EXPLOITATION OF COASTAL RESOURCES AND ENVIRONMENT IMPACTS IN THE MALDIVES, PAKISTAN AND SRI LANKA

by
S. Antony Norbert

Introduction

The coastal zone can be defined as "that part of land, affected by its proximity to the sea and that part of ocean affected by its proximity to the land" (Sorensen Jens et al. 1984). The coastal zone is the interface between physical systems where land forms materials, lifeforms and forces interact and mutually adjust to one another in the course of time (Swan, 1981) and to produce a range of dynamic geomorphological and ecological conditions. Several habitats in the form of coral reefs, mangroves and lagoons, sea grass beds and salt marshes occur in the coastal zone possess unique and characteristic features. Coastal habitats have economic value and they serve multiple uses. Their resiliency is now being rapidly eroded by influences that harm organisms and thereby reduce the diversity of delicate ecosystems. The coastal zone is a fragile and vulnerable area that affects natural resources.The conservation and protection of the physical environment of the coastal areas and its habitat ecology has become necessary because of its potential to generate substantial foreign exchange earnings and employment opportunities in the informal sector.

The coastal ecosystem and its management are significantly sensitive from the perspective of ecological, and sociological aspects. The accelerated growth of population and its pressure on coastal natural resources in the form of industrial activities, urban growth, tourism and modernization have caused environmental degradation and increased conflicts which are a cause of concern among the coastal users. In these countries, there have been phenominal development of transport networks, recreational facilities combined with tourism development and intensive diffusion of human settlements in the coastal areas in recent years. These efforts of development have led to the unplanned and indiscriminate exploitation of coastal resources which has affected the diversity, productivity and stability of the coastal environment in a long-term period. Besides, these human activities, and the unabated natural hazards in coastal areas have caused severe damage not only to properties and human life, but also to the physical integrity of the coastal margins of the Maldives, Pakistan and Sri Lanka.

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Resource Utilization in Coastal Areas Coastal Ecosystem

The main feature of the coastal ecosystem in the Maldives, Pakistan and Sri Lanka comprise coral reefs, estuaries, lagoons, mangrove, swamps, sea grass beds and salt marshes. The magnitude of these ecosystems and communities differs from region to region. Numerous estuaries and lagoons along the coast of Pakistan and Sri Lanka have varying degrees of sand barrier and spit formation across their mouth. Estuaries are semi-enclosed coastal bodies of water which serve as important nursery areas for shrimps and fish. Estuaries are known to be highly productive, and to act as nutrient traps and they are absent in the Maldives. Mangroves are salt tolerant forest ecosystems and have unique physiological and morphological adaptations to the saline, loose and anaerobic soil which is often acidic. Mangrove ecosystems have a wide range of economic uses in both non-extractive and extractive purposes. Large number of crabs, molluscs and other invertebrates are permanent inhabitants while shrimps, prawns and fish move in and out with the tides (Mann, K.H. [1982]). Their most important non-extractive uses are in coast protection, a barrier against storms, nursery area for fish and shrimps, recreation and science. The important extractive uses are as timber, charcoal, firewood, bulb tannin.

Sea grass beds occur along the North Western coast of Sri Lanka and very little is known of sea grass beds in Pakistan. Sea grass beds occur on the seaward reefs and in channels spanning atolls in the Maldives. They trap bind sediment thereby resisting erosion — salt marshes occur extensively in these countries. Salt marshes communities develop intertidally in sheltered places where silt and mud can accumulate and they serve as breeding and feeding habitats for a variety of birds and therefore are important in tourism. The coral islands are flat in structure and are protected from wind and storms by the atoll reefs. In Pakistan, several important estuaries and extensive swamps occur in the coastal areas. The mangroves area in the Indus Delta covers 85,000 hectares and on the Sind coast it extends to over 350,000 hectares. The Sind coastal waste land especially between Karachi and Rann of Kutch has vast areas under tidal forests. The Indus Delta is very rich in flora and fauna of various types.

In Sri Lanka, coral reefs are one of the most spectacular of nature's marvels and occur along the coast in the North, South-West and South-East. Coral destruction has been the most severe along the southwest coastal belt where 10,400 tons of coral are excavated from the inlands deposits annually. In the Western and Southern coastal zone submerged channels of the rivers, troughs and terraces are covered by algae, limestone, sandstone and forests on the continental shelf. The coastal lowlands consist of barrier beaches, islands, buried and emerged coral reef patches, lagoons and lakes, marshes and mangrove swamps.

Minerals

In the Maldives, lack of minerals has resulted in its economy depending almost entirely upon fishing and tourism. The value of coral and sand mining is about 1.0 per cent of the Gross Domestic Product. At the present time coral mining is concentrated around Manigilili and Thimarafushi Islands which are situated in the Male Atoll. The government of Pakistan is now taking an interest in discovering the possible mineral resources from deep ocean floors. Recently, their oceanographic research vessels have discovered that modules on the deep ocean floor are widely distributed and rich in valuable metals like nickel and copper. The principal mining activities in Sri Lanka are extraction of mineral sands, heavy minerals and corals. Sands are extracted on the coast at Kalutara and Panadura, and large quantities are extracted specially in the lower reaches of the major river systems, for instance in the mouth of the Kelani river. Silica deposits occur in the Marawila, Nattandiya and Madampe areas, and silica sand also occurs in the eastern part of the Jaffna Peninsula. The minerals ilmenite,rutile, zircon and monazite occur relatively on a large scale in Pulmoddai and also at Kaikawela, Polkotuwa near Induruwa and Kudremalai Point near Mannar (Herath, J.W. 1975).

Fisheries

The living resources of the sea are among the most important of the natural resources in the Maldives, Pakistan and Sri Lanka. The quantum of these resources depend on the extent of water and character of the sea. Most of the people living in coastal areas are actively engaged in fishing activities. In Sri Lanka, the total fish production was 205,286 metric tons in 1989, in which coastal fishery subsector contributed 157,411 metric tons (76.6 percent). The total marine fisheries catch of the Pakistan was 446,000 tons in 1989-90 (Economic Survey 1989-90). Marine fisheries constitute the most important economic activity of the Maldives. Of a total of 61,900 tons of fish caught in 1985, 44.0 percent was utilized for domestic consumption, while 50.2 percent was exported.

In the Maldives fisheriesare essentially a coastal operation and contributed 24.0 per cent of th GDP. Significant contribution is also made by collection for commercial purposes of live aquarium fishes, shells and coral for jewellery. About 40.0 per cent of the economically active population was principally engaged in fisheries in 1985. Pakistan coastal waters are believed to have all those types of fishes and sea creatures which are found in the Gulf area and the Arabian sea. The total value to GNP from fish production at current factor cost of 1980-81 was Rs. 4,492 million in 1987-88 and Rs. 5,362 millions in 1989-90.

Coastal Tourism

Tourism in developing countries has become one of the important sources of national income in recent decades. It has been the most dynamic growth sector of the economy in the Maldives, and registered an increase from 1,092 visitors in 1972 to 114,554 in 1985. The revenue from tourism grew 44.5 per cent in 1985. The population employed in the tourist sector is 22,155 persons. Vacationing tourists are attracted to the Maldives primarily by the coastal natural resources. The resorts are spectacular and are located in idyllic tropical Islands where tourists from temperate countries seek pristine conditions.

Pakistan's coastline does not have fully developed tourist spots. Karachi is the country's prime sea port, even though its beaches at Hawkes Bay, Sandpit and Paradise Point are not properly developed. Gwadar, Omara, Pasni and Gadani are the potential tourist resorts still lacking facilities. In Sri Lanka tourism has become a new source of national income and the total foreign exchange earned from tourism was Rs. 870 million (1978) which increased by 350 per cent to Rs. 3,050 million in 1982 (Central Bank of Ceylon, 1978-87). In 1990, the gross foreign exchange earnings from tourism have been estimated at Rs. 4,800 million, showing an increase of 75 percent over the earnings of the preceding year.

Environmental Pollution and its Impacts

The resources of the coastal zones of the Maldives, Pakistan and Sri Lanka are being rapidly depleted by natural hazards and man-induced activities, creating a number of ecological and socio-economic problems. Fishing is the traditional vocation of the coastal people and hence coastal land use has become an important factor in coastal zone management. In recent years there have been pressures on the resources of the coastal zones and many interacting factors contribute to the instability and degradation of the coastal areas in the Maldives, Pakistan and Sri Lanka.

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Coastal Erosion

Erosion reduces the extent of land available for human settlement. Beaches consist of accumulated unconsolidated sediments transported from sea to shore and moulded into characteristic forms by wave-generated water motion. In the Maldives and Sri Lanka, heavier precipitation occurs at the onset of the south-western monsoon and this regulates the direction and force of the wind. During the south-west monsoon period (May-September) unusual high energy tidal wave action of a fearful frequency and magnitude prevail in the Maldives and Sri Lanka. Beach erosion caused by on-shore wave is seasonal, but long shore

sand transport and deposition have moved the beaches in a predictable manner. In Pakistan as far as the development of coastal tourism is concerned, erosional problems do not pose any severe threats as compared with the Maldives and Sri Lanka. In Sri Lanka erosion of beaches has been aggravated by damage to coral reefs by their being broken off and sold to tourists as souvenirs thereby rendering the coasts more erosion prone. Since coral and sandstone reefs act as a natural wave barrier, their depletion causes erosion along the western and south-western coastal sectors.

Sand Sedimentation / Siltation

Coastal vegetation from the point of aesthetic view adds colour and character to a beach and is also attractive to the tourists. It is considered as a protecting factor to minimise the loss of land from erosional activities. The vegetation of the coastal areas trap the wind laden sand and deposits them in frontal areas resulting in the formation of coastal sand dunes. In the Maldives some islands do not have the the basic attractions such as beaches while in Huduveli and Makunudhoo, construction of groynes has encouraged beach sand deposition.

Although sediment discharge from rivers does not occur in the Maldives, siltation from land reclamation may be considerable under localized situations.

In Pakistan, the great river Indus formed a drainage system in the maritime zones of Pakistan and deposited silt along the coast. In Sri Lanka where most of the tourist centres are located sand bars are formed during the period of south-west monsoon. The waves and currents form seasonal sand bars across the mouth of streams, rivers and lagoons which tend to affect coastal tourism. Coastal ecosystems such as estuaries, mangroves, coral reefs and sea grass beds are beginning to show signs of adverse effects of siltation. Beaches in the Maldives are formed from fragments of sea shells, coral skeletons and other scoured material. The rate of regeneration of this material is considerably slower than the rate at which such material could be lost by leakage. The construction of groyne and piers alters the usual movement of sand along the shore and generally causes heavy deposition to occur over live corals.

Extraction of Corals

The corals and sand stone reef in the coastal areas protect the coast from the high waves during surge of the south-west monsoon. The physical foundation of a coral reef is calcium carbonate deposited by animals (corals) and plants (ceralline algae) and is considered to have a very high primary productivity potential for living species of several groups. Disposal of sewage from the tourist resorts, removal of buried corals, removal of sand in bulk, and using explosives are known to have caused much damage to the coastal habitats and increasing land loss and social costs. A stretch of several kilometers in the main Colombo-Galle road has been threatened and parts of it have been completely eroded. Increasing coral mining in the sea in this area has caused a serious problem to the stability of the beach and also damaged the landing areas.

The dumping of garbage and waste water from the tourist hotels on to the beaches and recreational resorts have caused damage to the coastal vegetation and degraded the marshes, mangrove swamps and coral reefs.

The Maldives consist entirely of coral atolls resting on a submerged mountain range. The once beautiful under water corals and fauna around Balegic Paradise Point and Churna Island are fast perishing. Record of coral reefs are not available for Pakistan.

Industrial Sewage and Oil Pollution

The dumping of garbage and waste water from the tourist hotels on to the beaches and recreational resorts have caused damage to the coastal vegetation and degraded the marshes, mangrove swamps and coral reefs. Apart from the Maldives, Pakistan and Sri Lanka are confronted with serious coastal pollution problems arising from the discharge of untreated industrial effluents into estuaries, rivers and other waterways connected to the sea. The municipal wastes from the eastern part of Karachi are also discharged in the creeks through Malir river. Sometimes discharges of oil from fishing boats and ships add to the pollution problems.

Dumping of plastic bags and tin cans are now causing problems in the Maldives. In Pakistan, the discharge of bilge-oils and waste by ships and chemicals wastes and other industrial effluents by factories are carried away to the Karachi coast during the rainy season which may not only be unaesthetic but constitutes a positive danger to health. Spreading of wastes into the mangrove forest, creeks and deltaic regions have destroyed wild life and breeding habitats of fish. Toxic substances in industrial effluents could be concentrated along marine food chains and eventually reach humans through commercial catches of marine organisms. Some of these toxic substances directly affect marine organisms and the ecological balance.

Destruction of Coastal Vegetation/ Development Process

Coastal vegetation promotes accretion, binds coastal materials, protects the coastal margin from sea erosion and is effective against mobilisation by the wind. From the aesthetic point of view it adds colour and character to a beach and also attracts the tourists. Houses and buildings, tourist hotels and other recreational amenities and transport networks constructed in the vicinity of the coastal areas have caused the severe degradation of coastal vegetation. In Pakistan, the Sind coast waste land especially between Karachi and the Rann of Kutch has a vast area under tidal forest. The demand for timber is high in Karachi and the practice of destroying the forest for timber without adequate conservation measures is having an adverse impact on the management of forest resources. Increasing salinity of the water in this region gradually restricts the diversity of wild life which can survive in this environment.

In Sri Lanka the coastal vegetation has been damaged by man induced activities. The clearing of natural vegetation, watershed erosion and deposits made by run-off are the main causes of damage to vegetation indentified in the process of siltation in the coastal areas and destruction of coral reef and life forms. Reef

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mining has caused land forms resulting in the land becoming unproductive due to seepage of saline water.

Conclusions

Conservation measures should be adopted to protect the environment of coastal zone as a national heritage to promote tourism and earn foreign exchange. In South Asia like other countries Sri Lanka, the Maldives and Pakistan have a high potential to develop coastal tourism. Action should be taken to introduce alternative means of livelihood to the people who are engaged directly and indirectly in the utilization of coastal resources. The socio-economic problems of the people also need to be identified and mitigated. More research should be undertaken on the inter-relationships that exist between ecological and socio-economic aspects for effective management of the resources.

Surveying and mapping of marine features on the basis of an inter disciplinary approach with the possibility of sophisticated remote sensing techniques are also necessary. The natural resources survey including a general coastal resources assessment should be carried out. The main inhibiting factor has been the lack of technical manpower. A multi-disciplinary team of experts committee could therefore be established. There should be increased awareness among decision-makers of trends in coastal resources depletion and need for a more effective resources management policy among the South Asian Countries.

References

* ***Central Bank of Ceylon (1978-87):*** Annual Report, Colombo, Central Bank of Ceylon, Sri Lanka.
* ***Central Bank of Sri Lanka (1990):*** Annual Report, Colombo, Sri Lanka.
* ***Economic Survey (1990-90):*** Finance Division, Government of Pakistan, Islamabad.
* ***Herath, J.W. (1975):*** Mineral Resources of Sri Lanka, Economic Bulletin, No. 2 Geological Survey Department, Colombo.
* ***Mann, K.H. (1982):*** Ecology of Coastal Waters: A Systems Approach Studies in Ecology, vol. 8, London.
* ***Nalin, W. (1984):*** Mineral Exploration in Sri Lanka. Mining Magazine, No. 150, pp. 464-467, July.
* ***Swan, B. (1981):*** The Coastal Geomorphology of Sri Lanka: An Introductory Survey, Research Series in Applied Geography, University of New England, New South Wales.
* ***Sorensen, J.C. et al(1984):*** Coasts: Institutional Arrangements for the Management of Coastal Resources. Nat. Park Service and USID, Renewable Resources Information Services, Coastal Publication, No. 1.