

Coastal Area Management in South Asia

A Comparative Perspective

Chandrika Sharma

Programme Associate, ICSF

Background Paper

**South Asia Workshop on Fisheries and
Coastal Area Management**
26 September - 1 October 1996
Madras, India

International Collective in Support of Fishworkers
27 College Road, Chennai 600 006, India

Coastal Area Management in South Asia A Comparative Perspective

Chandrika Sharma
Programme Associate, ICSF

Background Paper

**South Asia Workshop on Fisheries and
Coastal Area Management**
26 September - 1 October 1996
Madras, India

International Collective in Support of Fishworkers
27, College Road, Chennai 600 006, India

**Coastal Area Management in South Asia
A Comparative Perspective**

Background Paper Prepared for the
South Asia Workshop on Fisheries and Coastal Area Management
26 September -1 October 1996, Madras, India

Written by
Chandrika Sharma
Programme Associate, ICSF

Published by
ICSF, 27 College Road, Chennai 600 006. India

November 1997

Edited by
SAMUDRA Editorial

Designed by
Satish Babu

Printed at
Nagaraj and Company Pvt. Ltd., Chennai

Information contained in this publication may be reproduced freely.
However, acknowledging ICSF would be appreciated.

ICSF, 27 College Road, Chennai 600 006, India
Tel: 91-44-827 5303
Fax:91-44-825 4457
E-mail: mdsaab06@giasmd01.vsnl.net.in

Contents

| | |
|--|----|
| Introduction..... | 1 |
| I. Case Studies from South Asia..... | 3 |
| Sri Lanka | 3 |
| India | 10 |
| Bangladesh..... | 17 |
| Maldives | 22 |
| II. A Comparative Perspective..... | 25 |
| Coastal Area Management Initiatives | 25 |
| Fisheries and Coastal Area Management | 27 |
| III. Legal, Institutional and Policy Dimensions..... | 29 |
| ICAM and the International Legal Environment | 32 |
| IV. Some Useful References..... | 33 |

Coastal Area Management in South Asia: A Comparative Perspective

Most of the world's fisheries and fishing communities are supported by coastal areas. Consequently, the well-being and future of the fishery sector is inextricably linked to the health of the coastal ecosystem. Not surprisingly, therefore, concern about coastal degradation and its impact on the fishery sector has long been expressed, notably at the first-ever conference of fishworkers and their supporters in Rome in 1984. Discussions then emphasized how the coastal environment is affected by activities within the fisheries sector as well as by other activities pursued in inland, inshore and offshore areas.

In 1994, at ICSF's conference in Cebu, the issue was explored in greater detail. It was stressed that the coastal and marine environments were threatened by, among other things, natural calamities, destruction of mangroves, water pollution, irresponsible tourism, destructive fishing techniques, privatisation of fishery resources and deforestation. Worsening quality of the coastal environment and the destruction of critical coastal habitats have a negative impact on fisheries. This manifests as a decline in new recruitment of fish, as spawning grounds are destroyed or affected, and in fish kills and changes in species composition, as water salinity levels in lakes and estuaries change.

Dwindling fishery resources affect the livelihood and survival of fishing communities. Men, women and children involved in the pre-harvesting, harvesting and post-harvesting of fish, are displaced and forced to look for alternative employment opportunities.

Understandably, therefore, initiatives on coastal area management are of great concern to the fishery sector. This paper explores efforts on coastal area management, more specifically in the South Asian region, and the extent to which the perspectives of actors in the fishery sector have been incorporated.

I. Case Studies from South Asia

These case studies will highlight the following aspects within each country context:

- threats to the coastal environment and to coastal fisheries;
- specific efforts at coastal area management, if any;
- shortcomings in legislation related to coastal area management, and in its implementation; and
- other relevant information.

SRI LANKA

The Sri Lankan economy highly dependent on coastal resources. The coastal region, comprising 24 per cent of Sri Lanka's land area, contributes about 40 per cent to the nation's Gross Domestic Product (GDP). Most of its vital sectors such as tourism, industry, mining and fishing, are concentrated in coastal areas and over half of its population is settled in coastal districts. Under these circumstances, it is not surprising that Sri Lanka's coastal resources are under greater stress.

The fishery sector is important as a source of food, employment and income as well as foreign exchange. In the 1980's fisheries and related activities supported almost half a million people. Protein from fish contributes up to 65 per cent of animal protein and 13 per cent of the total protein intake in the Sri Lankan diet. The fisheries sector contributes 2 per cent to Sri Lanka's GDP. Foreign exchange is earned mainly through the export of fish, tuna and ornamental aquarium fish.

The major portion of Sri Lanka's fish catch comes from the marine fisheries sector, most of it from coastal fisheries, catering primarily to domestic demand. Despite government support and subsidies for fleet modernization and mechanization, 30 to 40 per cent of total landings continue to be made by the traditional, non-mechanized sector that makes up half of Sri Lanka's fishing fleet. The inland and aquaculture sectors contribute only about 20 per cent to the total fish production.

The fishery sector in Sri Lanka faces serious threats from the degradation of the coastal environment, especially since the most important fishery resources are derived from lagoons and estuaries, coral reefs and nearshore shallow coastal waters, all areas highly vulnerable to coastal degradation.

Threats to the Coastal Environment

Important factors responsible for coastal degradation in Sri Lanka include the following:

Pollution

Inshore and coastal waters of Sri Lanka are exposed to various types of pollutants from inland, coastal and offshore sources.

Industrial wastes

90 per cent of industrial units are located in the coastal region, with the Greater Colombo area serving as a major hub of industrial activity. Heaviest pollution loads come from leather tanneries, paper mills, rubber processing units, coral-based lime kilns, textile factories and batik printing units, arrack distilleries and asbestos-cement plants. Most industrial wastes are not

treated before being discharged into rivers, lagoons and the sea. Recognizing this problem, the Industrial Strategy of 1989 recommended that all new industries should be situated in specially designated industrial zones with facilities for waste water disposal and solid waste management.

Agriculture

Pesticides and fertilisers are used extensively in Sri Lanka. Run-off with agrochemicals drains into rivers, estuaries, lagoons and eventually into the ocean. Marine organisms such as molluscs and crustaceans are particularly susceptible to pollution from pesticides. However, the more persistent types of organochlorine pesticides, including DDT and Endrin, are banned for import and use.

Domestic wastes

Except for Colombo, no other city in Sri Lanka possesses treatment facilities for municipal wastes. As a result, all waste is eventually discharged into rivers and seas.

Aquaculture

Most shrimp culture sites are located in the northwestern coastal belt of the island. Aquacultural activities have resulted in the increased concentration of nutrients, the production of toxic metabolites like ammonia and hydrogen sulphides, increase in suspended solids, land salinization, soil and water acidification and the siltation of natural wetlands. The Ministry of Aquatic Resources and Development, the project approving agency under the National Environmental Act, has recently set guidelines for the construction and operation of ponds, in collaboration with the National Aquatic Resources Agency (NARA), Central Environmental Agency (CEA), Coast Conservation Department (CCD) and other relevant agencies.

Oil pollution

As a consequence of the international shipping route to the south of Sri Lanka, the country's coastal waters are exposed to oil pollution from the heavy maritime traffic in the area. Contaminants from the ships include oil and waste discharge. The southern coast is polluted with tar balls formed from the coagulation of petroleum hydrocarbons.

Pollution has resulted in the eutrophication of lakes and coastal waters as well as the overall degradation of marine habitats. Instances of fish kills in the Kelani river (near Colombo) are symptomatic of the pollution of Sri Lanka's waters. The Marine Pollution Prevention Authority (MPPA) in collaboration with the Ports Authority, CCD, CEA and NARA is in the process of preparing regulations to address these issues.

Tourism

This industry is very important to Sri Lanka, even though the past few years have seen a lull in tourist traffic due to civil disturbances within the country. Tourist activities have been known to cause beach and water pollution. The Ceylon Tourist Board has set guidelines and administrative procedures for tourism development in the coastal areas to minimise environmental damage. There are also conflicts between the hoteliers and fishing communities, especially when access of fishers to beach space and to fishing grounds is obstructed by hotels and tourist complexes.

Degradation of Natural Habitats

The extent of biologically productive mangrove systems, estuaries, coral reefs and seagrasses is decreasing. The degradation of coral reefs is primarily due to coral mining, destructive fishing practices, siltation and blasting of reefs for the construction of navigation channels. Mangrove tracts are being destroyed to meet fuelwood and timber needs, and for aquacultural and agricultural purposes. Besides the vital coastal protection functions performed by coral reefs,

seagrass beds and mangroves, these habitats are especially important to the fisheries sector since they serve as spawning and breeding grounds for many fish species. Seagrass beds, for instance, support more than half the country's nearshore fishery production.

Lagoons and estuaries, among the most productive of all coastal waters, are being threatened by urban encroachments, pollutants, siltation and overfishing. Irrigation schemes along the coast have affected the salinity levels in several southern lagoons and, as a result, fisheries have been adversely affected or totally destroyed.

Coastal Erosion

About 45 to 50 per cent of Sri Lanka's coastline, primarily in the south, is exposed to coastal erosion. On an average, the Sri Lankan coast recedes by about .3 metres every year. The natural supply of sand nourishing Sri Lanka's beaches is being affected by river sand mining and by the construction of dams and reservoirs. Beach sand mining, inland coral mining, collection of corals from beaches, reef breaking, improperly sited groynes and coastal buildings, harbours, revetments and jetties, degradation of natural coastal habitats and the improper removal of coastal vegetation are other important factors contributing to coastal erosion.

Siltation

Deforestation, the encroachment of river banks, mining of gems and other minerals, and poor agricultural practices contribute to siltation. As a consequence, coral reefs are smothered, mangroves, lagoons and estuaries become shallower as they are silted and nearshore waters become turbid. Sedimentation also results in the formation of sand bars across the sea outlets of the coastal water bodies, reducing water exchange with the sea and leading to an accumulation of pollutants. Shrimp and fish recruitment is also affected.

Overfishing and Destructive Fishing Practices

The most heavily exploited fisheries are in the nearshore areas, within 40 km. of the coast, as evident from declining catches per unit of effort. According to the Ministry of Fisheries, almost all important estuarine and nearshore stocks are already exploited at, or even above, their maximum sustainable yields. The national lobster fishery is known to suffer from overfishing. Destructive fishing practices include blast fishing, bottom trawling, drag-net fisheries, use of 'disco' nets and of bottom-set nets. Only a few fisheries societies have been successful in regulating the exploitation of fish as in the Galle, Puttalam and Trincomalee areas. Present government policies reflect the need to limit nearshore fishery effort. Licensing is being introduced for trawlers and purse seiners and is being considered for all motorized boats.

Capture and export of ornamental fish, especially of coral reef species, has increased since the 1980s. This has led to overfishing and habitat destruction, as evident from the increasing scarcity of coral reef fish used both for food and for the aquarium trade. For example, the clown fish has almost completely disappeared from the inshore waters.

Coastal Area Management Initiatives

With a history of 15 years, Sri Lanka's coastal management programme is considered successful amongst developing countries. The programme was first adopted in response to Sri Lanka's highly visible coastal problem, that of coastal erosion. The mandate of the Coast Protection Unit set up under the Colombo Port Commission in 1963, was consequently to seek an engineering solution to the erosion problem. The Unit concentrated on the construction of coast protection structures designed to meet site-specific requirements. There was, however, no mechanism to co-ordinate the activities of other departments with jurisdiction over coastal areas, so that efforts at coastal protection were often piecemeal and ad hoc.

In 1978, a Coast Conservation Division was established within the Ministry of Fisheries with the responsibility for handling all matters related to coast conservation. However, it was only in 1981 that the Coast Conservation Act (CCA) No. 57 was enacted to deal specifically with coastal problems in a more comprehensive manner. The Act came into operation in October 1983. A year later, the existing Coast Conservation Division was upgraded into the Coast Conservation Department (CCD) headed by the Director, Coast Conservation (DCC), under the Ministry of Fisheries. The CCA also established the Coast Conservation Advisory Council (CCAC), an advisory body, to review coastal management problems of significant concern and to give appropriate advice. The CCAC consists of 14 members drawn from various departments with responsibilities for coastal zone management and development, universities, NGOs as well as from the fishing community. In 1989, the CCD was assigned to the Ministry of Defence and, in 1990, to the new Ministry of Ports and Shipping. It has recently been reverted back to the Ministry of Fisheries.

The coastal zone is defined in the Act as that area which lies within a limit of 300 m. landward of the Mean High Water Line and a limit of 2 km. seaward of the Mean Low Water Line. In the case of water bodies like lagoons, rivers and streams that are connected to the sea, the landward boundary is considered to extend up to 2 km. The Act aims at regulating development within this narrow zone to prevent environmental degradation, pollution and erosion.

The CCA assigns the CCD with three primary responsibilities within the designated coastal zone:

- (a) policy formulation, planning and research;
- (b) administration of permit procedures regulating coastal activities; and
- (c) construction and maintenance of shoreline protection works.

The Act prescribes two important tools for the regulation of development activities by the CCD, namely, the permit system and the Environmental Impact Assessment requirement for managing development projects in coastal areas. Non-regulatory tools include the construction of coast protection structures and awareness generation about coastal problems through environmental education.

The Act makes it mandatory to obtain a permit for any development activity likely to alter the physical nature of the coastal zone in any way. Fishing, agriculture and silviculture have been exempted from permit requirements. Aquaculture operations, however, require a permit as do the construction of buildings and other structures; the deposition of wastes or other materials from outfalls, vessels or by other means; the removal of sand, seashells, natural vegetation, seagrass or other substances; dredging and filling; land reclaiming or mining; and drilling for minerals.

CCD's monitoring and enforcement responsibilities require it to undertake periodic visits and surveys to ensure compliance with permit conditions, and, if required, to issue demolition orders for unauthorized structures.

The Act calls for the setting up of Environmental Impact Assessment (EIA) procedures for large development activities potentially affecting the coastal zone. The EIA procedure involves seeking the co-operation of the general public as well as of NGOs.

While prior to 1988, the CCD was empowered to ask for an EIA for any development activity considered to have significant coastal impact, under the amended Environment Protection Act, EIA regulations were revised. The Central Environmental Authority (CEA) became the lead

agency for the implementation of EIA regulations. The CCD remains responsible for conducting EIAs only in the coastal zone in accordance with the guidelines set forth by the CEA.

The Act also entrusts the CCD with the task of preparing a Coastal Zone Management Plan (CZMP) on the basis of coastal zone surveys and research in collaboration with relevant agencies. A national CZMP was drafted in 1986. Following a public hearing and review, the Plan was duly revised and approved by the CCAC and the Minister of Fisheries. It was finally approved by the Cabinet of Ministers in 1990. It addresses critical coastal management issues such as coastal erosion, degradation and depletion of natural coastal habitats, and the loss and degradation of archaeological, historical and cultural sites, in a co-ordinated manner. The Plan is based, in part, on the principle that the coastal zone is the common heritage of the nation to which every citizen has the right of access, and that the control, custody and management of the coastal zone is vested in the State. The Coastal Erosion Management Master Plan is an integral part of the Coastal Zone Management Plan. The CCA calls for periodic revisions of the national CZMP.

The CCD's mandate is to help co-ordinate the sectoral activities of the other agencies with jurisdiction over coastal areas and resources. While there are as many as 32 different governmental agencies with jurisdiction over activities affecting coastal resources and coastal areas, the agencies with significant coastal jurisdiction include the Department of Fisheries and Aquatic Resources, Urban Development Authority, Irrigation Department, Central Environmental Authority and the Ceylon Tourist Board. Other more specialized, development-oriented agencies operating in the coastal zone include the Sri Lanka Ports Authority, the Sri Lanka Land Reclamation and Development Corporation, Ceylon Fisheries Harbours Corporation, National Drainage and Water Supply Board and the Board of Investment of Sri Lanka.

The CCAC is primarily responsible for reviewing the CZMP and the Environmental Impact Assessments undertaken. It also reviews variance applications for coastal development, and can, if it considers appropriate, approve the grant of permits on applications earlier rejected by the CCD.

In 1988, the CCA was amended in response to the growing threat posed by coral mining. The Coast Conservation (Amendment) Act No. 64 of 1988 prohibits engaging in the mining, collecting, processing, possessing, storing, burning and transporting—in any form whatever—of coral within the coastal zone. A complete ban on coral mining, except for research purposes, was imposed. However, without the support of broader measures to provide alternative means of livelihood for people traditionally dependent on coral mining, this remains a complex issue.

The other initiatives in coastal management in Sri Lanka are the Special Area Management (SAM) Projects currently under way in two areas, the Hikkaduwa Marine Sanctuary and the Rekawa Lagoon. These projects aim at facilitating resource management within a defined geographical setting and with defined user groups.

The CCD receives substantial support from foreign donor agencies, primarily from the US, Germany and Denmark, for coastal zone management.

Shortcomings in the Act and in its Implementation

A fundamental problem relates to the narrow, geographic definition of the coastal zone proposed by the Act. Most of Sri Lanka's coastal habitats, including mangroves, salt marshes, wetlands, seagrass beds and estuaries, are located outside the coastal zone, as defined by the CCA. This hampers the CCD's ability to initiate integrated management plans for geographically specific areas.

Further, there is provision to regulate only development activity that alters the physical nature of the coastal zone. This explicitly excludes activities that could impact on the environmental quality of the coastal zone, such as industrial pollution in inland areas. Similarly, the CCD does not have the mandate to co-ordinate the activities of agencies with jurisdiction outside the coastal zone, even if their activities have a direct bearing on the coastal ecosystem

Sri Lanka's coastal programme thus defines the physical boundaries of the coastal zone and provides for its protection. It can not be termed as an integrated coastal resources management plan which includes the management of coastal resources, such as fisheries and forests.

There have also been problems in the implementation of the Act.

- Although the CCD is expected to undertake several activities, including regulation, development, research, co-ordination and education, it concentrates primarily on coastal erosion management and regulation of development along the shorefront through the permit system. The CCD's approach is essentially reactive, responding to critical problems in the coastal zone. The staffing pattern within the CCD reflects this approach. Within the CCD, the engineering division, responsible for design, construction and maintenance of coast protection works, predominates. The Planning Division of the CCD, responsible for coastal resource assessment, regulation and management, is insufficiently staffed.
- Enforcement and monitoring actions and capacity of the CCD have generally been weak. Since 1983, 95 per cent of all applications for permits have been cleared. Enforcement of permit conditions and actions against violations have been poor. For instance, even though beaches are recognized as state-owned lands, the CCD has failed to take action against illegal encroachment of beach tracts in some areas, especially by hotels and tourist resorts. This has led to user conflicts. The CCD has also faced political interference, especially in enforcement of the ban on coral and sand mining.
- Even though the CCA provides for the delegation of powers and functions to district governments, in practice, the permit system is highly centralized. It was only after 1991 that the authority for issuing minor coastal development permits was delegated to local authorities under Section 5 of the Coast Conservation Act (CCA). Public participation in coastal zone planning has so far been limited.
- Also, while the participation of the general public and of NGO's is envisaged in EIA procedures, it is often only after the project has been completed that the public is informed of the EIA and its findings.
- Jurisdiction over coastal areas and resources is scattered between different agencies and there is a lack of strong inter-agency co-ordination mechanisms. For example, fisheries have suffered from the coastal wetlands reclamation projects undertaken by the Land Reclamation and Development Corporation.

Thus, while coastal management has been recognized as a priority and several initiatives have been undertaken in Sri Lanka, lacunae exist both in the legislation and in its implementation.

Some suggestions to strengthen Sri Lanka's coastal management initiatives have been put forth. These include:

- Narrow geographic definition of the coastal zone must be broadened to recognise the interconnections within coastal ecosystems and resources.

- Single agency and sectoral approaches to solving coastal resources management problems in Sri Lanka must be replaced by a more comprehensive perspective and co-ordinated approach.
- Coastal management initiatives should be proactive rather than reactive and regulatory, and should also focus on the development of important coastal resources, such as fisheries.
- Participation of local and provincial officials and coastal communities in the formulation and implementation of plans and strategies must be strengthened.

Sri Lanka is now preparing a second-generation programme which is intended to address coastal issues that were not addressed under the earlier coastal management initiatives. The Cabinet of Ministers, in 1994, approved policies promoting a broader and more integrated coastal resource management system proposed in Coastal 2000: Recommendations for a Resource Management Strategy for Sri Lanka's Coastal Region (Olson et al 1992). The second generation programme calls for a broader perspective of coastal zone management in terms of objectives, range of geographic areas and participating agencies. There will be a greater emphasis on Special Area Management Projects, where resource management issues can be addressed in a holistic, integrated manner, within a demarcated geographical area. It appears, also, that greater community participation will be sought through the Special Area Management planning process.

Other Relevant Legislation

There are several other laws that complement the CCA in coastal areas. These include:

1. The National Aquatic Resources, Research and Development Agency Act No. 54 of 1981 which establishes the National Aquatic Resources Agency (NARA). NARA seeks to ensure the application of science and technology to aquatic resources in inland waters, coastal wetlands and offshore areas, disseminate information and provide advisory functions. NARA has a co-ordinative role over all aquatic resources and institutions engaged in the above, but it does not have a specifically regulatory function.
2. The Natural Resources Energy and Science Authority of Sri Lanka Act No. 78 of 1981: This law provides for the establishment of the Natural Resources Energy and Science Authority (NARESA), whose main function is to advise on governance, management and direction of plans for exploitation and development of natural resources.
3. The Fisheries and Aquatic Resources Act No. 2 of 1996: This Act also calls for the establishment of a Fisheries and Aquatic Resources Advisory Council (FARAC), which includes the Director of CCD, Chairman of CEA, two representatives from fishing co-operatives and two representatives of women from fishing communities. There is also a provision for the inclusion of two representatives from the fish export sector. This council has the task of advising the Minister on all matters related to management, regulation, conservation and development of fisheries and aquatic resources. The Act also provides for the establishment of Fisheries Committees (FCs), the functions of which include formulating a fisheries programme for its area and implementing that programme.
4. The Urban Development Authority Law No 41 of 1978 and its Amendment in 1982: This Act established the Urban Development Authority (UDA). It promotes integrated planning of areas declared to be urban development areas. The act can complement the CCD in the preparation of land use plans for urban areas in the coastal zone.

5. The National Environmental Act No 47 of 1980 and 56 of 1988: This Act provides for the establishment of a Central Environmental Authority (CEA) with powers to protect, manage and enhance environmental quality and to prevent and control pollution.
6. The Board of Investment (BOI) of Sri Lanka seeks to foster economic development by encouraging foreign investment and the establishment of industrial and commercial enterprises in Sri Lanka.
7. The Sri Lanka Land Reclamation and Development Corporation (LRDC) Act provides for the reclamation and development of low-lying marshy and waste lands and swamp areas declared by the Minister as Reclamation and Development areas. (The CCD has minimal influence over the activities of the BOI and LRDC outside of the coastal zone, even if these have a direct impact on the health of the coastal ecosystem.)
8. The 13th Amendment to the Constitution provides for the establishment of Provincial Councils (PCs) and for the devolution of powers and functions to the Provinces. Although matters related to coasts and coast conservation are not explicitly devolved to the PCs and are assumed to be a reserved subject for the Central Government, all enforcement and economic activity within the coastal belt of a province would come under the purview of the PC or the local authority of the area. This calls for a co-ordination mechanism between the CCD and the PCs.

Other laws relevant to coastal resources in Sri Lanka include:

- The Seashore Protection Ordinance 1979, which bans the removal of coral sand and other substances;
- The Natural Heritage and Wilderness Act 1980, and its amendment of 1988;
- The Fauna and Flora Protection Ordinance N.o 2 of 1937, and its amendments of 1937,1938, 1970 and 1972;
- The Marine Pollution Prevention Act No. 59 of 1981 which authorizes the Marine Pollution Prevention Authority to prevent, reduce and control the pollution of Sri Lankan waters;
- The Tourist Development Act No. 14 of 1968 and the Specified Tourist Services Code 1984 which provides for the classification, registration and regulation of all tourism-related establishments.

Sri Lanka is party to the United Nations Convention on the Law of the Sea (UNCLOS), the Convention on Biological Diversity (CBD), Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the International Convention on Civil Liability for Oil Pollution Damage (CLC), Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. It has not, however, ratified the articles of association of the International Convention for the Prevention of Pollution from Ships (MARPOL 1973/78).

INDIA

With a long coastline of over 8000 km, India has a variety of natural coastal ecosystems. The eastern coast is low-lying, with lagoons, marshes, beaches and deltas, while the western coast is dominated by rocky shores. The islands of Lakshadweep are composed of atolls (as in the

Maldives), while the Andaman and Nicobar islands are volcanic in origin, arising from a submerged mountain chain.

The coastal areas are productive and rich in natural resources. They support a significant proportion of India's population as well as several important urban centres and ports. Coastal resources and natural habitats are, however, showing visible signs of strain and degradation. Among the important factors responsible for this are pollution from land- as well as water-based sources and the competing, often conflicting, demands placed on coastal resources by different sectors.

The fisheries sector has also contributed to this situation, even as it has had to bear the consequences. Although this sector contributes only a single per cent to India's GDP, it plays an important role in providing food, employment and income, especially to traditional, artisanal fishing communities and coastal populations, among the most economically marginalized sections of Indian society. It is estimated that there are 8 million fisherpeople in the country. Small- scale coastal fisheries presently account for about 80 per cent of total marine fish production. The very livelihood and food security of this segment is currently under threat as coastal resources are degraded and overexploited.

Threats to the Coastal Environment

Some important factors contribute to coastal degradation.

Pollution

The coastal waters off the Indian coast are exposed to pollution from various sources - inland, coastal, offshore and atmospheric. Pollutants from inland areas find their way to coastal waters through rivers and streams. The main pollutants include:

Industrial wastes

In India, few industries possess effluent treatment plants. Among the coastal States, industrial pollution is high in West Bengal, Tamil Nadu, Gujarat, Maharashtra and Andhra Pradesh. In addition, atmospheric and other pollutants from non-coastal Indian States are also washed into coastal waters. Polluting industries include leather tanneries, textiles, chemical and allied industries as well as marine products processing industries. The mining industry also contributes to pollution of coastal waters as, for example, off the coasts of Goa and Orissa.

Sewage

Sewage from inland and coastal urban centres is dumped directly into coastal waters or indirectly through rivers. Excessive nutrients from discharged sewage leads to eutrophication of waters, a decline in photosynthetic activity and a reduction of dissolved oxygen. Negative effects are especially evident in estuaries and creeks near cities, as in the Mahim area off Bombay.

Agriculture

The 'Green Revolution' in India has facilitated the increased use of fertilizers and pesticides in agricultural operations. Use of fertilizers and pesticides is especially high in the non-coastal States of Punjab and Haryana and in the coastal States of Andhra Pradesh, Maharashtra and Tamil Nadu.

Oil pollution

Pollution due to oil exploration and mining, oil refining, oil transportation, oil spills and bilge discharge from ships and fishing trawlers, as well as from petrochemical industries, is also present in some regions, for instance, in Tamil Nadu, Gujarat, Andaman and Nicobar and the Lakshadweep islands. The Arabian Sea oil tanker route which runs close to India, exposes the

Indian coastline to oil spills from tanker accidents. An oil spill near the Nicobaf island in 1993 resulted in an estimated loss of Rs. 15 crores (US \$ 5.25 million) to the fisheries sector alone.

Pollution has been responsible for the eutrophication of lakes and coastal waters. Reports of fish kills and contamination of fish in inshore areas, decline in fish productivity and the collapse of some fisheries, as in Tamil Nadu and Orissa, indicate the extent of pollution. Fish production in Kolleru lake, a freshwater lake in Andhra Pradesh, has been affected as a consequence of the high use of fertilizers and pesticides in its drainage area. Significantly, Andhra Pradesh uses a third of the total amount of fertilizers used in India. Pollution has affected breeding grounds and new recruitment in the coastal waters off India. Bacterial pollution and pesticide residues ' have been reportedly found in fish and shellfish from, for instance, the inshore waters off Tamil Nadu. In the recent past, shipments of contaminated shrimp have been returned from Japan and Europe.

While pollution is, in most cases, highly detrimental to fisheries, in some instances, fish production actually increases as nutrient levels in the water increase. For example, between 1960 and 1980, fish production reportedly doubled in the outer zone of the Hugli estuary, considered one of the most polluted in the world.

Siltation

Increased siltation and sedimentation of coastal water is a consequence of deforestation, mining and inappropriate agricultural practices in upstream and coastal areas. This results in turbidity of coastal waters, and reduced light penetration and photosynthetic activity. The productivity and growth of fish and coral reefs is also affected. At the same time, mangrove habitats, lagoons, estuaries and lakes become shallower as they get silted up. The Chilika lake in Orissa, the largest brackishwater lake in Asia, is shrinking due to siltation. The closure of its mouth with silt deposits has resulted in salinity decline, affecting both fish growth and species composition in the lake. Siltation, in combination with pollution/has been detrimental to deposits of pearls and 'chanks', seagrass beds and coral reefs, off the coast of Tamil Nadu.

Coastal Erosion

The Indian coastline, for instance, along the coasts of the western States of Kerala and Karnataka, is vulnerable to erosion. The construction of inappropriately designed coastal protection structures such as seawalls has, in many cases, aggravated the problem.

Dredging

Dredging for harbour construction and land reclamation is reported to be detrimental to the benthic ecosystem. It disturbs the bottom substrata and leads to turbidity, increased nutrient levels in the water column and reduction of dissolved oxygen levels. The impact on fish growth and productivity is significant. The dredging of navigational channels along some ports of Kerala, for instance, has proved detrimental to the coastal ecosystem.

Construction of Dams and Groundwater Mining

Several dams have been constructed in India in the post-Independence period, primarily for irrigation and generation of hydroelectric power. Diversion of water for irrigation has reduced supply of fresh water to lakes and coastal areas. The resultant salinity increase has affected the growth of mangrove forests along the coasts of India, as in West Bengal and Tamil Nadu. Construction of dams has also obstructed the movement and migration of migratory fish species for breeding and feeding. Species such as Hilsa, carp and mullets have been affected.

The excessive withdrawal of ground water in coastal areas for, among other things, agriculture, industry, tourism, aquaculture and urban uses has been responsible for salinity ingress.

Degradation and Destruction of Natural Habitats

Natural coastal habitats, such as mangrove forests, coral reefs and seagrass beds are being degraded. The destruction of mangrove forests has been due to several factors. Important among these are conversion of mangrove areas to aquaculture sites, the use of mangroves as timber and fuelwood, land reclamation, the destructive impact of the salt industry, and natural disasters such as tidal waves. In Andhra Pradesh, for instance, almost half the area developed for aquaculture has been at the cost of clearing mangroves for pond construction. It is reported that shrimp farming has destroyed thousands of acres of mangrove forests in Guntur and Nellore districts. Mangroves in Gujarat have been damaged by the salt industry and by collection of fuelwood for sale. To deal with the situation, the Government of India constituted a National Mangrove Committee for mangrove research and development under the Department of Environment in 1979.

Coral reef formations off mainland India near Gujarat and Tamil Nadu are similarly degraded. They have been heavily exploited for saleable products and affected by sedimentation, pollution and tidal wave action. Mining of coral for use in the cement industry was common in earlier decades, as was the use of corals for road construction in the Andamans. Reportedly, illegal mining of coral in the Tuticorin area continues.

The degradation of natural coastal habitats has had an impact on fish recruitment since these areas serve as natural spawning and breeding grounds.

Aquaculture

There has been a rapid growth in coastal aquaculture in recent years. Several environmental consequences have been reported from areas where aquaculture is practised, including salinity ingress, decline in the quality of land, surface and ground water due to discharge of pollutants from aquaculture ponds, destruction of mangroves and decline in catches of shrimp and fish. Since hatchery production of fingerlings and availability of quality seed for the aquaculture industry are inadequate, dependence on wild seed continues. Destructive and wasteful practices employed for the collection of shrimp fry have affected the yield of natural prawn and other fish species in coastal waters and have damaged mangrove forests. Moreover, removal of gravid females from the wild also leads to depletion of wild stocks of tiger prawns, adversely affecting the catch potential of marine prawn fisheries.

As a consequence, aquaculture faces considerable opposition from agrarian and coastal communities on environmental and socioeconomic grounds. In response to a recent Public Interest Litigation, the Supreme Court of India has temporarily banned the establishment of new shrimp farms.

Overfishing and Destructive Fishing Practices

It is estimated that almost all important species in the Indian coastal waters show signs of overfishing. Lobster fisheries, for instance, collapsed after the boom of the 1970s. The Indian sand whiting and Gangetic whiting stocks off Orissa and West Bengal also show signs of over fishing. In Lakshwadeep, baitfish have been overexploited to meet the demands of the tuna fishery.

The use of destructive and overefficient fishing gear and technology such as trawling and purse seining, besides stimulating conflicts between the artisanal and mechanized sectors, have contributed to overexploitibn of fish stocks in Indian waters. These technologies are reported to damage the marine ecosystem. They have also been accused of being highly wasteful. High rates of by-catch have been reported. The use of bag-nets in estuaries and push-nets in coastal waters also contributes to the indiscriminate harvesting of juveniles. Other destructive fishing

practices include the use of dynamite and poison by some fishers. These methods are also employed by the nascent aquarium fish trade industry in India.

Tourism

The burgeoning tourism sector in coastal India has also contributed to coastal degradation through discharge of untreated sewage and excessive withdrawal of ground water. The takeover of beach space by tourist resorts has interfered with the pre-harvesting, harvesting and post-harvesting activities of traditional fishworkers.

Coastal Area Management Initiatives

Concern about environmental degradation of coastal areas prompted the Ministry of Environment and Forests to issue Environmental Guidelines for Development of Beaches and to advise States to prepare Master Plans for the development of coastal stretches. The document proposed Environmental Impact Assessment (EIA) procedures to gauge the potential impact of activities that have direct impact on coastal land-sea interface area and its hinterland. Significantly, the document recognizes that 'direct impact' on the coastal ecosystem could be experienced as a consequence of activities even in hinterland areas, and that, therefore, it is not prudent to restrict the EIA to activities within a geographically defined coastal stretch.

In 1991, the Ministry of Environment and Forests, Government of India issued a Notification under the Environment (Protection) Act, declaring coastal stretches as Coastal Regulations Zone (CRZ) and regulating activities within them. The provisions of this are to be implemented through coastal States and Union Territories. The institution of an authority at the State level, responsible for enforcement and monitoring of provisions under the notification, is also envisaged.

The Act defines the coastal stretches of seas, bays, estuaries, creeks, rivers and backwaters which are influenced by tidal action, in the landward side, upto 500 m from the High Tide Line (HTL) and the land between the Low Tide Line (LTL) and HTL, as the CRZ. It also specifies that the distance from the HTL shall apply to both sides of rivers, creeks and backwaters that are influenced by tidal action, and shall not be less than 100 metres or the width of the creek, river, or backwater, whichever is less. Significantly, mangroves, coral reefs and areas close to spawning and breeding grounds of fish and other marine life, areas which technically fall outside the coastal zone, as defined by the Notification, have explicitly been referred to as 'ecologically sensitive areas' requiring protection.

The CRZ has been classified into four categories for the purpose of regulating development activities. CRZ-I includes areas that are ecologically sensitive as well as the area between the HTL and the LTL. CRZ-II includes areas that have already been developed up to or close to the shoreline. CRZ-III includes areas that are relatively undisturbed and those which do not belong to either Category I or II. CRZ-IV includes coastal stretches in islands. This approach is quite unique in that it takes into account current development reality, and then tries to regulate further development.

Norms regulating development and construction activities within the CRZ have been specified, with maximum restrictions applying to the ecologically sensitive areas of CRZ-I. Certain activities are completely prohibited within the CRZ, including the establishment and expansion of existing industries, manufacturing, handling or disposal of hazardous substances, dumping of city or town wastes, land reclamation and embankment building, dumping ash or wastes from thermal power stations, and mining of sands, rocks and substrata. Significantly, it has been specified that in CRZ-III, construction/reconstruction of dwelling units between 200-500 m of the HTL will be permitted, so long as it is within the ambit of traditional rights and customary uses, such as existing fishing villages and *goathans*.

Harvesting or drawing of ground water within 200 m. of the HTL is prohibited. Between 200 m. and 500 m., only manual withdrawal of groundwater for purposes of drinking, horticulture, agriculture and fisheries, is allowed. Through a later amendment, the tourist sector has also been allowed to tap groundwater in this zone with the concurrence of the Central/State Ground Water Boards. The Notification specifies that activities that require waterfront and foreshore facilities will be given clearance. It also specifies that construction necessary for defence purposes, for ports, harbours and light houses, and foreshore facilities for thermal power plants, will be permitted, after environmental clearance from the Ministry of Environment and Forests.

The Notification thus attempts to prevent uncontrolled and environmentally harmful development through various methods:

- (a) Several industrial and construction activities are completely prohibited.
- (b) Some activities require environmental clearance by appropriate authorities before they are permitted in the regulation zone.
- (c) Specific rules applying to construction and development in the CRZ have been formulated.

Shortcomings in the Notification and in its Implementation

The Notification, however, represents only a preliminary step in the direction of coastal management. There are several concerns on the Notification.

- The Notification aims only at regulating activities in a narrow, geographically defined, coastal strip. In doing so, it fails to recognize the links between activities in inland and offshore areas which affect the coastal environment in a significant way. In fact, its predecessor, the Environmental Guidelines for the Development of Beaches, is better since it recognizes the influence of activities in hinterland areas on coastal zones.
- It completely lacks a seaward component and ignores the need to regulate developmental activities in inshore coastal areas.
- While it recognizes the need for a Coastal Zone Authority at the State level, it fails to make provision for stakeholder and public representation in this body. Also, while some of the draft State Plans envisage the formulation of coastal management plans at the district level, there is no attempt to make linkages with the Panchayati Raj Act and to decentralize planning and implementation to the panchayat level.
- The Notification is primarily regulatory in nature and lacks a proactive focus.
- The mining of rare earths in coastal areas, a highly destructive activity from an environmental perspective, is not regulated.

There are also problems with the implementation of the provisions of the Notification. It has been specified that coastal States and Union Territories should, within one year, prepare CZM plans classifying CRZ areas within their territories. Regulations were also later passed on Coastal Area Classification and Development.

However, failure of the States to formulate CZM plans in the said period prompted an NGO, the Indian Council for Enviro-legal Action, to file a writ petition in the Supreme Court. The petition sought the court's intervention in directing the States to comply with the Notification, and requested that an independent CZM authority proposed under the Notification, for

co-ordination, monitoring and supervising activities, be established. The Supreme Court ordered the setting up of coastal zone management authorities at the Central and State levels and the speedy formulation and enforcement of coastal zone management plans.

In response to the Supreme Court directive, preliminary Coastal Management Plans have been prepared by the Governments of West Bengal, Kerala, Gujarat, Tamil Nadu, Orissa, Karnataka, Maharashtra, Andhra Pradesh, Lakshadweep, and Andaman and Nicobar islands. All these plans classify coastal stretches according to the zoning guidelines proposed by the CRZ Notification. They are primarily zoning rather than management plans.

However, the classification of CRZ areas by State governments is being questioned. It is being alleged that the classification of CRZ areas has been prompted by economic and industrial interests, so that even areas that are ecologically sensitive and fragile have been classified as CRZ-II or CRZ-III.

From the fisheries perspective, some of the provisions of the Notification, if well implemented, can be of benefit. The prohibition or regulation of certain harmful development and construction activities within the CRZ (mentioned above) is likely to improve the quality of coastal waters and the preservation of natural coastal ecosystems, such as mangroves and coral reefs, which are important spawning and breeding grounds for fish.

The Notification also specifically allows activities that require waterfront facilities, such as jetties and boat yards, which benefit fishworkers. However, ice plants and fish processing plants are not permitted. This may adversely affect the interests of fishworkers in the processing sector. There is also a concern that fishing communities may lose their right to build, repair, consolidate or expand their homesteads, and to otherwise commercialize their spaces, especially in ecologically sensitive areas (CRZ-I).

While progress on Coastal Area Management is still tardy at the national and state levels, there is evidence that local groups are recognizing, and taking action on, coastal environmental issues. The recent protest by thousands of fisherpeople of Dakshina Kannada District, State of Karnataka, against the proposed discharge of effluent by Mangalore Refinery and Petrochemical Ltd. (MRPL) into coastal waters, is a case in point. Coastal waters and fisheries in the area are already under stress due to effluent discharges from other small industries. Pollution reduces the supply of fish by killing them or by rendering them toxic and unfit for human consumption. The protestors were successful in that, through a Government Order (GO), the MRPL has been directed to install effluent treatment facilities. MRPL has asked for a grace period of two years to comply with the order. The possibility of the sea being used as a dumping ground until such a plant is installed, however, remains.

Other Relevant Legislation

Legislation that bear on the coastal zone include:

- The Environment Protection Act, 1986. This is an umbrella legislation which provides a framework for co-ordination by the central government of activities under the Water and Air Acts. State and central Pollution Control Boards have been constituted under these three acts.
- Merchant Shipping Act, 1964 deals with pollution caused by ships and tankers. It has been recently amended in keeping with guidelines under MARPOL 1973/78.
- Wildlife Protection Act, 1972 provides for the protection of a number of species, including marine species, and for the establishment of protected areas.

- Indian Forest Act, 1927
- Forest Conservation Act, 1980
- The Water (Prevention and Control of Pollution) Act, 1974
- The Air (Prevention and Control of Pollution) Act, 1981
- Panchayati Raj Act

Two new Acts are under consideration, i.e. the Conservation of Biological Diversity Act and the Conservation of Forests and Other Ecosystems Act.

Agencies with jurisdiction over the coastal zone include those related to environment, agriculture, fishery, labour, transport, energy, industry, mining, local government, public works, and town and country planning.

India is party to various international conventions, such as the Convention on Biological Diversity (CBD), the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the International Convention on Civil Liability for Oil Pollution Damage (CLC), Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. It has not, however, ratified the articles of association of the United Nations Convention on the Law of the Sea (UNCLOS).

BANGLADESH

Bangladesh, landlocked on three sides, is washed by the Bay of Bengal on the south. Most of the country is low-lying and the influence of the sea is felt even in inland areas. Bangladesh is highly vulnerable to cyclonic storms and tidal waves which form over the Bay of Bengal. The bay acts as a giant funnel for storm events. The 480 km. Bangladesh coastline is dominated by mangrove and estuarine ecosystems. In fact, the country has one of the largest mangrove tracts in the world.

The Western coast of Bangladesh is covered with relatively dense mangrove forests. There is heavy sediment deposit in the central region. Here, the coastline is dynamic, subject to continuous processes of erosion and accretion. It is fragmented and consists of a series of islands formed by sediment deposits. The central part is also very vulnerable to cyclones and storm surges. The Eastern coast is regular and unbroken, protected by mudflats and submerged sands.

In recent years, coastal management issues have assumed importance in Bangladesh, as its fertile coastal areas show evident signs of degradation and as the country becomes increasingly vulnerable to tropical storms and cyclones. Among other things, this has been a consequence of land- and water-based pollution as well as the degradation of natural habitats like mangroves and coral reefs.

While the fishery sector has, in some ways, contributed to the degradation of the marine environment, it has also had to bear the consequences. This is a matter of some concern, given the important role that this sector plays in Bangladesh's economy. With a contribution of about 80 per cent to the national animal protein intake, fish continues to be the most accessible source of animal protein for a majority of the population. The sector also plays a vital role in terms of providing jobs and income. The fishery sector contributes to nearly 3 per cent of the country's GDP and 11 per cent of its total export earnings. It has been estimated, however, that per capita

fish production in Bangladesh in 1984/85 was 65 per cent of that in 1972/73. This has critical implications for a nation where fish is important, both nutritionally and culturally.

As compared to the other countries in the South Asian region, there are certain unique characteristics of the fisheries in Bangladesh. Inland fisheries contribute more than 50 per cent to total fish production. Low lying coastal areas in the country have historically been exposed to a pattern of seasonal flooding in the monsoon followed by a dry season. A majority of finfish species as well as several species of inland water prawns inhabiting rivers and flood plains, lakes and estuaries, have been adapted to these changes. However, the catch from inland fisheries has been declining due to changes in such natural hydrological systems, a consequence of extensive flood control and coastal protection works and the inefficient management of public water bodies.

Small-scale and subsistence-level fishers active in estuarine and nearshore fisheries also play a crucial role. While data on the inshore and estuarine fishery sector is scarce, it is estimated that as much as 90 to 95 per cent of Bangladesh's marine fishery production is contributed by this sector. Offshore trawl fishing, primarily targeted at shrimp species, became popular only in the late 1970s.

Threats to the Coastal Environment

Factors that have contributed to coastal degradation in Bangladesh, and their impact on its fisheries, are:

Pollution

The numerous rivers that run across the country carry pollutants from the entire drainage area, which encompasses not only Bangladesh but also parts of Nepal, India, Bhutan and China. Pollutants include municipal and industrial wastes, agrochemical residues and pollutant discharges from ships and boats.

Industrial pollutants

Although Bangladesh is not an industrialized country, in recent years industrial growth has had a significant environmental impact. Few industries possess facilities for effluent treatment: untreated effluents ultimately find their way into coastal waters, especially since most industries are located along the banks of rivers. Major polluting industries include textiles, steel, asbestos, leather tanneries, pharmaceuticals, fertilizers, insecticides and pesticides. Pollutant levels from the ship breaking industry are also high. Concentration of industries is highest around Dhaka, Narayanganj and Ghorashal in central Bangladesh, Chittagong in the west and Khulna in the east. Pollutants discharged by these industries include urea, ammonia, chromium, mercury and phenols.

Municipal wastes

With the sole exception of Dhaka, cities and urban settlements in Bangladesh lack domestic waste treatment facilities. Untreated effluents find their way into the Bay of Bengal.

Agriculture

Large quantities of fertilizers and pesticides are used in agricultural operations in Bangladesh. It is also believed that agrochemical pollutants from Nepal and India are washed down through shared rivers. The Department of Environment, in conjunction with the Plant Protection Department, has been attempting to restrict the use of insecticides in the country.

Oil pollution

Oil spills and oily substances are common in coastal waters, as a result of tanker traffic and transshipment operations in the Chittagong and Mongla port areas, as a result of urban activities

as well as of the activities of seagoing vessels and oil tankers that pass through the upper portions of the Bay of Bengal. Oil pollution is damaging to the mangrove ecosystem. It also has a qualitative and quantitative impact on coastal and marine fisheries and on fish productivity. Thin layers of oil on water surfaces hamper light penetration and photosynthesis, as well as air-sea gas interaction.

Though no systematic study on the overall impact of pollution on aquatic life has been undertaken, cases of fish kills reported in recent years as a consequence of industrial activity, are indicative. In general, it is observed that estuarine fish species are more contaminated than species near the coast or in the open sea.

Destruction of Natural Habitats

At present, the only surviving dense tract of mangroves in the country is limited to the western coast. This is a matter of concern, given Bangladesh's vulnerability to cyclonic storms and tidal waves, and the vital role mangroves play in affording protection against these natural disasters. Destruction of mangroves in Bangladesh has been a consequence of several factors, importantly, the conversion of mangrove sites for aquaculture, felling of mangroves for fuelwood and timber, as well as the destruction wreaked by storms, cyclones and tidal waves. The construction of dykes, embankments and hydraulic sluices for control of floods and tidal waves, damming of rivers for irrigation and power generation and the diversion of channels, have also had a significant impact on freshwater and sediment supplies for mangrove forests. The resultant salinity increase has affected mangrove growth.

The only coral reef island in Bangladesh, Saint Martin, is threatened by sedimentation, cyclones and storm surges, destructive fishing methods, coral mining and pollution.

Destruction of mangroves and coral reefs has also had an impact on the fishery sector, since these habitats provide important nursery and breeding grounds for numerous fish and wildlife resources. This has affected fish recruitment, as well as the quantity, diversity and quality of fish production.

Aquaculture

The rapid, irrational and unplanned growth of shrimp aquaculture has often been at the cost of mangroves. The once dense mangrove tract on the east coast - the Chakaria Sunderbans in Chittagong District - has been decimated. In the post-1977 period, over half the mangroves in this area were cleared for preparation of shrimp ponds. At present, a majority of shrimp farms are located in the still dense, remaining mangrove areas on the west coast (Bagerhat, Satkhira and Khulna areas). There is currently no legislation to control the aquaculture of shrimps.

The growth of shrimp aquaculture in coastal brackishwater areas has also been responsible for pollution and environmental degradation in coastal and inshore areas. Given the paucity of shrimp hatcheries, shrimp fry is collected from estuarine and nearshore waters by thousands of fisherfolk. Bag-nets and push-nets made of nylon mosquito nets are commonly used by collectors to catch the wild fry. As a consequence, larvae of many other non-target species, as well as plenty of zooplanktons, are also caught. While the 'bagda' shrimp fry is retained, all other catch is discarded, causing great harm to other valuable species. It has been estimated that to catch a single 'bagda' shrimp fry, 14 other shrimp and 21 finfish post-larvae as well as 1,600 other zooplanktons are wasted. Not surprisingly, it is commonly claimed that the availability of shrimp and finfish fry is declining. Indiscriminate collection of shrimp fry also damages the nursery grounds of many species and harms newly afforested mangrove sites.

Moreover, coastal embankments are often breached for aquacultural operations, not only making water management in polders more difficult, but also increasing the vulnerability of coastal areas to natural disasters.

Construction of Dams and Embankments

The construction of dams has been instrumental in obstructing the free movement, and migration, of anadromous and catadromous fish species for breeding and feeding. This has affected freshwater species such as carp, as well as estuarine and marine species such as mullet, 'hilsa' and freshwater prawns, which live in both environments during the different phases of their life. It is, therefore, not surprising that the hilsa fishery both in Bangladesh and India has declined due to the blockage of its upstream migration path by the Farakka Barrage. It is estimated that the availability of hilsa declined by as much as 99 per cent

It has been estimated that flood control and drainage projects have removed 2.1 million ha. of flood lands from fishery production. Flood control structures, coastal embankments, etc. have interfered with natural hydrological systems. These structures, by preventing flooding in intertidal areas, have removed natural nursery grounds for fish and shrimp juveniles, leading to depletion of fish production and a loss of biodiversity in the open-water fisheries of Bangladesh. Also, the indiscriminate use of groundwater for irrigation has lowered the water table and, in many cases, has led to salinity ingress.

Natural Disasters

Bangladesh is highly vulnerable to cyclonic storms, tidal wave activity and floods. Besides the huge losses to life, property and natural habitats caused by such natural calamities, they also often lead to the inundation of freshwater ponds and canals with saline water, affecting freshwater fish.

Siltation

The high sedimentation load in rivers is a consequence of increased erosion in the Himalayas and Assam hills, frequent floods as well as the increased erosion of topsoil due to coastal and inland deforestation and depletion of vegetation. Construction of embankments and earthworks, undertaken as a part of coastal development projects, are also believed to interfere with the natural patterns of siltation. This has resulted in the siltation of inshore waters, habitat degradation—especially of the benthic region—high turbidity and reduced penetration of light.

Overfishing and Use of Destructive Fishing Methods

The use of the fixed set bag-nets popular with artisanal fishers in coastal and estuarine brackishwater areas has been identified as an environmentally damaging practice, due to the small mesh size employed at the cod end, as a result of which juveniles and undersized shrimp and finfish as well as planktonic shrimp are caught. As a consequence, practices related to the discarding of non-target species, as well as of the smaller sizes of target species, are common. Shrimp trawlers operating in offshore waters are also known to discard large volumes of non-target species such as finfish. Only quality finfish are retained, while all others are dumped overboard as trash fish.

Coastal Area Management Initiatives

Bangladesh has no legislation specific to coastal area management. Although there is a coastal environment management plan, currently this has no legal status.

The Department of Environment (DOE), under the newly formed Ministry of Environment and Forests, is the main government institution responsible for all environmental planning, management and monitoring, including those relating to the marine sector. Overall

co-ordination on environmental issues is the responsibility of the DOE. It also works as the technical arm of the Ministry of Environment and Forests.

The National Conservation Strategy, adopted by Bangladesh in 1987, identified the following ecosystems as important: Coastal Zones, Hill Forests, the Sunderbans and Wetlands. In 1992, a National Environment Policy was adopted along with an Environmental Action Plan. This policy addresses, to some extent, issues related to the marine environment. In the monitoring, control and prevention of coastal and marine environmental problems, the Action Plan envisages the involvement of the Ministry of Environment and Forests, Ministry of Land, Ministry of Shipping and the Ministry of Defence.

A National Environment Management Action Plan (NEMAP) has also been formulated to address environment issues in an integrated manner. The plan builds on the general principles set out in the National Environment Policy. A participatory approach was adopted in developing it. NEMAP identifies the management of coastal and marine resources as an important issue calling for appropriate action.

In 1995, the Environment Conservation Act (ECA) was passed. This has yet to come into force. The ECA is a cross-sectoral legislation and provides for the establishment of a new Department of Environment (DOE). The Department, under a Director General (DG), will have broad powers to control all activities which affect the environment. The Act also recognizes the public right of any person affected by pollution or environmental degradation to appeal to the DG for corrective action. He may, if he deems it necessary, call a public hearing for the purpose. The Act also makes it necessary for any industrial unit or project to obtain environmental clearance. The Protection of the Marine Environment Act of Bangladesh drafted in 1984 and redrafted in 1990, has yet to come into force.

Other Relevant Legislation

According to a study by the International Union for the Conservation of Nature (IUCN), Bangladesh has about 45 laws on different areas that have a bearing on environmental issues, including those related to coastal and marine environment and resources. However, there are no specific standards and enforcement mechanisms. There is, as yet, no appropriate and comprehensive legislation for the protection of the country's marine environment and related ecosystems. The principal legislation dealing with control and prevention of environmental pollution is the Environmental Pollution Control Ordinance of 1977. This, however, does not deal with marine environmental pollution or pollution caused by ships.

Laws related directly or indirectly to coastal and marine environmental protection and resource development are:

- Territorial Waters and Maritime Zone Act, 1974 and the rules formed under this Act in 1977, for the management of maritime activities within territorial waters;
- Environment Pollution Control Ordinance, 1977;
- Marine Fisheries Ordinance, 1983;
- East Bengal Protection and Conservation of Fish Act, 1950;
- Petroleum Act, 1934, to regulate petroleum exploitation in the offshore areas;
- Pesticide Ordinance, 1971 (amended in 1980 and 1983);

- Water Supply and Sewerage Authority Ordinance, 1963 and the Factories Act, 1965.

Many government agencies deal with coastal and marine affairs. These include the Department of Forests, responsible for coastal forests; the Department of Fisheries, responsible for coastal and marine fisheries survey, development and management; the Bangladesh Fisheries Development Corporation, responsible for culture fishing and marketing; the Department of Science and Technology, which oversees marine affairs, including coastal zone management; the Bangladesh Navy, responsible for protecting Bangladesh's marine boundary as well as for the surveillance and enforcement of pollution prevention and environmental protection in national marine waters; the Directorate of Shipping, the and Chittagong and Mongla Port Authorities, responsible for overseeing marine shipping and port activities, including the monitoring and control of pollution in the port and marine waters of Bangladesh. There is, however, little co-ordination between these agencies.

Bangladesh is party to the Convention on Biological Diversity (CBD), the Convention on International Trade in Endangered Species of Wild Flora and Fauna' (CITES), the Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the International Convention on Civil Liability for Oil Pollution Damage (CLC) and OILPOL (1954). The articles of association of the United Nations Convention on the Law of the Sea (UNCLOS) and the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) have, however, not been ratified by Bangladesh.

MALDIVES

The Maldives comprise about 1,190 low-lying islands, of which around 200 are inhabited. The country owes its physical existence to the coral reefs which provide the living base on which these fragile ecosystems are established. The small size and the relative isolation of the islands make them particularly vulnerable. People are forced to depend on a narrow resource base for their livelihood.

The economic and physical survival of Maldives hinges on its ability to maintain its coastal ecosystem. The two most important industries in Maldives—tourism and fishing—are both directly dependent on coastal resources and on a healthy coastal environment. Ironically, the few recent instances of coastal degradation in the Maldives are a direct consequence of unsustainable resource-use practices pursued by the tourism and fishery sector.

The tourism industry is the largest contributor to the GDP of Maldives (17.1 per cent), closely followed by the fishing industry (12.4 per cent). Maldivians have traditionally depended on tuna and tuna-like fisheries as a source of nutrition, employment and foreign exchange. The main export of Maldives has been fish, primarily skipjack tuna. Other resources, such as souvenir shells, reef fish for aquariums, sharks, lobsters, turtle eggs and rays, are used for local consumption or export. Non-traditional reef fisheries such as lobster, sea cucumber, shark and giant clam fisheries have also gained importance in recent years, due to the high demand for these species in international markets and in the local tourism industry.

The fishery sector currently employs about 22.4 per cent of the labour force. The past two decades have witnessed a decline in the percentage of people employed in fisheries, since young people are seeking employment in more lucrative sectors, such as tourism.

Threats to the Coastal Environment

Coastal resources in Maldives are currently being exposed to several threats, important among which are the following:

Coral and Sand Mining

Living coral is stripped from shallow reef tops to meet the demands of the construction industry. Tourism has increased the demand for coral rock for construction of resorts. Coral mining increases the vulnerability of coastal areas to tide and wave-induced erosion and sand movements. It also reduces the diversity and quantity of coral reef fishes, including that of baitfish, essential for the tuna fishery. Prior to 1992, there were few controls on coral mining. New regulations were developed in 1992 to combat uncontrolled mining activities. These have come into effect since 1996. The Ministry of Fisheries and Agriculture (MOFA) is the government authority responsible for the formulation of regulations regarding coral mining. Sand has traditionally been mined from shallow lagoons around the islands and from beaches.

Coastal Erosion

In Maldives, the islands are continuously exposed to processes of accretion and erosion. Vulnerability to erosion is high, due to several factors—loss of sources of sand, increased exposure to wave action due to coral mining and changes in nearshore current patterns either due to natural causes or man-made changes, such as construction of coastal infrastructure. Even though the construction of groynes and other structures facilitate sand deposits and beach formation, improper constructions often prove counterproductive.

Dredging and Land Reclamation

Dredging associated with harbour deepening, land reclamation and mining for construction material, is damaging to the marine ecosystem. It disturbs the bottom substrata and benthic resources and results in turbidity due to suspended sedimentation, increased nutrient level in the water column and reduction in dissolved oxygen. Consequently, fish growth and productivity are affected. Moreover, land reclamation, to increase the habitable land area of densely populated islands, increases the susceptibility of the islands to flooding.

Sewage and Solid Waste Disposal

The dumping of sewage and solid wastes in the more densely populated islands, especially Mal, has the potential of leading to problems of marine pollution, nutrient enrichment and deoxygenation. It can also lead to siltation, the smothering of corals and reduced availability of reef fishes. However, pollution by sewage and solid waste disposal remains a minor localized problem, with negligible effects on reef-associated fisheries.

Overfishing and Use of Destructive Fishing Practices

In Maldives, fishing is almost entirely carried out by small motorized craft using pole-and-line for skipjack and other tuna, and longlining for shark. As a consequence of the use of non-destructive fishing gear, the Maldivian Exclusive Economic Zone (EEZ) is largely underexploited, except by fishing gear from neighbouring countries. The use of illegal fishing methods, lethal chemicals and destructive gear, though not very common, does, however, pose a threat. Some reef and lagoon fisheries are currently under stress and the government had to ban the beche-de-mer and giant clam fisheries. The export of beche-de-mer, for instance, rose from 2.5 tonnes in 1986 to over 750 tonnes in 1990. Initially, beche-de-mer were picked by hand during low tide from the intertidal regions and from shallow lagoons. As the catch declined, other methods, such as snorkelling and scuba diving in deeper waters were adopted. The Ministry of Fisheries and Agriculture (MOFA) has banned the capture of sea turtles. It also regulates lobster fishing through size limits. At the same time, the increase in the capture and export of aquarium and ornamental fish is causing concern. Some of the species exported are very rare and vulnerable to overexploitation. Depletion of such stocks affects both the tourism industry and the supply of live bait fish for tuna fishery.

Tourism

The importance of the tourism sector is growing in Maldives. At the same time there is an increased awareness about the potentially harmful effects of this industry on the environment, as for instance, due to sewage disposal, and the use of coral resources for construction of tourist resorts. As a result the industry and its undue expansion is strictly regulated by the government.

Coastal Area Management Initiatives

Only in recent years has the environment become an issue in Maldives. Compared to the other countries in the region, it remains relatively free of urgent environmental problems. Most environmental efforts in the country have focused on coral reef conservation and management, given the fact that the country depends for its existence on these fragile ecosystems. While coastal area management initiatives are more appropriate for large continental land masses, for a country like Maldives it is the concept of coral reef management that has more relevance.

The Environmental Affairs Division in the Ministry of Home Affairs and Social Service was created in 1984, in recognition of the growing importance of the environment sector. At present, the responsibility for all environment-related matters rests with the Ministry of Planning Human Resources and Environment (MOPHRE), formed in 1993. MOPHRE is also responsible for enforcing the Environmental Protection and Preservation Act of 1993. This Act aims at protecting and preserving the environment for the benefit of future generations. It makes an Environmental Impact Assessment (EIA) mandatory for any new project that has a potential impact on the environment. It also regulates the disposal of wastes, oil, poisonous gases or environmentally harmful substances within the territory of Maldives, and stipulates fines for damage to the environment as well as compensation for environmental damage. However, the provisions of this Act have been poorly enforced and many illegal practices persist. The geographically scattered nature of the country and its population makes effective implementation of laws difficult.

MOPHRE also acts as the secretariat for the National Commission for the Protection of the Environment (NCPE). The NCPE, appointed by the President in 1989, comprises of various government officials. It advises the Minister on various matters of environmental policy. The Environment Research Unit (ERU), under MOPHRE, assembles the environmental information required for planning purposes and for the monitoring of environmental quality. The National Environmental Action Plan was drawn up in 1989 by the ERU. This plan contains the overall strategy of the government in the environmental sector. It outlines the approach to managing and solving existing problems, while also establishing the mechanisms and procedures for future, sound, management of the environment.

Other Relevant Information

Authorities other than MOPHRE and NCPE involved in the protection and management of coastal resources include the Ministry of Fisheries and Agriculture (MOFA), the Ministry of Atoll Administration, the Ministry of Tourism and the Ministry of Construction and Public Works. The MOFA is directly responsible for the management of marine living resources in the Maldives. The Fisheries Law of Maldives (No. 5/87) imposes controls on fishing gears and methods, and bans specific destructive methods. The exploitation and/or export of certain reef species has also been banned. MOFA has also initiated a voluntary monitoring programme among resorts to report infestation by Crown-of-Thorns starfish. This programme has helped raise awareness about coral reef conservation. Maldives is party to several international conventions including the United Nations Framework Convention on Climate Change, the Convention on Biological Diversity (CBD), International Convention for the Prevention of Pollution of the Sea by Oil (MARPOL) and the Basel Convention on the Transboundary Movement of Hazardous Waste and their Disposal.

II. A Comparative Perspective

Coastal areas in the countries of the South Asian region are exposed to various environmental threats, as discussed in the earlier case studies. A summary is presented in the adjoining table. It needs to be noted that information in the table is merely indicative, based on the information in the earlier case studies. There is no claim to presenting an objective comparative picture. For instance, while tourism is seen as a potential threat both in India and Maldives, the magnitude of the threat is far more in India, where the industry is little regulated. Similarly, while pollution is big hazard in the South Asian region, its form, incidence and intensity varies from area to area.

Coastal Area Management Initiatives

It is evident that, except for Maldives, coastal area degradation is acute in the countries of the South Asian region. During a SACEP/UNEP/ESCAP workshop in 1993, which focused on management strategies to protect the coastal and marine environments in the South Asian Seas, integrated coastal area management was identified as a priority area by the South Asian Co-operative Environment Programme (SACEP). The recommendations of the workshop were formally adopted in March 1995 by all South Asian governments.

However, at the national level, only Sri Lanka has legislation with ICAM as a specific objective. Coastal management in Sri Lanka now has a history of 15 years. A specific agency, the Coast Conservation Department (CCD), has been created to handle all matters on coast conservation. Initial efforts were geared towards dealing with the severe problem of coastal erosion. Efforts are now on to evolve a second-generation coastal management strategy, with an emphasis on Special Area Management Projects, to deal comprehensively with other coastal management issues.

In India, a notification, outlining a zoning scheme regulating development in a defined coastal strip, has recently been issued. States have been required, by law, to develop coastal management plans for these zones, and to specify an authority at the state level responsible for enforcement and monitoring of provisions under the notification. State coastal management plans are still at the draft stage.

| Threats to the Coastal Environment | India | Bangladesh | Sri Lanka | Maldives |
|---|-------------|-------------|-------------|----------|
| Pollution | Very severe | Very Severe | Severe | Mild |
| Siltation | Very severe | Very Severe | Severe | NA |
| Coastal erosion | Severe | NA | Very Severe | Severe |
| Dredging | Severe | NA | NA | Severe |
| Groundwater mining in coastal areas | Severe | Severe | Severe | Severe |
| Construction of dams | Very Severe | Very Severe | Severe | NA |
| Degradation and destruction of natural habitats | Very Severe | Very Severe | Very Severe | Severe |

| | | | | |
|---|-------------|-------------|-------------|-------------|
| Aquaculture | Very Severe | Very Severe | Severe | NA |
| Threats to the Coastal Environment | India | Bangladesh | Sri Lanka | Maldives |
| Overfishing and destructive fishing practices | Severe | Severe | Severe | Mild |
| Coral and sand mining | Severe | NA | Very Severe | Very Severe |
| Sewage and solid waste disposal | Very Severe | Very Severe | Very Severe | Mild |
| Land reclamation | Severe | Severe | NA | Mild |
| Natural disasters | Severe | Very Severe | NA | NA |
| Tourism | Severe | NA | Severe | Severe |

Maldives has comprehensive legislation specifically targeted at the management of coral reefs and a National Environmental Action plan which focuses on coastal management issues. Regulating pollution in coastal waters, especially from sewage and solid wastes, has been identified as a priority task.

In Bangladesh the coastal management plan has, as yet, no legal status. There is, however, a National Environment Management Action Plan, which recognizes the importance of managing coastal and marine resources.

Thus, except for Sri Lanka to some extent, other countries in this region lack a coherent national policy framework for ICAM. In the case of Maldives, the focus on reef management, rather than on coastal management, has been a deliberate and considered decision.

Various legal tools and techniques have been employed by countries in the region to achieve ICAM objectives. These include: (a) defining coastal setback or exclusion zones in India and Sri Lanka, where certain activities are prohibited or severely restricted; (b) discretionary administrative controls on development, such as making mandatory the need for permits, licences and consents. Permits and clearance for specified developmental activities in coastal zones are required in Sri Lanka and India; (c) Environmental Impact Assessment (EIA) procedures for activities and projects in the coastal zone. EIAs are required in Sri Lanka for development activities with a potentially significant impact on the coastal environment; (d) the establishment of protected areas to conserve unique or threatened coastal habitats or ecosystems. Protected areas for the conservation of sensitive coastal habitats, such as coral reefs and mangrove tracts, have been established in Sri Lanka and India, as well as in Bangladesh and Maldives; (e) All the four countries have enacted legislation enabling the government to acquire land for implementing conservation-oriented programmes, such as for the establishment of marine parks and sanctuaries.

It is significant that all the four countries (including Sri Lanka and India which have Coastal Area Management-specific legislation) already have legislation aimed at protecting the environment. For instance, each country has a proliferation of legislation related to, among other things, controlling pollution, checking deforestation, regulating mining activities, and protecting and managing fishery resources. Unfortunately, implementation of existing

legislation is weak. Had implementation been effective, it is unlikely that coastal area degradation would have been of the same magnitude.

Further, ICAM-related legislation, in itself, is inadequate to improve the quality of the coastal environment. The objectives of ICAM legislation needs to be reflected in national policy and resource management initiatives. For instance, if chemical-intensive agriculture responsible for contamination of coastal waters is promoted, efforts at coastal management are likely to fail. There is then a need to harmonise existing economic and natural resource management policy.

Fisheries and Coastal Area Management

It is useful to examine CAM initiatives in the South Asian region from the perspective of the fishery sector.

In **Sri Lanka**, the Coast Conservation Act provides for the protection and management of sensitive coastal habitats, important for fisheries. There is also a provision for the nomination of a representative of the fishing community on the Coast Conservation Advisory Council, an advisory body on coastal management problems. Moreover, the CCD has recently been reverted back to the Ministry of Fisheries, and is, in that sense, more responsive to fishery interests.

However, there are lacunae in the implementation of the Act. Moreover, the CCD has little control over activities that fall outside the legally defined coastal zone, but which nevertheless have significant impact on fishery habitats and resources. While there is legislation in Sri Lanka that addresses other environmental issues in inland and offshore areas, the focus of each is specific and sectoral. Further, there is no mechanism to bring together and coordinate the activities of different departments whose activities have a bearing on the coastal zone and on fisheries. In sum, there has been little effort to look at issues of coastal area and fisheries management in a holistic manner.

The proposed second-generation ICAM programme may rectify this omission, since the focus will be on addressing resource management issues within identified project areas in a comprehensive manner. It is also significant that the country's recent Fishery and Aquatic Resources Act (No. 2 of 1996) provides for the representation of the Director, Coast Conservation Department, as well as representatives of other departments, in the Fisheries and Aquatic Resources Advisory Council (FARAC). The need for cross-sectoral co-ordination is clearly recognized.

In **India**, the focus of the CRZ Notification is primarily on regulating developmental activity within a narrow coastal strip of land. Though the Notification otherwise lacks a seaward component, the importance of preserving sensitive coastal ecosystems such as mangroves, coral reefs and areas close to the spawning and breeding grounds of fish and other marine species, is recognised. As in the case of Sri Lanka, the CRZ Notification is limited in scope and inadequate for the effective protection and management of coastal resources, especially since it fails to recognise the links between activities on land and sea that affect the coastal environment.

Again, the sectoral approach predominates in coastal area and fisheries management. There is no mechanism to coordinate the activities of departments whose activities have a bearing on the coastal zone and on coastal fishery resources. The fishery department in India is, in general, marginalized, with little control over important parts of the ecosystem which sustain fisheries in coastal areas, such as mangroves, estuaries, wetlands and coral reefs.

In **Bangladesh**, there is, as yet, no coastal management plan or supporting legislation. The National Environment Management Action Plan (NEMAP), which builds on the principles set out in the National Environment Policy, has identified the management of coastal and marine

resources as an important issue requiring appropriate action. However, the sectoral approach to management of coastal and fishery resources is still evident. For instance, while the Department of Forests is responsible for coastal forests, such as the highly productive Sunderbans mangrove tract, the Department of Fisheries is responsible for the development and management of fishery resources. The aquaculture industry, blamed for considerable damage to coastal and fishery resources, is controlled by the Bangladesh Fisheries Development Corporation. There is little provision for inter-departmental planning and co-ordination. The cross-sectoral Environment Conservation Act, which ought to enable the government to control all activities affecting the environment, has yet to come into force.

In **Maldives**, environmental problems are still not very severe. To deal with them the country has evolved a programme for the integrated management of reef resources. This is very much in the interest of the fishery sector, given the importance of the reef ecosystem to fisheries. The main challenge, however, lies in instituting effective systems for protecting and managing coral reef resources, given the spread of the islands comprising Maldives. Other pressing problems in coastal areas of populated islands, such as sewage contamination of coastal waters, also need to be better regulated.

Even though at present there is no mechanism to facilitate intersectoral coordination and holistic planning, it is significant that in Maldives, since fishery is an important economic activity, the fishery department is influential and in a better position to monitor and control activities that affect coastal resources vital for fisheries.

It is evident, then, that while all countries in the region have taken some steps to better protect and manage coastal resources, such initiatives, are not adequate. They remain narrow and sectoral in focus. There is an obvious need for comprehensive planning and for greater inter-departmental coordination. From the perspective of the fishery sector this is of great importance, since, with the possible exceptions of Maldives and Sri Lanka, in both India and Bangladesh, the fishery sector is quite marginalized. It lacks sufficient clout to control or influence the activities of other sectors that impact negatively on fishery and marine resources. Actively promoting and supporting integrated coastal area management efforts would, therefore, be very much in its interest.

III. Legal, Institutional and Policy Dimensions

As is evident from the case studies of countries in the South Asian region, coastal areas represent a complex and dynamic interface of land, water and air resources. Often highly productive, they support a significant proportion of the world's population. Approximately over half the world's people live within 60 km. of the coast.

Coastal areas are home to some of the richest, most diverse and fragile of natural resources. Mangroves, seagrass beds and coral reefs serve to protect coasts, prevent coastal erosion and mitigate the effects of natural disasters like cyclones, typhoons and tidal waves. These ecosystems help stabilize the physical environment by dissipating wave action, buffering salinity changes and by stabilizing sediments. Moreover, coastal ecosystems such as mangroves, coral reefs and estuaries provide important spawning and breeding grounds for fish.

Degradation of Coastal Resources

The world over, however, coastal resources are showing evident signs of overuse and degradation. This has been a consequence of, among other things, pollution from land, water and air based sources, degradation and overexploitation of natural ecosystems as well as due to conflicts stemming from the multiple use of coastal resources.

Need for Coastal Area Management

Given the uniqueness, richness, diversity and extreme fragility of coastal resources, a comprehensive and holistic strategy for their management is essential. The need to monitor, maintain and protect the coastal ecosystem is important also because the health of the coastal region can be viewed as a vital indicator of the environmental health of the region at large and of its economy.

The combined effects of unsustainable resource-use practices in inland and offshore areas often find dramatic manifestation in coastal regions. For instance, pollution in upstream areas discernibly affects the quality of coastal waters and fisheries. Conversely, a healthy coastal environment would indicate the environmental sustainability of resource-use practices in inland and offshore areas.

As far back as 1973, the Economic and Social Council of the United Nations recommended that a comprehensive, interdisciplinary study be undertaken to identify and review the problems of coastal area development. The UNCED meeting in 1991 also reflected this concern. Programme Area A of Chapter 17 in Agenda 21 of UNCED highlights the need for sustainable management of coastal areas.

Integrated Coastal Area Management

In coastal areas, terrestrial, atmospheric and marine ecosystems interact in complex, dynamic, and often unknown, ways. There are multiple users of coastal resources and a multiplicity of government departments with a stake in the coastal zone. A range of property regimes, ranging from private property, common property and state property controlled by several governmental departments co-exist. Any effort at management of coastal areas must take into account these realities.

An ICAM approach attempts to deal with some of the above issues. It emphasizes the need to move away from a sectoral approach to a more comprehensive planning and legislative framework. A major objective is then to co-ordinate, manage and reduce conflicts between the activities of various sectors in coastal areas for the long-term sustainability of coastal resources.

An ICAM programme typically defines a management zone based on the management priorities identified, and a cross-sectoral management programme with the participation of affected government agencies and stakeholders.

While the US was the first nation to institute a coastal zone management programme through the enactment of the Coastal Zone Management Act of 1972, at present, several countries of the North, such as Norway, New Zealand, Australia and France, and of the South, such as Sri Lanka, Ecuador, Costa Rica and Philippines, have initiated coastal area management programmes. ICAM programmes have usually been adopted in response to a perceived use conflict, overexploitation and degradation of a resource or a severe natural disaster in the coastal belt.

Approaches to ICAM

ICAM programmes have differed on various counts, such as their scale, priorities perceived and addressed, the institutional and legislative framework adopted, the regulatory and non-regulatory tools employed, the extent of stakeholder /public participation sought in planning, implementation and conflict resolution, as well as the level of decentralisation achieved.

Some countries, such as the US and China, have introduced specific ICAM legislation. Others, like New Zealand, have enacted comprehensive legislation for the holistic management of all natural resources, including coastal resources. Still other regions, such as Western Australia, have taken a conscious decision not to enact comprehensive legislation. Instead, they seek to achieve ICAM objectives by co-ordinating existing laws and policies through inter-agency guidelines.

The definition adopted for the 'coastal zone' has depended primarily on coastal resource issues and the priorities for management identified in the particular context of each country. For example, in Sri Lanka, where coastal management was adopted mainly in response to the critical problem of coastal erosion, all efforts were initially geared towards finding engineering solutions. The coastal zone was consequently identified as lying within a limit of 300 m. landward of the Mean High Water Line and a limit of 2 km. seaward of the Mean Low Water Line. Sri Lanka is now in the process of reviewing its programme and making it more responsive to other coastal resource management issues.

On the other hand, in the State of Alaska, where the development of fishery resources has been accorded priority, the Bristol Bay Coastal Resource Service Area of Alaska has fixed the coastal zone boundary as extending inland up to a distance over 200 miles from the shoreline, along the courses of all anadromous fish streams and their tributaries.

New Zealand's Resource Management Act of 1991 attempts to deal with regional variations in coastal management issues. A precise definition of the core area to which the principal regulatory mechanisms apply is provided. At the same time, it is emphasized that this is a component of a larger, undefined area termed the coastal environment, which the Act seeks to manage. The 'coastal environment' is considered to include at least three distinct, but inter-related parts: the coastal marine area, the active coastal zone and the land backdrop.

The Fisheries Sector and ICAM

It is useful to examine coastal management issues from the perspective of the participants in the fisheries sector. This section draws from the framework for Integrated Coastal Fisheries Management proposed by Willman and Insull.

- (a) The sector needs to analyze the activities of actors within it that have an impact on the health of fishery resources and on the coastal environment. Such activities could include

the use of destructive fishing gear, overfishing, building overcapacity, and inappropriate timing and location of fishing effort. For any meaningful analysis, there is a need to identify the various actors and sub-groups within the sector and to distinguish the various impacts of fishing activities pursued by these sub-groups.

These sub-groups would include fishers of the small-scale artisanal sector who are totally dependent on fishing for their livelihood, part-time or occasional fishers who combine agriculture or some other economic activity with fishing, owners of large mechanized vessels as well as the workers on these vessels. It can be reasonably expected that resource use and management practices employed by these different sub-groups, as well as their stakes in resource management, would vary.

Part-time fishers, for instance, often form part of a sub-group that employs diverse strategies for survival, including perhaps agriculture, daily-wage labour work, migration and exploitation of forest resources. In the Asian context, it has been observed that destructive fishing practices, such as dynamiting and poisoning of waters are often employed. This is also true of occasional fishers, i.e. those who resort to fishing when other sources of livelihood become scarce. Their main interest often lies in increasing income from fishing in the shortest possible time.

On the other hand, full-time fishers from the artisanal sector have been traditionally dependent on fishing for a livelihood. For them, fishing is a way of life. The fishing technology and management practices they adopt tend to be geared towards exploiting fishery resources in a sustainable manner. However, with macroeconomic changes and with market-led economic incentives, this is not always the case any longer. More recent entrants into the fishery, like trawlers and large mechanized vessels are lured by the hope of quick profits. Overefficient and destructive fishing gear are often employed. While these may be rather broad and stylised generalisations, the point that needs to be emphasized is that, for any useful resource management initiatives, variations within a sector must be analyzed.

Understanding the diversity within the sector and facilitating a process of dialogue between the various sub-groups would encourage the sector as a whole to arrive at co-operative solutions to protect their long-term interests and livelihood. For a greater impact, it would be useful to articulate the common concerns in the fishery sector. Also, unless the fishery sector adopts sustainable resource-use practices there will be little incentive for other sectors to modify existing practices that are detrimental to the coastal environment and to fisheries.

- (b) Simultaneously, there is a need to analyze the impact of activities pursued by other sectors on the fishery sector, in particular, and on the coastal environment, in general. The activities of the industrial, agricultural, forestry and tourism sectors, for instance, have a significant impact on fisheries and fishworkers. This may be in terms of polluting, degrading or destroying resources and natural ecosystems essential for sustaining fisheries. It may also be in terms of conflict over space and over the use of coastal resources. The activities of the tourism sector, for instance, often displace fishing communities, take over fish landing centres as well as the beach space of women and men involved in the marketing and processing of fish. It is significant that while negative externalities flowing from sectors such as agriculture, industry, forestry and tourism affect the coastal environment and the fishery sector, the reverse flow is limited—few activities pursued by the fishery sector affect the economic or environmental viability of sectors such as industry and agriculture in inland or hinterland areas. The fishery sector, thus, bears the consequence of unsustainable resource-use practices pursued by other sectors.

Thus, while the fishery sector needs to identify ways of self-regulation, it is imperative that it identifies activities of other sectors that significantly affect it, prioritise them according to threat value, and devise strategies to try and control or regulate them. This is by no means an easy task. The fishery sector and fishery line agencies are marginalized in most countries. At the same time, there is little incentive for sectors like inland industry and agriculture, whose activities contribute to coastal degradation, to change existing practices. The fishery sector could adopt strategies, such as creating greater public attention or concern through the media, joining forces, where feasible, with other sectors which have a common stake in maintaining the health of the coastal ecosystem, lobbying to implement or change existing legislation, and calling for new legislation. It could also try to increase the accountability of sectors which cause environmental degradation.

ICAM and the International Legal Environment

Binding international legal instruments include:

- Convention on Biological Diversity (CBD) which came into force in 1994: The CBD requires signatories to achieve sustainable use of all biodiversity, including the conservation in situ of natural ecosystems within their jurisdictions. These obligations also refer to marine and coastal ecosystems within existing territorial limits.
- UN Convention on the Law of the Sea (UNCLOS): This came into force in 1994. UNCLOS emphasizes that States have a general duty to 'protect and preserve' the marine environment, and a specific obligation to control pollution of the marine environment from all sources, including land-based sources. A special need to protect fragile or rare ecosystems is also recognized.
- MARPOL (1973/78): The International Convention on the Prevention of Pollution from Ships attempts to regulate potentially polluting activities on the high seas. MARPOL applies to about 90 per cent of the world's merchant fleet. The convention, however, does not address pollution from land-based sources for which there is as yet no international convention.
- The London Dumping Convention (1972): This convention highlights the need to protect the marine environment by controlling dumping of wastes and other substances at sea. Countries in the South Asian region have signed, but have not ratified, approved or accepted the Convention.

Non-binding international instruments include:

- Chapter 17 of Agenda 21, which sets out comprehensive guidelines for the management of the coastal and marine ecosystem, is an influential, though not a legally binding, document. It is a voluntary declaration of intent. However, many principles have been given legal effect through the Biodiversity Convention.
- The Code of Conduct for Responsible Fisheries, formulated by the FAO: While the Code is non-binding and its adoption is voluntary. It is, nevertheless, important in influencing national and international fisheries policies. The Code also has a section on Coastal Area Management.
- Montreal Guidelines for the Protection of the Marine Environment from Land-based Sources (1985) is directed primarily at establishing regional agreements for the control of land-based pollution. At present, there is no legally binding instrument to control land-based pollution.

IV. Some Useful References

General

1. FAO. Integrated Management of Coastal Zones, FAO Fisheries Technical Paper 327, Rome, 1992.
2. Needham, Brian (ed). Case Studies of Coastal Management: Experience from the US, CRC Publication Number 1001, University of Rhode Island, 1991.
3. Boelaert-Suominen S. & Cullinan, C. Legal and Institutional Aspects of Integrated Coastal Area Management in National Legislation, FAO Development Law Service Legal Office, 1994.
4. Cicin-Sain, B., Knecht R.W. Ocean and Coastal Management, Volume 21 Nos 1-3, Elsevier Applied Science, 1993.
5. Willman, R. & Insull, D. Integrated Coastal Fisheries Management, in Ocean and Coastal Management, Volume 21 Nos 1-3, Elsevier Applied Science, 1993.

South Asia

1. Overseas Development Authority. Proceedings of the International Coral Reef Initiative South Asian Workshop, 1996.
2. FAO, Bay of Bengal Programme. Towards Sustainability, Report/71, Madras, India, 1996.
3. Staffan Holmgren. An Environmental Assessment of the Bay of Bengal Region, Sweden/BOBP, 1994.

India

1. Equations. Coastal Zones: An Overview, Equations, Bangalore, 1995.
2. GOI. Environmental Guidelines for Development of Beaches, Ministry of Environment and Forests, GOI, New Delhi, 1982.
3. Draft Coastal Management Plans of Gujarat, Maharashtra, Karnataka, Kerala, Lakshadweep, Tamil Nadu, Andhra Pradesh, Orissa, Andaman and Nicobar, and West Bengal, Undated.

Maldives

1. Brown et al. Effect of Degradation of the Environment on Local Reef Fisheries in the Maldives, Final report prepared for ODA, Undated.
2. Shakeel et al. Potential Environmental Threats to Fisheries in Maldives, 1992.
3. Ministry of Fisheries and Agriculture. Workshop on Integrated Reef Resource Management, Republic of Maldives, 1996.

Bangladesh

1. Ministry of Environment and Forest. National Environment Management Action Plan, Volume I to IV, Government of the People's Republic of Bangladesh, 1995.

2. Economic and Social Commission for Asia and the Pacific. Coastal Environmental Management Plan for Bangladesh, Volume Two: Final Report, ESCAP, Thailand, United Nations, Undated.

Sri Lanka

1. Olsen et al (ed). Coastal 2000: Recommendations for a Resource Management Strategy for Sri Lanka's Coastal Region, Volume 1 and 2, 1992.
2. Perera E.W.M. A Study of the Legislative and Institutional Arrangements for Coastal Zone Management in Sri Lanka, Undated.
3. Coast Conservation Department, Government of Sri Lanka. Coastal Zone Management Plan, 1990.
4. Lowry, K. & Wickremeratne H.J.M. Coastal Area Management in Sri Lanka in Ocean Yearbook 7, 1989.
5. White A.T. & Wijeratne. Are Coastal Zone Management and Economic Development Complementary in Sri Lanka?, 1989.
6. Tilakratna, K.W.P. Management of Sri Lanka's Coastal Resources, Paper submitted for Degree of Master of Marine Affairs, University of Rhode Island, 1994.
7. Parliament of the Democratic Socialist Republic of Sri Lanka. Coast Conservation Act, No. 57 of 1981, and No. 64 of 1988, 1981 and 1988.
8. Parliament of the Democratic Socialist Republic of Sri Lanka. Fisheries and Aquatic Resources Act, No. 2 of 1996, 1996.

Coastal Area Management in South Asia A Comparative Perspective

Most of the world's fisheries and fishing communities are supported by coastal areas. Consequently, the well-being and future of the fishery sector depend on the health of the coastal ecosystem. Not surprisingly, therefore, concern about coastal degradation and its impact on the fishery sector has long been expressed, notably at the first-ever conference of fishworkers and their supporters in Rome in 1984. Discussions then emphasized how the coastal environment is affected by activities within the fisheries sector as well as by other activities pursued in inland, inshore and offshore areas.

It was in this context that the International Collective in Support of Fishworkers (ICSF) organized a workshop and symposium on Fisheries and Coastal Area Management in South Asia, in Madras, India, in 1996. To aid participants focus on the major coastal resources management issues, a background paper was prepared by ICSF. This paper explores efforts on coastal area management, more specifically in the South Asian region, and the extent to which the perspectives of actors in the fishery sector have been incorporated. It also deals with legislation of direct relevance to Integrated Coastal Area Management (ICAM).