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Kerala's Coastal Area: The case for a coastal zone management plan covering coastal land and water*

(or why the coast is a little more than just the shore!)

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1. Introduction

The beautiful coast of Kerala is as much a part of the unique dynamics of Kerala's social history as its natural history. The several ports on the coast facilitated commercial and cultural links of a population confined between the idyllic Western Ghats ranges and the Arabian Sea. These links extended to almost all the major ancient civilizations in the world. The fortuitous winds blowing over the oceans, in predictable patterns or what came to be known as the 'monsoon' made these maritime links possible. The seasonal change in winds combined with the existence of the Western Ghats determined the macro and micro climate and ecology or the biogeography of a region nestled between geologically young shoreline and a very old land formation.

The coastal plain of Kerala also constitutes a special ecological mosaic. Along most of its considerable length, except in a few southern parts, water for cultivation has been ample and almost exclusively monsoonal. Two crops have been taken from most of the cultivated tracts behind the coastal backwaters. The substantive influence of these ecological conditions on modes of resource use and thereby the social organisation is only to be expected.

It is important not to forget the role of the various ecotypes in shaping the society, while we examine the various aspects of the development on the Kerala Coast. The physiographic setting of Kerala presents a variety of gradients along the narrow strip of land 32 to 133 km wide, between the Western Ghats and the nearly 600 km of shoreline. About 320 km of the coast is subject to a dynamic process of land erosion and accretion. The coastal waters are not only rich in biodiversity but also support the livelihood of a large number of people dependent on the coastal ecosystem, particularly the fishing communities.

2. Coastal Environmental Concerns

The environmental concerns of the coastal zone in most parts of the world have tended to take a back seat in governmental policy. However, the spate of development activities specific to the coast has highlighted the question of protecting coastal environment. The gamut of development activities on the coast: aquaculture, mechanised fishing, tourism, nuclear power plants, thermal stations, port expansion, etc., pose varying degrees of threats to the coastal environment. Apart from the immediate question of adverse environmental impacts are the larger issue of operationalising the paradigm of sustainable development[1] in coastal areas. Due to peculiar features of Kerala, this is a stupendous task, calling for creative cooperation of the state, the local bodies, scientific institutions, political parties and non-governmental organisations.

* Kerala Development Expereince, Vol. 2, M.A.Oomman (ed.) p279-299, Concept Press, New Delhi (1999)

The interaction between different elements like structural processes, denudation, fluvial processes and marine processes plays a vital role in the geomorphic evolution of the coast. The littoral zone is defined as the zone extending from the shoreline to the tidal (usually upto a depth of 100 fathoms). The transport of sediments in this zone is of importance in coastal engineering and estimation of erosion and accretion rates along the shore. Compared to the open ocean, coastal and estuarine waters undergo rapid changes due to tidal effects and the close interaction with the land. Therefore, the coastal environment presents an extremely dynamic system, demanding significantly different requirements for monitoring the physio-chemical and biotic changes, as well as environmental impacts.

Though the discussion on the CRZ has tended to reduce the coastal ecosystem to a narrow strip of the shore, it is necessary to discard such a administratively delimited view of the coast and define a scientifically more meaningful idea of the coast. As we travel through the marine environment along a depth gradient starting from the deep ocean into oceanic-shelf-estuarine systems, we find along with that gradient, a number of other gradients that determine the functioning of the system.

From a biological perspective, with decreasing depth, the primary producers tend to come closer to benthic consumers. In deeper waters the benthic system is dependent on the fallout from the pelagic. In systems where the tides keep water column more or less mixed, the benthos are able to feed on the pelagic production directly. Conversely, in such conditions the pelagic are also able to take advantage of the nutrient regeneration from the sediments[2].

Bays, estuaries, different types of coastal wetlands such as backwaters and lagoons, river deltas, mudflats, swamps and saltmarshes, and mangrove forests are closely associated with the near-shore coastal waters. These ecosystems are also very rich in biodiversity. The human activities on both landward and seaward have a direct bearing on the survival of these biota and their fragile habitats. The besides fish, this complex lifescape consist of a large number of associated animal life such as migratory birds, several aquatic fauna, reptiles, amphibians and an astonishing variety of plant life or flora as well. The coastal ecosystem comprising of all these various elements is highly productive.

Several studies indicate that the coastal waters are much more productive than inland marshes or open seas. Standing crop and productivity of aquatic grasses and abundance of macro- and meio-benthic organisms, fish and crustaceans are higher in estuarine waters. In addition, the rich, shallow shore areas and tidal channels are important as nurseries for fish, shrimp and crabs. The young of many species spend their rapid-growth juvenile stage in these areas. A large proportion of estuarine organisms are migratory species, allowing much higher standing crops during periods of seasonally high food availability than could exist with an entirely endemic population.

Man has been part of the coastal system for thousands of years. However, man has become a significant force modifying the coastal region - seaward and landward regions - only recently and is now tampering with both short and long-term natural processes on the coast. The anthropogenic activities now interfere with natural processes at several scales: the geological processes relating to flow of rivers, land-sea interaction, rates of delta formation, sediment transport, alteration of biotic cycles whose periods range from hours and days to years. This is also accompanied by severe over-exploitation of biotic resources. In several cases, the harvests of biotic resources have not only been unsustainable, but have led to catastrophic situations, resulting in total or near total extinction of several fish species that were abundant less than ten years ago.

3. Coastal Regulation Zone Act

As populations in coastal areas increase and the economic activity diversifies, all the impacts on coastal environment are bound to worsen threatening survival several species, productivity of the biota, and render fishing an unsustainable proposition. It is, therefore, clear that unless governments and resource users take appropriate action, the degradation of the coastal and marine environment will become uncontrollable and there will be no possibilities for sustainable use of resources from these waters.

These concerns are expressed in the linkage between development in Chapter 17 of UNCED Agenda 21: "Protection of the oceans, all kinds of seas including enclosed and semi-closed seas, coastal areas and the protection, rational use and development of their living resources'. It includes a commitment of nations to sustainable development of coastal areas and the marine environment under their jurisdiction. It also enjoins states to 'identify marine ecosystems exhibiting high levels of biodiversity and productivity and other critical habitat areas' and 'provide necessary limitations on use in these areas, through *inter alia*, designation of protected areas.' In particular, it states that the priority should be accorded, as appropriate, to:

a) Coral reef ecosystems
b) Estuaries
c) Temperate and tropical wetlands, including mangroves
d) Seagrass beds and
e) Other spawning and nursery areas.

The CRZ Act[3] notified by the Ministry of Environment and Forests in 1991 needs to be seen against this background. It declares coastal stretches as CRZ and regulates certain activities within the zone. The provisions of the act are to be implemented by the coastal states and Union Territories. It also envisages the creation of an appropriate authority at the state/UT level to be responsible for enforcement and enactment of these provisions.

The act defines the coastal stretches as seas, bays, estuaries, creeks, rivers and backwaters which are influenced by tidal action, in the *landward* side, upto 500m from the high tide line[4] (HTL) and the land between the Low Tide Line (LTL) and HTL or the intertidal zone, as the CRZ. It classifies the CRZ into four categories for regulating the development activities. A short description of these categories is given in table 1.

The notification specifies activities that are prohibited or regulated in these categories, with the most stringent regulations applying to CRZ-I. The norms for regulation of activities in different categories of the CRZ are given in Appendix. Certain activities are totally prohibited in it, such as the establishment and expansion of existing industries, manufacture/ handling/disposal of hazardous substances, dumping of wastes, land reclamation and embankment building, dumping of industrial wastes, mining of rocks, sands and substrata. Harvesting of ground water within 200m is also disallowed. Between 200m and 500m, only manual withdrawal of ground water for purposes of drinking, horticulture, agriculture and fisheries is permitted. It is to be noted that, tourist sector, however, has been allowed to tap ground water in the zone with the concurrence of the Central/Sate Ground Water Boards.

The notification permits a large set of activities subject to environmental clearance from the Ministry of Environment and Forests. Water front and foreshore activities, development work relating needs of expanding defence facilities, etc., are possible. The notification is an attempt to *prevent* uncontrolled and environmentally unsound development on the coast. It is an attempt to provide a legal framework for the protection of the coastal environment, in the background of the concerns expressed in the convention on biodiversity.

Table 1

Category	Description
CRZ-I	a. Ecologically sensitive areas (national/ marine parks, sanctuaries, reserve forests, wildlife habitats, mangroves, coral reefs, areas close to breeding and spawning grounds of fish and other marine life, areas of outstanding natural beauty/historical/heritage, areas rich in genetic diversity. b. Those falling between HTL and LTL. c. Those areas likely to be inundated due to sea level rise due to global warming and such other areas as may be declared by the concerned authority (Central/State/UT).
CRZ-II	Areas that are already developed up to and close to the shoreline. For this purpose, "developed area" is that which falls within the municipal limits or in other legally designated urban areas which is already substantially built up and which have been provided with drainage and approach roads and other infrastructure.
CRZ-III	Relatively undisturbed areas that do not belong to either I or II. This will include coastal zone in rural areas (developed and undeveloped) and also areas within municipal limits or in other legally designated urban areas which are not substantially built up.
CRZ-IV	Coastal stretches in Andaman & Nicobar, Lakshadweep and small islands, except those designated as CRZ-I, II, or III.

Note: The CRZ Act is with effect from 19/2/91. Therefore all the prohibitions and regulations apply from that date. Any change in land use after 19/2/91 within the CRZ must be in accordance with the provisions of the act. For example, an area is considered to be “developed” or “substantially built up” or the status of the existence of a road or other infrastructure must be based on the status as on 19/2/91.

It is quite evident that the notification is only a preliminary step in this direction and *not* a comprehensive legislation. Its aims are rather limited, confined to regulating certain acts in a narrow, geographically defined, strip of the coast. In particular, it does not recognize the intimate links between aquatic and landward sides of the shoreline.

Its most glaring drawback is the complete absence of a seaward component in the definition of the CRZ. A major drawback of the CRZ Notification is that while its provisions are supposed to apply to 'coastal stretches of seas, bays, estuaries, creeks, rivers and backwaters which are influenced by tidal action' and several other ecologically sensitive areas along the coast, the actual protection zone defined by it covers only an extremely narrow strip of the shoreline.

As evident from several discussions on the issue, the regulatory authority proposed to be set up does not make any provision for representation of the stakeholder and the public. There are no provisions for either public hearings or information disclosures. It is thus a continuation of the existing environmental protection acts and does not contain any new progressive elements. This is despite the Panchayati Raj Act and the concept of joint ecological management that is replacing the approach of managing from above.

A careful reading of the act shows that the communities traditionally dependent on the coast for their livelihood, who in most cases have lived in harmony with the coastal environment have little to lose by the stringent implementation of the act. In fact, they stand to gain a lot. The development pressures which threaten their livelihood would be inhibited by the act. The act will help to rejuvenate the coastal ecology in several ways. It can lead to substantial improvement in the quality of coastal habitats.

Further, if the state and local authorities are committed to the protection of environment and are not misled by the environmentally and socially irresponsible noises made primarily from the industry (in its broadest sense), there are possibilities of embarking on new forms of development with community participation. Restoration of coastal ecology, such as restoring mangrove vegetation, safeguarding habitats for migratory birds and other animals, could form part of such initiatives. The state governments (Kerala is no exception), unfortunately, have tended to neglect the responsibility to safeguard environment and have been far too much in favour of the arguments against enforcing environmental protection acts.

The CRZ and CZM is not just a matter of zoning and regulating development on the shore, but are one part of a strategy for coastal biodiversity conservation and ecologically balanced sustainable development of the coastal areas. The threats to ecology of coastal waters, affecting not merely the marine biota, but also that of sustaining an important food source for human communities is at the heart of CRZ and CZM.

4. Kerala Coast: Ominous Developments

Under the physiographic conditions of Kerala, the population density has tended to increase towards the coastal region. Even the unstable coastline has not deterred large human settlements in close proximity to the sea. Out of a total area of 38,863 sq. km. of Kerala, 3,355 sq. km. falls in the coastal area supporting a population of 72.72 lakhs. The density of coastal urban population is 4,228 per sq. km., as compared to the average urban density of 2,097 in the state. The coastal rural population density is 1700, far above the state average rural population density of 603. Considering the large number of people, the high concentration of industries, the existence of small and large ports, and the enormous fishing potential, the question of limiting development or putting in place a regime of regulatory measures for human activities on the coast is bound to be a highly contentious. The complexity of these problems is spelt out in the coastal zone management plan prepared by Centre for Earth Science Studies, Trivandrum[5].

The development efforts in Kerala on the coast have repeatedly ignored the ecological importance of the coastal waters and the backwater system. The development activities in and around the Cochin Backwater System (CBS) or the Vembanad Kayal has in it all the complexities and environmental dilemmas of coastal area development. The construction of the Cochin harbour between 1930 and '40 and the creation of the Wellington Island signify the beginning of dramatic changes in the CBS. This led to the ascendance of Cochin region as the major industrial and commercial centre of the state. The rapid growth in the region accompanied by very high population growth, housing shortages, haphazard industrial and commercial development along transportation corridors greatly increased the problems of urban development[6]. The severe environmental impacts on the CBS and its aquatic resources due to the pressures of material, infrastructural and spatial needs of industrial development have been noted even in the late 60s and early 70s.[7,8]

The hydrologic changes in the CBS were mainly on account of port extension, large scale land reclamation, construction of dams on the rivers that discharge into the backwaters, diversion of water flows by the construction of spillways such as the one at Thottapally and barriers to estuarine circulation by the construction of salt water barrier at Thanneermukkam. The concentration of chemical industry and the intensification of agriculture in the Kuttanad region closely linked to the CBS, have increased the pollution loads in the backwaters (from point and non-point sources). It is to be noted that for a long period there were no pollution control regulations and the untreated effluents including those from heavily polluting industries were being discharged into the backwaters. Even with pollution control regulations, the enforcement and monitoring are far from adequate.

The ecological changes brought about by the construction of the Thanneermukkam Salinity Barrier across the Vembanad Kayal (or the Cochin Backwaters) in Kerala are a constant reminder of the close links between coastal waters and the ecosystem of coastal area. The reclamation of backwater carried out by the Greater Cochin Development Authority further altered the geometry and bathymetry of the backwaters, changing the flow regimes and circulation. Recently ecologists have expressed serious concern regarding the soundness of the grand development plan for islands adjoining the Ernakulam mainland consisting of large scale land reclamation work and construction of several bridges in the backwaters.

The massive project under the Goshree Island Development Authority which entails further alterations, particularly severe changes in the geometry of the backwaters in complete violation of the CRZ has been criticised on both socio-economic and environmental grounds[9]. The project is to be carried out in three phases for the development of Vypeen and other islands. The first phase will consist of major works such as reclaiming a total of 154 hectares of land from the Cochin backwaters, the construction of four bridges linking the different islands, over 13 km by way of roads and the execution of a master plan for tourism development for creating facilities such as parks, golf courses, and the development of Cherai beach as a resort. The second phase envisages reclamation of another 90 hectares from the backwaters. And in the third phase it is proposed to develop 128 hectares around Vallarpadom. Environmentalists have also questioned the validity of the environmental clearance given by the Ministry of Environment and Forests.

The Bakel Project is another grandoise project promoted by the state government as an exclusive beach resort for tourists in north Kerala (Kasargode). The project has not been subjected any serious environmental review. The project in its present form can be executed only by violating the stipulations of the CRZ. Besides, the developments planned under the project will entail considerable urbanisation close to the coast with serious impacts on the coastal waters. In addition, it will adversely affect the daily lives of the traditional coastal communities significantly. Moreover, the long term economic benefits of the project are not clear in the absence of any meaningful cost/benefit analysis. EQUATIONS - a Bangalore based NGO has examined the ramifications of the tourism policies of the state and central governments. They have raised several pertinent questions regarding the tourism projects, such as the Bakel Project[10] and raised several questions regarding the approach to tourism development.

5. CRZ, Kerala Government and Community Participation

Given the fact that the Kerala's development experience has thrown up a large environmental constituency, and has resulted in large mobilization of people under the aegis of 'people's science movements', the elected representatives of the people can be expected to voice some of these concerns. Moreover, a state government with avowed social concerns can be expected to take a somewhat balanced view of the environment/development dichotomy and not take sides in haste on a sensitive issue. That this has not happened may, perhaps, be one of the many ironies of Kerala's development experience, which needs further examination by social scientists. Besides this curious quirk of 'real politick', there is also another irony to the CRZ controversy. This has to do with the fact that much of the scenic beauty of Kerala is inseparable from its complex coastal landscape. While the CRZ, in fact, will go a long way in preventing the wanton destruction of this landscape in the name of development, those who oppose it, including the tourism industry[*], appear to ignore this link.

The responsibility for enforcement and monitoring of the Environmental Protection Acts are vested with the state government and its declared opposition to the law should be of serious concern to citizens. It also brings to the fore the need for independent regulatory authority in enforcing environmental protection laws. It is one thing for the state government to differ with the provisions at the appropriate time and quite another to side with those who want to violate the law! Moreover, the desirable approach in the matter would have been to strictly implement the act pending a larger debate or public hearings on the issue, facilitating a highly informed debate. In a highly literate state such as Kerala, where these issues are being debated even in small community meetings, such a course would have been very rewarding in improving the proposed legislation.

[*] The successive state governments in Kerala have tended to accord high priority to tourism industry. However, the kind of tourism promoted on the coast not only ignores the ecology, but also threatens the livelihood of traditional communities living on the coast. Despite political and ideological postures, the approach to tourism of different state governments is marked by a convergence with the views of the tourism industry which is set on a path of cultural and ecological destruction of the coast.

The approach of Government of Kerala on the CRZ has neither facilitated an informed debate on the issue nor revealed any serious thinking on the part of the state. Most of the objections that are articulated against the act were well known at the time the act was being formulated. All states including the Government of Kerala, also had ample time to record its views on the matter. The attitude also reveals a closed mind of the state administration to the delicate task of evolving a sound environmental policy framework for the development of the state. The state which is expected to enforce the environmental protection acts appear to be aggressively opposed to strict enforcement and monitoring of such laws. This attitude also brings home the sad truth that the political parties are yet to take environmental issues seriously and are far from recognising the need to elevate sustainable development paradigm into the realm of political practice.

The demand for dilution of the CRZ and making 'exceptions' to Kerala or for that matter any state, is not marked by a sound consideration of either economics or ecology of the coastal region. Unfortunately, the CRZ act, which is a step in the right direction, despite all its shortcomings, and which is in the interest of fishing communities as well as the majority of people living in the coastal areas, is portrayed as 'anti-people'. However, the concerns attributed to ‘people’ find a strange convergence with that of certain industries whose record of socially and environmentally irresponsible conduct is only too well known. In fact, it is precisely the (mis)conduct of certain industries that has given a sense of urgency for the implementation of CRZ.

Joint management of resources is the new approach to ecological management. The concept itself is being refined and operationalised. However, there are many successful cases of joint forest management. The approach could also be applied to the implementation of the CRZ as well as for drawing up sustainable development strategies for the coast. There are 200 coastal panchayats affected by the No-Development Zone (NDZ) under the State Coastal Zone Management Plan. The plan categories about 68.58% (341.83 sq. km) of the total CRZ area of 498.58 sq. km under CRZ-III. As has been pointed out in the recent debates widely reported in the press[11], a rehabilitation programme can be effected though the Coastal Zone Development Authority. It is also to be noted that the informed sections of the fishing community have by and large favoured the implementation of the CRZ, even as they recognize its limitations.

The Panchayati Raj institutions in Kerala, can seize the opportunity and enlist the participation of communities living on the shore in the sincere implementation of the CRZ and monitoring the compliance. The regulations can be turned into an advantage to improve the quality of both life and environment. The possibilities opened up by the lively decentralised democracy in Kerala, provides a rare opportunity for both a participatory regime of CRZ implementation and people's involvement in developing a CZM Action Plan. The memorandum submitted by the KSSP to the Legislative Committee on Environment contain such suggestions.

It may be of some interest to look at the State of California in USA, which has the most stringent environmental protection acts among the different states in the US. The development experience of Kerala has many ingredients in it to permit such a comparison. The community participation in environmental regulation is also rather high in California. In fact there are instances where the local communities in California have enforced rather strict regulations on use of resources such as water. Even in a sector such as energy, rather strict regulations covering both demand and supply side management have been enforced to ensure compliance with energy conservation policies. The environmental protection laws in India have followed the US model and have several features of the US law, wherein the federal legislation provides the model act, laying down the bottom line, beyond which regulations cannot be relaxed by the states. The states, however, are free to enact stricter laws if they chose to. Kerala with its high densities of population confined in a small geographically well delimited areas, need to look at sustainable development more seriously. Diluting the regulatory regime of CRZ and accelerating the urbanization will lead to rapid increase in the population density in the coastal areas besides promoting a highly unsustainable use of the resource base.

6. Case for a larger coastal management zone

The CRZ Act has several important shortcomings. As noted earlier, it is primarily regulatory and does not have a proactive focus[12]. It fails to address the concerns of protecting biodiversity of the shoreline and coastal waters. The complex issues arising from the linkages between coastal marine life and the activities in the coastal region are not reflected in the approach to the CRZ and CZM.

Several provisions are nothing more than a declaration of good intentions. The enforcement and regulatory regimes are not spelt out clearly. Just like many other regulations, it lacks teeth and is not equipped enough to chew what it can bite. It is possible in Kerala, than else where, to rectify these lacunae. It is important that public opinion be mobilised for preventing the certain destruction of the coastal ecology in pursuit of short term economic gains. It is also important to note that the CRZ and a well thought out CZM will not seriously impede economic development; it will only ensure that the industry is forced to take its environmental responsibilities seriously as is being increasingly insisted upon by more and more communities.

It can be seen that development activities have an important bearing on coastal waters and aquatic life. There is strong relationship between quality of waters in the backwaters and the coastal waters. Changes such as that of flow regimes, salinity mixing patterns and circulation, flushing action and tidal mixing affect biotic elements in the coastal waters. All these are also linked to the question of sustainable yields in the case of fishing. Similarly the barriers to saline circulation in estuarine waters and backwaters will not only affect the natural biota in these waters, but create undesirable ecological conditions upstream of the barrier as is evident in the case of the effects of Thanneermukkom Salt Water Barrier in the Vembanad Estuary.

Considering the close relationship between coastal area (landward side) and the coastal marine waters (the seaward side), the Subsidiary Body on Scientific, Technical and Technological Advice to the Convention on Biological Diversity (SBSTTA/CBD) has favoured an approach that integrates marine and coastal area management[13]. The SBSTTA considers such an approach as the framework for addressing impacts of land-based activities on coastal biological diversity. This, is possible by minimising or eliminating inputs of pollutants (including persistent organic and radioactive substances, excessive nutrients and sediments), in particular those arising from municipal waste, industrial effluent, deforestation, watershed degradation, mining and unsustainable agricultural practices.

Some of the basic principles[14] of Integrated Marine and Coastal Area Management (IMCAM) are given below:

1. The coastal area is a unique resource system which requires special management and planning approaches.

The coastal ecosystems and key coastal habitats, for instance, coral reefs or mangrove forests, are distinctive and extremely productive. The traditional land-based or marine-based forms of management and planning needs to be modified to be effective for the coast, at the transition between land and sea.

2. The land and sea uses needs to be managed in combination

The coastal zone needs to account for lowlands, intertidal areas, lagoons and open waters as a single interacting unit that lies between the upland and the open sea. Ecologically, development activity located anywhere near coastal areas has the potential for damage to the coastal water ecosystem. Because of these reasons, the land and sea uses needs to be planned in combination. The relationship

between the 'dryside' and 'wetside' of the coast or between the terrestrial and marine ecosystems precludes the effective management of a marine or estuarine resource system without concurrent management of adjacent land.

3. Coping with the natural hazards and conservation of natural resources needs to be combined in IMCAM programmes.

The coast is prone to numerous threats and development on the coast has to account for the existence of such threats. It is now well recognised by planners that the measures best suited to conserving ecological resources are often not different from those required for conserving economic resources. Maintenance of natural landform is an important component of this approach.

4. An Environmental Impact Assessment (EIA) approach must be preferred to other approaches.

The EIA approach implies that likely impacts of activities/projects on the coastal zone need to be taken into account rather than the location of the activity. The SBSTTA, for instance, emphasises the need to carry out EIA of all major coastal and marine development activities with special attention to the conservation of marine and coastal biodiversity, taking into account the *cumulative* impacts.

5. The SBSTTA also emphasises participation of communities in resource management as another important component of the IMCAM.

Combined marine and coastal area management needs to be promoted as a participatory process for decision making to prevent, control or mitigate adverse impacts from human activities in the marine and coastal environment and to contribute to the restoration of degraded coastal areas.

7. Conclusion

There are large knowledge gaps in our understanding of the coastal ecosystems. There is need to fix fishing limits based on a detailed knowledge of the fishery resources and stability of the habitat. The quotas need to be defined for different kinds of fishing. A detailed inventory of coastal biodiversity is also lacking and the implementation of coastal zone management plans must be complemented by a rapid survey of the biological diversity. Based on these surveys guidelines need be worked out for the protection of threatened species. This also means that it is necessary to establish habitat requirements, relationships between different communities and understand the migratory patterns in coastal area, estuarine environment and marine waters.

The aim of this paper has been two fold: a) to emphasise the urgent implementation of Coastal Regulation Zone (CRZ) and b) to articulate a case for a more stringent and comprehensive approach to coastal zone management covering both the coastal land and water. The CZM needs to cover both landward and seaward sides. It is argued that regulating the activities on a narrow strip along the shore is inadequate to protect the coastal and associated ecosystems. The CZM needs to be based more on periodic assessment of environmental impacts than on mere static zoning to regulate development. It must form part of a larger strategy for conservation of biodiversity and ecologically balanced sustainable development on the coast.

With respect to the Kerala coast, it is argued that:

a) CRZ Act needs to be not only implemented in full but also its scope needs to be extended.

b) The people of Kerala have more to gain by strengthening the CRZ Act than diluting it.

c) The possibilities opened up by the lively decentralised democracy in Kerala, provides a rare opportunity for both a participatory regime of CRZ implementation and people's involvement, particularly of the coastal communities, in developing a CZM Action Plan.

Kerala's development experience has amply demonstrated that economic gains based on ecological degradation have proved to be unsustainable even in a narrow economic sense. The coastal area and waters are no exception. Ecologically balanced sustainable development on the coast needs to view the coast as a little more than just the shore.

Appendix

Extracts from the notification S.O. 114 (E) dated 19 February 1991, issued by the Govt. of India, MEF issued under sections 3(1) and 3(2) of the Environment (Protection) Act, 1986 and rule 5(3)(d) of Environment (Protection) Rules, 1986.

Norms for Regulation of Activities:

The development or construction activities in different categories of CRZ areas shall be regulated by the concerned authorities at the State/Union Territory level, in accordance with the following norms:

CRZ-I

No new construction shall be permitted within 500 metres of the high ride Line. No construction activity, except as listed under 2(xii), will be permitted between the Low Tide Line and the High Tide Line.

CRZ-II

i. Building shall be permitted neither on the seaward side of the existing road (or roads proposed in the approved Coastal Zone Management Plan of the area) nor on seaward side of existing authorised structures. Buildings permitted on the estuaries side of the existing and proposed roads / existing authorised structures shall be subject to the existing local Town and Country Planing Regulations including the existing norms of FSI / FAR.

ii. Reconstruction of the authorised buildings to be permitted subject to the existing FSI / FAR norms and without change in the existing use.

iii. The design and construction of buildings shall be consistent with the surrounding landscape and local architectural style.

CRZ-III

i. The area upto 200 metres form the High Tide Line is to be earmarked as 'No Development Zone'. No construction shall be permitted within this zone except for repairs of existing authorised structures not exceeding existing FSI, existing plinth area and existing density. However, the following uses may be possible in this zone - agriculture, horticulture, gardens, pastures, parks, play fields, forestry and salt manufacture from sea water.

ii. Development of vacant plots between 200 and 500 metres *of* High Tide Line in designated areas of CRZ-III with prior approval of Ministry of Environment Forests (MEF) permitted for construction of hotels / beach resorts for temporary occupation of tourists / visitors subject to the conditions as stipulated in the guidelines at Annexure-II (*of the notification*).

iii. Construction reconstruction of dwelling units between 200 and 500 metres of the High Tide Lire permitted so long it is within the ambit of traditional rights and customary uses such as existing fishing villages and goathans. Building permission for such construction / reconstruction will be subject to the conditions that the total number of dwelling units shall not be more than twice the number of existing units; total covered area on all floors shall not exceed 33 per cent of the plot

size; the overall height of the construction shall not exceed 9 metres and construction shall not be more than 2 floors (ground floor plus one floor).

iv. Reconstruction / alterations of an existing authorised building permitted subject to (i) to (iii) above.

CRZ-IV

Andaman & Nicobar Islands:

i. No new construction of buildings shall be permitted within 200 metres of the HTL;

ii. The buildings between 200 and 500 metres from the High Tide Line shall not have more than 2 floors (ground floor and 1st floor), the total covered area on all floors shall not be more than 50 per cent of the plot size and the total height of construction shall not exceed 9 metres;

iii. The design and construction of buildings shall be consistent with the surrounding landscape and local architectural style.

iv. Corals and sand from the beaches and coastal waters shall not be used for construction and other purpose;

v. Dredging and underwater blasting in and around coral formations shall not be permitted; and

vi. However, in some of the islands, coastal stretches may also be classified into categories CRZ-I or III, with the prior approval of Ministry of Environment and Forests and in such designated stretches, the appropriate regulations given for respective categories shall apply.

Lakshwadeep and small Island:

i. For permitting construction of buildings, the distance form the High Tide Line shall be decided depending on the size of the islands. This shall be laid down for each island, in consultation with the experts and with approval of the Ministry of Environment & Forests, keeping in view the land use requirements for specific purposes vis-à-vis local conditions including hydrological aspects, erosion and ecological sensitivity:

ii. The buildings within 500 metres from the HTL shall not have more than 2 floors (ground floor and 1st floor), the total covered area on all floors shall not be more than 50 per cent of the plot size and the total height of construction shall not exceed 9 metres;

iii. The design and construction of buildings shall be consistent with the surrounding landscape and local architectural style.

iv. Corals and sand from the beaches and coastal waters shall not be used for construction and other purpose;

v. Dredging and underwater blasting in and around coral formations shall not be permitted; and

vi. However, in some of the islands, coastal stretches may also be classified into categories CRZ-I of II or III, with the prior approval of Ministry of Environment & Forests and in such designated stretches, the appropriate regulations given for respective categories shall apply.

8. End Notes

[1] The broad definition for sustainable agricultural and rural development used by FAO goes as: "...the management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in the agricultural, forestry and fishery

sectors) concerns land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable, and socially acceptable..."

[2] Baretta, J. and Ruardij, P. (ed.), Tidal Flat Estuaries: Simulation and Analysis of the Ems Estuary, Springer-Verlag, Berlin, 1988.

[3] Notification S.O. 114 (E) dated 19 February 1991, issued by the Govt. of India, MEF issued under sections 3(1) and 3(2) of the Environment (Protection) Act, 1986 and rule 5(3)(d) of Environment (Protection) Rules, 1986.

[4] High Tide Line is the line connecting the highest points to which water has reached during tidal action over several years. The HTL must account for long cycles in tidal pattern which occur with periodicity as large as19 years. According to the notification, the HTL is the line on the land upto which the highest water line reaches during the spring tide and shall be demarcated uniformly in all parts of the country by the demarcating authority so authorized by the Central Government in consultation with the Surveyor General of India.

[5] Integrated environmental study for coastal zone management of Kerala state, Centre for Earth Science Studies, Trivandrum, 1980

[6] Development Plan for Cochin Region. Part 1. Basic Plan. Prepared by the Department of Town Planning. Government of Kerala, 1977.

[7] Shetty, H.P.C. (1965) Observations on the fish and fisheries of the Vembanad backwaters, Kerala. In: Proceedings of National Academy of Science, India. Section B, Vol XXXV, Part 1.

[8] Jingran, V.G. and Gopalakrishanan. Multifarious uses of the coastal areas suitable for aquaculture developemnt. Indo-Pacific Fisheries Commission, 15th Session, Wellington, New Zealand, 10-27 Oct. 1972.

[9] Seethi, K.M., Destruction of unique ecosystem of Kochi Backwaters. Economic and Political Weekly, July 22, 1995.

[10] Coastal Zones: an overview. EQUATIONS (Equitable Tourism Options), Bangalore, 1995.

[11] Curbs on coastal dwellers, The Hindu (Cochin Edition) p.5, 15, Nov. 1996.

[12] Chandrika Sharma, 1996. Coastal Area Management in South Asia (Background paper) The South Asian Workshop and Symposium on Fisheries and Coastal Area Management: Institutional, Legal and Policy Dimensions, Madras, 26 Sept. - 1 Oct. 1996.

[13] SBSTTA/2/14, Report to the Conference of Parties, 24/7/96., United Nations Environment Programme, Convention on Biological Diversity, Second Meeting, Montreal, 2-6 Sept., 1996.

[14] Integrated Management of Coastal Zones, FAO Fisheries Technical Paper 327, pp.48-66, Clark, J.R., Fifteen principles of Integrated Management of Coastal Zones.