoring, fragile ecosystem management, in particular for the mangrove ecosystem, and for upgrading of technical expertise in such fields as EIA, coastal engineering, environmental protection, fisheries resource management, pollution control, coastal zone planning, coastal protection from adverse geomorphological processes.

c. The area of Karachi presents typical problems of highly industrialized and populated urban areas: therefore infrastructure development is the major issue.

d. Institutional mechanisms for integration of different planning instruments and administrative jurisdictions, as well as involvement of communities and grassroots organizations should be promoted.

e. The development of integrated coastal zone management would require the provision of adequate funding, trained personnel in coastal engineering and planning, as well as promotion of awareness among the public and policy makers.

V. SRI LANKA

1. Definition of coastal zone

Taking into consideration its primary concerns of coastal erosion and shorefront construction, the Coast Conservation Department set the boundaries of its jurisdictional area as a 2 km band of coastal sea and a parallel belt of land extending 300 m inland (Coast Conservation Act No. 57, 1981).

The inadequacy of this definition for purposes of integrated land and water use management as required by the nature of coastal ecosystems and the dynamics of coastal processes has been recognized. Therefore, a strategic definition proposed for integrated coastal area management in Sri Lanka includes the band of sea of 2 km and the entirety of the 67 Divisional Secretariat Divisions (DS Divisions) with a coastal boundary.

2. Overview of coastal resources

Ecosystems and habitats

The estuaries, lagoons and the coastal fishery habitat, generally lying within 2 km of the coastline constitute important life support systems that have shaped livelihood of communities that depend upon their fishery productivity. Coral reefs, mangroves, seagrasses, beaches and dunes generally provided various services for the primary activity of harvesting the productivity of estuaries, lagoons and coastal waters. The beaches have now become significant for coastal tourism.

Human population

The coastal area of Sri Lanka supports 32 per cent of the population at the last census in 1981. The density and distribution of the population in the coastal DS Divisions is associated with the level of urbanization. The population in the coastal areas will reach about 15 million in the year 2036.

Utilization practices

The major land uses in the coastal include: approximately 65 per cent of the urbanized area; the units producing two thirds of the total output of organized (factory) industry; the principal road transportation infrastructure; the international air transportation system; ports, shipping and container storage system; approximately 80 per cent of the tourism related infrastructure and sites; fisheries that produce about 30 per cent of the animal protein essential to the diet of the population and nearly 80 per cent of total annual fish production; habitats (ecosystems) critical to the sustained production of coastal fisheries, the maintenance of optimal water quality, and the scenic values important to quality of life of both residents and tourists: the ecosystems include estuaries, lagoons,

seagrass beds, coral reefs and fringing mangroves, beaches and sand dunes; some of the richest biodiversity reserves including estuaries, coral reefs and seagrass beds; significant extents of unutilized land for shrimp culture and agriculture ; sizable areas of land still available for other developments; mineral sands reserves which are being exploited.

Resources stressed by over-utilization

Stresses on the coastal resources include: industrial and organic waste loads in brackish water bodies; existing and expanding infrastructure in some segments of the coastal belt; shrimp culture expansion along a segment of the western coast coupled with inadequate water management and conflicts over access to land and water; expansion of tourist facilities without adequate attention to setbacks and shoreline dynamics; expansion and modernization of marine fishing in the absence of adequate resource management and effective coast guard to enforce norms of access; diminishment of real income by inflation which intensifies harvesting of all natural resources in the coastal area; low-income housing expansion in areas vulnerable to flooding and obstruction to hydrology; absence of institutions that facilitate local communities and community based organization to participate in planning and decision making; feebleness of countervailing power of local communities.

3. Economic indicators of coastal resources

(a) The nearshore and small pelagic stocks are regarded as being fully exploited or even overexploited, with very few inshore areas still underfished. The annual sustainable yield within the continental shelf was estimated to be 250,000 mt (170,00 mt of pelagic and 80,000

mt of demersal species) (1970s data). In 1988, 62% of the pelagics and 32% of the demersals were being already exploited.

(b) Subsistence and commercial fisheries are carried out in estuaries and lagoons with varying degrees of intensity. The total fishing population supported by the brackishwater fisheries is estimated to exceed 20,000, which would be 25% of the labour force engaged in the marine fishery (80,000 persons). Most of the brackishwater bodies appear to be overexploited.

(c) Labour is the most important resource in Sri Lanka. The actual unemployment rate of 13.3% (Central Bank, 1993) hides substantial disparities among the local and regional situations. At coastal locations such as Rekawa lagoon area, average unemployment is as high as 26%.

(d) The coastal region of Sri Lanka contributes about 40 per cent of the nation's gross domestic product.

(e) The western coastal region is the focus of most development efforts. Ninety per cent of all large industrial units lie within the Greater Colombo area. A major contribution to economic growth in the rural coastal areas would seem possible by way of tourism and shrimp aquaculture since the available land exists there.

4. National planning system

Numerous national, regional and local level organizations are involved in planning which has implications for the coastal zone. Planning for management of the coastal zone is done by the CCD which has its own Planning Division. Development activities that are planned for implementation in the coastal zone require approval by the CCD. The CCD generally participates

in national, regional and local level planning activities which may have impacts on the coastal zone.

The most important legal instrument for management of the defined coastal zone of Sri Lanka is the Coast Conservation Act, No. 57 of 1981 and its amendment in 1988 which enables the CCD to apply a permit procedure for all activities coming within its area of authority. The Director, CCD also may request an EIA for projects in the declared coastal zone.

The Central Environmental Authority, established in 1981, has now acquired regulatory authority with regard to monitoring and pollution prevention. Pollution of coastal waters by industrial and urban activities that lie outside of the legal coastal zone is a major problem in the area coastal resources management. In 1993 it gazetted regulations pertaining to EIAs which have implications for the coastal area.

5. Planning and management resources and capabilities

Several planning instruments for coastal areas have been produced:

- The Coastal Zone Management Plan (CZMP): the plan prepared by the CCD which describes the nature, scope, severity and causes associated with each of four problem areas is being implemented. The CZM Plan is now due for revision.
- Coastal Environmental Management Plan for the Southwest Coast (CEMP): The plan was prepared by CEA with support from ESCAP.
- Accelerated Strategy for the Development of Coastal Resources in the Southern Province: Serious consideration was given to the integration of coastal resources development within an integrated development framework for the Southern Province in 1988 in the plan prepared