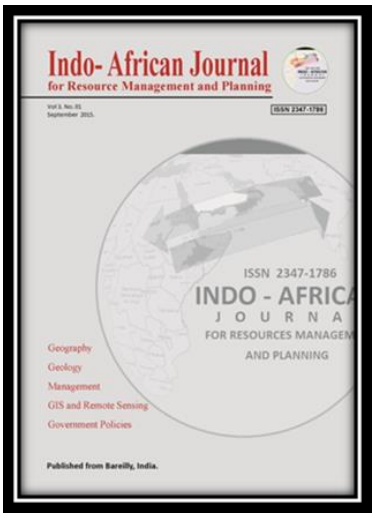

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Depleting Marine Environment Resource of Indian ocean: A Pressure in Future

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ABSTRACT

The marine environment resource, which includes the adjacent coastal areas, supports productive and protective habitats such as mangroves, coral reefs and sand dunes. The marine environment resource is facing a number of pressures, arising out of the needs of people, and the multiple uses that coastal and marine areas can be put to. These pressures contribute to the depletion of marine resources and degradation of the marine environment. In the absence of good management, these pressures may result in severe stress.

This paper also presents a brief overview of the institutional set-up of the marine sectors in India. This is followed by a summary of the major programmes relevant to this sector, followed by highlights of the policies and programmes undertaken by the Government of India to meet the objectives with regard to marine resources. The government policies and programmes are analyzed in the context of this paper. The chapter concludes with recommendations for a cleaner and healthier marine environment resource of Indian Ocean.

The Indian Ocean harbours an array of non-energy renewable and non-renewable resources. Various political, technological, and environmental factors affect the economic potential for developing these resources. The most commercially viable industries are fisheries and minerals. This paper will outline the current status of exploitation, emerging and existing trends, the future implications of these trends, and various legal and governance regimes that have sought to manage resource development in the region. This paper thus lays out certain programmes for the sustainable development of the marine environment resource of Indian Ocean.

Keywords*: Marine habitation, Biodiversity, Flora & Faun, Aquaculture, Coastal Communities, Exclusive Economic Zone.*

Introduction:

India has a long coastline of more than 7500 km. Its marine resources are spread over in the Indian Ocean, Arabian Sea, and Bay of Bengal. The exclusive economic

zone (EEZ) of the country has an area of 2.02 million sq km comprising 0.86 million sq km on the west coast, 0.56 million sq km on the east coast and 0.6 million sq km around the Andaman and Nicobar islands. The east coast supports activities such as agriculture and aquaculture while a number of industries are supported on the west coast. Tourism has emerged as a major economic activity in coastal states such as Goa, Kerala and Orissa. Mangrove cover in India has been estimated at approximately 3, 15,000 ha confined mainly along the east (Orissa and West Bengal) coast and Andaman and Nicobar Islands. The Sunderbans in West Bengal have one of the largest mangrove forests in the world. The mangrove flora of India is comprised of 50 exclusive species belonging to 20 genera. Some of the common and economically important species include *Mugil cephalus, Hilsa ilisha, Lates calcarifer, Scylla seratta, Meretrix casta* and *Crassostrea grephoides*. According to the
latest valuation (Rao, Molur and Walker, 1999) 67 % of the mangroves and associated plant species are endangered, while 97% of the plant species are threatened. Indiscriminate cutting, reclamation for agriculture and urbanization, fuel and overgrazing by domestic cattle have severely degraded mangroves in India. The threat to mangroves in recent years comes mainly from, aquaculture and urban settlements. Sand dunes which support diverse flora are categorized as ecologically sensitive areas under the Coastal Regulation Zone notification of 1991. Coral reefs are found in the Palk Bay, Gulf of Mannar, Gulf of Kutch, central west-coast of India, Lakshadweep and Andaman and Nicobar islands. A few species of corals have recently been reported from the Maharashtra coast. A total of 50 genera and 13 sub-genera of
Reef-building orals are known to occur in Indian reefs representing more than half of those recorded from all over the world**.**
The coastal and offshore environment of India supports rich biodiversity. Bacteria, fungi, and zooplankton species are abundant. Benthic fauna consists of plychaeta (62%), crustaceans (20%), and molluscs (18%). Over 630 species of marine algae have been reported. The annual production of seaweed is estimated at 70,000 tonnes. Sea grass flora is dominated by *Thalassia hemprichii* and *Cymodocea* species. The total standing crop is estimated at 7000–8000 tonnes. The few economically important species of algae such as *Gracilaria edulia* can be cultivated on a large scale. A sea grass called *Enhalus acroides* is now a threatened species. *Dugong dugong*, a mammal dependent on sea grass for its food is also threatened. Economic activities such as offshore drilling, aquaculture, port activities all impact the coastal ecosystem. India's external is almost entirely dependent on surface transport through its ports, except for a small quantity of high-value international cargo in volume terms, which is carried by air. For the protection, preservation and management of coastal waters and maritime zones the Central Government has formulated exclusive jurisdiction. The state governments too, have jurisdiction over the development of fishery and other living resources in the territorial waters adjoining the states.

The following Ministries of Indian Government are responsible for decision-making in the area of oceans and seas, in India.

Indian Government Responsibilities Organization	Responsibilities
Ministry of Environment and Forests	Management of resources in the coastal water, nodal ministry with major responsibility for protecting marine environment, includes implementation of legislative measures.
Department of Ocean Development	Scientific monitoring of the marine environment, Management of resources in the high seas
Ministry of Agriculture	Development of fisheries, aquaculture, fish Processing
Ministry of Water Resources	Erosion
Ministry of Defence (Indian Coast Guard)	Pollution response measures, including oil Pollution
Ministry of Surface Transport	Ports, shipping etc.
Ministry of Petroleum and Natural Gas	Offshore installations, coastal refineries, pipelines etc.
Ministry of Tourism	Tourism activities in coastal regions
Ministry of mines	Mining activities in coastal regions

Major Objectives of Study:

The major objectives of this paper is to identify the factors of marine environment which helps in preserving of ecologically sensitive areas, developing and increasing the potential of marine living resources, ensuring effective monitoring and enforcement with respect to fishing activities, improving the living standards of coastal communities, maintaining the health of the marine environment and addressing issues of critical uncertaintyand climate change. To achieve these objectives, programme areas have been identified and these are discussed below.

EEZ and Sustainable Management of Marine Environment:

The government has to adopt an integrated policy and decision making process to promote a balance of uses in coastal and marine areas. It also seeks to identify existing and projected uses of coastal areas and their interactions and concentrate on well-defined issues concerning coastal management. The study identifies the need to promote the development and application of methods, such as natural resource and environmental accounting that reflect changes in value resulting from uses of coastal and marine areas, including pollution, marine erosion, loss of resources and habitat destruction. It seeks to provide relevant information and opportunities to concerned individuals, groups and organizations for consultation and participation in planning and decision-making.

Protection of Indian Ocean Aquaculture:

The potential for degradation of the marine environment from a wide range of activities, a call for the adoption of a precautionary and anticipatory approach to development planning is necessary. It encourages the integration of marine environmental protection into relevant general environmental, social and economic development policies and the adoption of economic

incentives to apply clean technologies. The research study also stresses the need to improve the living standards of the coastal population.

Protecting Aquatic living organisms and their Sustainable use:

Sustainable use of marine living resources is a concern strongly viewed in the study area. Marine living resources provide food and livelihood to coastal communities. Adequate knowledge, use of new technology and good regulatory measures are necessary to manage and conserve these resources. This paper aims at developing and increasing the potential of marine living resources to meet human nutritional needs, maintaining or restoring populations of marine species at levels that can produce the maximum sustainable yield, promoting the development and uses of selective fishing gear and practices that minimize waste in the catch of target species and minimize by-catch of non-target species. It also urges governments to ensure effective monitoring and enforcement with respect to fishing activities, protecting and restoring endangered marine species, preserving habitats and other ecologically sensitive areas and promoting scientific research with respect to marine living resources in the high seas. It emphasizes the need to take into account traditional knowledge and interests of localcommunities, small-scale artisanal fisheries and indigenous people in development and management programmes.

Statuary warning to Marine resources due to Climate change:

The marine and coastal environment is vulnerable to the uncertainties of climate change. These changes may cause significant damage to the coast and inhabitants of nearby areas. In order to develop a good response strategy and reduce uncertainties, it is necessary to collect data systematically on various marine environmental parameters so that future conditions can be medicated. The study area seeks to promote scientific research on and systematic observation of the marine environment; promote exchange of data and information resulting from scientific research and systematic observation as well as from traditional ecological knowledge and ensure its availability to policy-makers and the public at the national level and cooperate with a view to the development of standard inter-calibrated procedures, measuring techniques, data storage and management capabilities for scientific research on and systematic observation of the marine environment.

Requirement of mutual co-ordination between Regional and International level:

The role of international cooperation in supporting and supplementing international efforts and stresses needs to improve coordination and strengthen links among national and international institutions. It emphasizes the need to integrate relevant sectoral activities addressing the environment and development in marine and coastal areas at the national, sub regional, regional and global levels, as appropriate; promote effective information exchange and institutional linkages between bilateral and multilateral national, regional, sub-regional and inter-regional institutions dealing with environment and development in marine and coastal areas; promote within the United Nations system, regular intergovernmental review and consideration of environment and development issues and promote the effective operation of coordinating mechanisms for the components of the United Nations system dealing with issues of environment and development in marine and coastal areas, as well as links with relevant international development bodies.

Marine environmental protection:

India's rapid population, economic and industrial growth has created pressures on the coastal resources. Some coastal stretches in India are highly polluted with municipal waste deriving from urbanization and tourism, waste generated from industry, chemical agents fromfertilizers

and pesticides and silt from degraded catchments. Untreated sewage and other non-industrial waste account more pollution than industrial effluents. Mining of sand from the sea-bed results in an increase in turbidity in the ambient water, which affects benthic organisms and primary productivity by limiting the availability of light. Aquaculture activity in some parts of India has also placed considerable pressure on coastal resources. Construction of breakwaters, which forms part of the port development, alters the sediment transport mechanisms in the coastal areas, thereby causing erosion or accretion. Efforts have been made to set up sewage treatment plants in all coastal states. Treated effluents are being discharged into deeper waters through pipelines. The Government is also preparing an action plan for treatment of domestic wastes. Legislation has helped in the treatment of industrial wastes. In India, the Water (Prevention and Control of Pollution) Act includes tidal waters, unlike some other countries. The Act is applicable upto 5 km into the sea. Though the discharge of effluents from small-scale industries is still a problem, efforts are being made to set up common treatment plants. This will help in minimizing the load that is discharged to the sea.

Uncertainties for the management of the marine environment and climate change:

India has introduced some programmes for the long-term monitoring of oceanographic parameters to address the issue of critical uncertainties. These are the Sea Level Monitoring and Modelling (SELMAM) Project, National Data Buoy Programme (NDBP), Satellite And Coastal Oceanographic Research (SATCORE) Project, Experimental Ocean State Forecast (E-OSF) programme, Indian Ocean Modelling and Dynamics (INDOMOD) etc. A set of three current meter arrays at pre-selected locations along the equator in the Indian Ocean for long-term monitoring of the current structure is proposed. Various projects of the Department of Ocean Development were restructured and reoriented in 1997-98 as Ocean Observation and Information Services (OOIS) in order to generate reliable data.

Initiative Concerns:

As in the other parts of the world, coastal areas in India are increasingly under pressure from anthropogenic activities. The major areas of concern are overexploitation of coastal resources and the impact of land-based activities and ship traffic. The following issues deserve immediate attention. Pollution from use of persistent organic pollutants (POPs) such as DDT for crop protection and the issue of adoption of a legal instrument on the control of POPs.

 The effect of antifouling paints used on ships on marine organisms and the adoption of the ban as targeted for the year 2006 by the IMO.

 Transfer of exotic species through ship fouling and ballast water.

 A need for providing adequate and appropriate support from developed countries to ocean-related capacity-building in developing countries.

 A need for some form of international involvement in the management of the high seas fishery resources, as observed by the UN Conference on Straddling and Highly Migratory Fish Stocks.

 The release of persistent hydrocarbons through ship traffic and their effect on global warming and climate change.

 Policies for coastal aquaculture, keeping in view socio-economic and environmental aspects, need to be framed.

Protecting Initiatives for Indian Ocean Marine Resource:

In order to protect the marine environment of Indian Ocean, the Government of India, had initiated a number of programmes. To meet the objectives of present study, continuous monitoring of ongoing projects, acquiring of new technology and implementation of already-existing policies are being actively carried out. The following section highlights the major policies and programme of the study area that relates to marine resources, assesses the achievements, and identifies the areas that remain of concern. The developments in policies reflect responses to the changing international scenario, where there is a recognition that development needs to be attentive not only to the environment, but also to the people who have a stake in any such development. The following activities are being undertaken under this programme. Development of GIS-based information systems for critical habitats containing all information necessary to prepare management plans.

- Determination of waste assimilation capacity at selected estuaries.
- Development of EIA guidelines for major coastal developmental activities and process.
- Determination of No Impact Zone for Pulicat and Coringa
- User classification of coastal zones for future developmental activities
- Infrastructure development for capacity building in ICMAM through training
- Development of model ICMAM plans for selected areas such as Chennai, Goa and Gulf of Kutch.

Conclusion:

Thus a healthier marine environment of Indian Ocean needs integrated policy approaches, which involve scientific disciplines to address the complexity of the interaction between the social and natural systems in such coastal and marine environment. The need for a single administration to deal with governmental responsibilities for policy implementation is recognized and the GOI is taking steps to initiate programmes which involve inter-departmental collaboration.

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