CHAPTER 4 CONCLUSION AND RECOMMENDATIONS

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4.1 The Changing Patterns of Mangrove Utilisation

Saenger et al. (1983) attribute the general cause of mangrove destruction and degradation to the preference for short-term exploitation for immediate economic benefits, rather than longer-term but sustainable use. Expanding on their basic classification, five specific types of human interference causing mangrove destruction can be suggested:

- 1. Over-exploitation by traditional users, e.g. excessive removal of trees for fuel wood, especially charcoal;
- 2. Activities requiring maintenance of the mangrove ecosystem, e.g. rotational felling and replanting of mangrove stands for wood production;
- 3. Natural resource activities destroying the mangrove resource which require little
- \checkmark or no inputs from it, e.g. coastal agriculture; salt production; intensive aqua culture;
 - 4. Other activities, generally unrelated to the mangrove ecosystem, which completely
 - _ destroy it, e.g. harbours, factories and other forms of coastal industrialisation or urbanisation; and
- Off-site activities unrelated to the mangrove ecosystem but detrimental to it, e.g.
 offshore dredging, coastal pollution, diversion of upstream freshwater sources for irrigation etc..

In general there is an increasing rate or scale of impacts associated with the above and a given mangrove area can be affected by several different activities simultaneously, or over time as land use patterns change. The mangroves which used to fringe the coastal areas near Mumbai and Thane are good examples. Today these areas are almost devoid of mangroves, but originally the mangroves were extensive; they would have served principally as the fishing grounds for local people and a source of wood products.

The inner mangroves were cleared, starting several decades ago, to create shallow ponds for salt production and canals were constructed through the mangroves for access and to carry seawater to the salt pans. Wild fish production in the wet season, alternating with salt production in the dry season, was introduced in early twentieth century, giving a further economic reason for mangrove conversion by local people.

In other mangrove areas around Mumbai and in south Maharashtra it may have been agriculture expansion, reclamation for urbanisation or shear destruction of the mangrove habitat by tree cutting for several purposes. As it is mentioned earlier the mangrove are on decline in the country, the rate of which is aggravated in the so called progressive and industrialised states like Maharashtra. Government of India in order to arrest the onslaught on mangrove ecosystems made certain changes in the existing legislation.

4.2 Coastal Regulation Act and Its Implementations

The importance of the coastal zone is illustrated by the fact that about 60% of the worlds population lives within 60 of the sea (it is likely to increase to 75% by 2020). Coastal ecosystems have a variety of goods and services which have an economic value and thus they provide numerous livelihood opportunities, encouraging concentrations of population and development activities in the coastal zone. Many of ecosystems s inshere waters, estuaries, backwaters, lagoons, brackish water, lakes, mangroves and corals etc. are found here and 95% of the marine capture fisheries is derived from coastal waters.

Thus it is not surprising that activities in the coastal zone in the countries make a significant contribution to the GDP of the national economy. The social economic and environmental significance of the boundary between the land and ocean is now widely recognised. There are direct links between coastal environmental functions and the generation of the goods, which may be used more than one form of the activity. There is high competition within the coastal zones within various stake holders, which often results in conflicts, and degradation of the resource system. Having the high concentration of the human settlement, it is the perfect site for urban development. Sustainable development for livelihoods for coastal communities are therefore dependant upon effective management of all interested activities in coastal areas to achieve optimal use of both living and non-living resources and equitable distribution of the benefits arising.

With this in mind, The Ministry of Environment and Forests (MoEF), Govt. Of India in 1991 notified the Coastal Regulation Zone (CRZ) ACT, the details of which is given bellow.

Coastal Regulation Zone

Category

Description

CRZ-I

(a) Ecologically Sensitive areas (national/marine parks, sanctuaries, reserve forests, wildlife habitats, mangroves, coral reef areas close to breeding and spawning ground of fish and other marine life, areas of outstanding natural beauty/heritage, area rich in genetic diversity)

(b) Those falling between High Tide Level (HTL) and Low Tide Level (LTL)

(c) Those are likely to be inundated due to Sea Level Rise (SLR) arising out of global warming and such other areas as may be declared by the concern authority (Central/ State/Union Territory)

CRZ-II

Areas that are already developed up to the shoreline. For this purpose "developed area" is that which falls within the municipal limits or in the legally designated urban areas which are already substantially build up and which have been provided with drainage and approach roads and other infrastructure. Permission here will be given for construction of Sewage Treatment Plant (STP).

CRZ-III

Relatively undisturbed areas, that do not belong to either I or II. This will include coastal zone in rural areas (developed and under developed) and areas within municipal limits or in the legally designated urban areas, which are not substantially, build up. No construction up to 200 m from HTL. Permission required from MoEF for construction within 200-500 m. Tourism is allowed within 200-500 from the HTL with certain guidelines e.g. Heights of the resorts should not be more than 9 m etc.

CRZ-IV

Coastal stretches in Andaman and Nicobar, Lakshdweep and small islands, excepts those designated as CRZ-I,II.III.

The mangroves being considered as ecologically very sensitive and important, they are included in CRZ I category. The Implementation of the CRZ-I Zone is no damage to the original character of the ecosystem by providing adequate protection, no construction or build up area. No new construction shall be permitted within 500 meters of the HTL. No construction activity, except as listed under 2(xii) will be permitted under HTL and LTL.

Coastal Regulation Zone (CRZ) has many contradictory points over the implementation of the same. The uniform application of the no-development zone and the distance barrier throughout the coasts of India is unscrupulous, since the tidal effect varies from coast to coast. So also, the geomorphology of the coast is also not the same in all the places. Likewise in the draft notification dated 5.8.1999, the government has permitted the development of petroleum and natural gas industry which would have more impacts on the coasts. But, restraints are imposed on tourism and required constructions, which are comparably non polluting (Jacon, 1999).

4.3 Conclusion:

On Maharashtra coast 30 mangrove sites along the entire 720 km coastline, excluding Mumbai, were studied for a period of one year. From the observations it is clear that there has been significant decline in the quality and quantity of mangroves over the period of last twenty years. Considering the understanding of the local people about mangroves, lack of will and co-ordinated efforts to save them on part of the government and over exploitation of coastal resources including mangroves, there seem to be little hope for mangrove conservation today. And many believe that it is just matter of time before they are completely lost, their If proper precautions are taken to conserve the mangrove ecosystems it will directly helps to conserve the natural habitat. There are few mangrove sites in Sindhudurg districts on Kolamb sites Kandalgaon and Kolamb having mangrove area 5.35 ha. and 1.25 ha. respectively.

Over exploitation and unsustainable demand of the mangrove resources resulting damage to the ecosystem. Problems observed during field visits are Habitat destruction and conversion, continued deterioration with heavy harvesting or are altered for other uses. Encroachment of critical habitats viz. mangroves, swamp areas etc. is the main problem for habitat loss and fragmentation.

In Sindhudurg district Achara is an estuarine area with good mangroves which extends to distance of 5 km. from the mouth of the river. This region having mangrove area of around 273 ha is considered as "sacred" since the land belongs to the local deity of Shri. Rameshwar. The area provides excellent habitat for a large number of vertebrates specially birds, mammals and reptiles. Girye and Tirlot in the district also have good mangrove habitat.

In Ratnagiri districts, Jaitapur site with Jaitapur and Nate locations have good mangroves area of 78.89 ha and 80.0 ha respectively. Ratnagiri site has fragmented mangrove area at Bhatye, Shirgaon and Kalabadevi which needs to be protected as it has potential threat of increased human impact due to proximity of ever growing Ratnagiri city and industrialisation. At Jaigad site, Kasari has large mangrove area of around 284 ha. it should be conserved by giving special protection status. Veldur site having good mangrove, this area should also be protected as it is under serious threat due to construction of embankment (Kharland bund) by the Kharland department.

In Thane district Mumbra, Diwa and Vaitarna still have reasonably large mangrove area which should be protected. This area provides suitable habitat for several coastal organisms. However, dredging, of sand for construction, done periodically in the shallow areas of the estuaries is detrimental for the health of mangroves as it adversely affects ecology of the region.

Introduction of exotic species particularly through monoculture plantations by social forestry department needs a critical scientific review. In general, the mangrove afforestation programme that involves mainly *Avicennia* sp. is being implemented in India. Experts feel that these species that are growing like weeds do not allow other species to grow luxuriantly and reduce mangrove floral diversity.

State Government at one stage is keen to encourage fish farming in the coastal areas, including mangroves, though the past experience from east coast is disastrous.



Supreme Court has also banned conversion of eco-sensitive land for fish farming. However, local rich with political and government support, for whom these are the 'waste marshy lands' have been noticed involved in fish farming in mangroves and adjoining area on the coast.

Nalylor et al. (2000) have estimated a reduction of fish biomass of about 434 g for every kg of farmed shrimp. This is the best example for the monoculture practice to show how the shrimp culture makes its impact on the local biodiversity. This is mainly because of the habitat conversion, nutrient rich outlets etc.

The coastal zone receives wastes generated by land based activities including sewage, sediments and industrial effluents. Agricultural chemicals notably fertilisers and pesticides, which is currently increasingly used in the plantations and orchards in Konkan also contribute to the degradation of the quality of coastal waters thus affecting the dependent biodiversity. Most of the creeks, estuaries and mangroves were seen polluted during the present study.

Mangrove is one of the most sensitive however neglected area. Local people from neighbouring villages and the towns use these areas as dumping ground for domestic and industrial waste which is directly discharged in to the estuaries and coastal waters. This is a major threat to the mangrove flora and associated fauna.

In the study area river Vasishthi is one of the most polluted coastal rivers due to the discharge of industrial effluent from Lote- Parsharam MIDC near Chiplun. Mangrove flora in the inter tidal zone is though rich, due to the high concentration of toxic chemicals, fishes and other aquatic animals are reported killed regularly.

Mumbra and Diva have well-preserved mangrove patch. But it too is being increasingly used as a dumping ground for the municipal and industrial waste. Public sanitation facilities are either lacking or if present generally build along the sides of mangroves. These mangroves are also cleared for new settlements. Most of the mangrove areas is surrounded by paddy fields. The potential threat to the mangroves is from the excess chemicals and fertilisers used in the paddy fields which drain into mangrove area and may cause problems to the ecosystem. Oil pollution is also a major and growing problem along the coast and particularly in mangroves. Most mangrove sites are near fishing villages where a large number of macanised fishing boats are operated and anchored leading to spillage of oil. Similarly due to offshore oil drilling platforms, coastal navigation, discharge of ballast waters and coastal industries oil pollution is reported to be on the increase on the coast of Maharashtra.

Poaching of wildlife in mangroves is a common phenomenon in most extensive mangroves in south and south east Asia like Sundarbans in India and Bangladesh The royal Bengal tiger (*Panthera tigris*) is the best known example for hunting and poaching. After the ban on tiger shooting and the commencement of project tiger, its population has increased substantially. However, in recent times, poaching this species for skin and bones has proved to be a major threat to its existence. In Chilika Lake, 15,000 – 20,000 waterfowl are killed by poachers every year.

The Andaman and Nicobar Islands have diverse marine wealth including commercially important fishes. Illegal collections of such species have increased considerably, particularly by the people from neighbouring countries like Myanmar and Thailand. This kind of poaching is for sea cucumbers, corals, coral reef fishes, ornamental shells, saltwater crocodiles, sea turtles and endemic birds of the islands.

As the people around the critical habitats often find their agricultural practices non-profitable, they either knowingly or unknowingly, to meet their daily needs, take up to hunting and catching of wildlife around them. In the present study area also periodic hunting, poaching or capture of animals in mangroves was not very uncommon. The activity by the locals is modest and mostly for subsistence rather that organised for commercial gains. However, damage caused to the local biodiversity could be serious considering fragmentation of the last strong hold of the isolated mangrove habitat.

Mangrove over exploitation by clearing the area for agriculture, aquaculture, urban and industrial development and recreational use was very common sight in the study area. Increase in industrialisation and urbanisation is one of the main cause for decrease in the area of mangrove ecosystem in Thane and Raigad districts. However, it must be remembered that development of mangrove is a long-term process and does not generate economy at faster rate as it in other instant processes like industrialisation and agricultural processes.

Kharland Department of the State is going ahead full swing with all out effort to convert saline and mangrove lands, for creating new agricultural area or converting the already saline fields, with funding received from the World Bank. While doing so no adequate attention is given to protect and conserve the existing vital mangrove ecosystems. At the same time mostly futile efforts are made by the Social Forestry Department of the same government to replant mangroves with great efforts by spending time, money and efforts. This contradictory effort was noticed in many study sites.

Kasari is a small village in Ratnagiri district having mangrove area of 284 ha but due to the construction of a wall by the Kharland Department, sufficient saline water required for the growth of mangrove has stopped reaching the plant which has directly affected the growth of mangrove vegetation. Village Murdi had patch of mangrove vegetation, which was on private land, recently it was cleared for construction of a school building thus permanently loosing the mangroves locally.

The fishing is carried out during the monsoon and post monsoon seasons in back waters and estuaries, where mangroves exist as important bird habitats, has a bearing on the avifauna of the area in the form of disturbance to the foraging birds by reducing the available food organisms, besides hunting.

Tourism

The increasing tourism is said to be exerting pressure on the fragile mangrove and other coastal ecosystems. Particularly on the foraging birds in the form of disturbances and other pollution related problems in the important bird sanctuaries like Chilka and Point Calimere wildlife and bird sanctuary. Considering Sindhudurg district being declared by Maharashtra government as tourism district with proposals to convert all undisturbed and pristine coastal habitats for "nature tourism" the threat to the fragile mangrove biodiversity along with other coastal biodiversity is eminent. Our past experience of such experiments elsewhere is not much encouraging and therefore we must learn from the mistakes committed earlier.

Local poor who do not afford to purchase daily fuelwood due to insufficient income, depend heavily on the mangroves for the fuelwood requirements. It was observed in some of the sites that the area in and around mangroves is used by cattle and buffaloes for foraging on mangrove leaves

Social, political and economic inequities are prominent in the study area Fortunately or unfortunately, most of the biologically critical areas are rural in nature like in this case coastal mangroves. So, there is every possibility for the pervading of social and economic prejudices. This sort of discrimination drives the people to get accustomed to evil practices of killing wildlife, birds and other fauna for their benefits.

One of the important problems faced in the implementation of programmes related to coastal or mangrove biodiversity conservation is lack of administrative coordination among different government agencies such as Zoological Survey of India, Botanical Survey of India, Fisheries Survey of India, State Fisheries Department, State Forest Department etc. which are supposed to be either directly or indirectly involved in conservation activities. In reality there is very little integration and coordination in planning and implementation at local or regional level between these agencies. Sharing the data and expertise available with them and taking lesser time to mobilise things for implementation of conservation programmes will help a great deal.

Many of the problems observed during the field study in Goa and the middle Andamans, particularly those caused by humans can be traced to the following causes, which need to be addressed if mangroves are to be sustainably conserved.

- The poverty of the local inhabitants, which forces them to depend on the mangroves for their fuelwood, timber and fodder requirements even if the collection is illegal.
- Increase in population, resulting in more pressure on mangroves.

- Lack of education and awareness regarding the importance of mangroves, and ignorance of rules and regulations regarding conservation of mangroves.
- Improper planing of development activities such as aquaculture, agriculture, construction for human habitation, mining and industrialisation.
- Short supply of fuelwood, timber and fodder at affordable prices.
- Absence of a systematic survey of the area and the ownership of the land under mangrove facilitating encroachment on this land
- Difficulties of protection because of the scattered geographic distribution of mangroves.
- Acute shortage of government staff and other infrastructure.

Threats to mangroves perceived in the present study are

- 1) Biotic Pressure: Biotic pressure for fuelwood is noticed in areas near human habitation and is a major threat.
- Reclamation of saline lands for agriculture purpose: Construction and maintenance of embankment to bring the estuarine areas under agriculture use has resulted in reduction of mangrove habitat.
- 3) Pollution: As a consequence of greater industrialisation, the tendency to discharge effluent wastes in the in the water courses is on the increase, some of which are toxic ill effects on the estuarine system are becoming obvious.
- 4) Diversion of fresh water inflow in estuaries also has bearing on the flushing effect on the mangroves affecting their continued survival and distribution.
- 5) Natural threats : Some of the natural threats along the Indian coast are sea level changes, geotectonic movements and cyclones.

4.4 Recommendations:

Programs should be arranged to raise awareness among the local people about mangroves. People should get convinced regarding importance of mangrove for their sustenance. Local peoples will play an important role in maintaining the mangrove ecosystem and the important biodiversity in the coastal area of the Maharashtra. Local peoples are educated but still unaware about the importance of the mangrove ecosystem. Therefore campaign should be conducted all over in the coastal areas especially in the estuarine regions by which people get motivated to in the conservation of mangroves. Policies used in the Joint Forest Management programmes can be helpful here.

People's involvement in mangrove management on public lands should be encouraged as much possible. Programmes to raise peoples awareness of the importance of mangroves i.e. through films, exhibitions, newsletters, magazines posters, stickers, brochures, banners, seminars, nature camps, bird watching, study tours in mangrove forests, establishment of mangrove parks in the mangrove areas close to towns and the celebration of mangrove conservation day with essay competition, debates and drawing competitions.

Participation of local peoples plays important role in conservation of mangrove ecosystem. Under the Divisional Forestry Dahanu, Range Forest Office Bhoisar has undertaken a project. Forestry preparing a mangrove nursery and planting this mangrove plants into the estuarine area. Forest department involved local peoples for protecting and conserving this nursery. Creating public Awareness and capacity building is therefore very essential. People should be made aware of the importance of mangrove ecosystem and the dangerous consequences of its destruction.

State Government should formulate a long term proper management policy for mangrove conservation by involving local people. The government should encourage and involve Grampanchayats, local self-government agencies and the local community in conserving mangroves. The government should implement attractive schemes, also for the private landowners, by giving them incentives to protect fragmented but vital mangroves, on their land. The local community should be empowered to mange the mangrove resource on sustained basis with out causing harm to biodiversity and its ecological functions.

Eco- friendly activities involving alternative options and livelihood opportunities be conducted, by which local people are directly benefited. Nature camps and eco-tourism in the mangrove should be conducted at regular intervals by which experts in the concern fields will give valuable guidance to the interested locals and the students who have affinity towards nature and wildlife conservation. Wherever there is need to reforest the degraded areas of mangrove plantation of suitable species be made with the help of students and locals. This will not only be cost effective but ensure its protection and conservation in future.

Our understanding about the mangrove dynamics and biodiversity is much limited. Therefore Government should encourage universities and research institutions to undertake short-term studies and long term monitoring of mangrove habitats. This will enable the planners to decide about the conservation priorities in time.

Encroachments, reclamation, illegal cutting of mangrove vegetation are some of the root cause for the decline of mangroves. Coastal Regulation Zone act should be strictly implemented with out exception. There should be long term planning at the regional level for the protection and conservation of mangroves and at no cost, by political or any other intervention, there should be any deviation in this policy. Careful planning of sustainable coastal developmental programmes needs to be made at the central and state level.