

# Integrated coastal zone management: An Indian perspective- A Review

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(Received 11 July, 2020; Accepted 24 August, 2020)

## ABSTRACT

Coastal Zones in India are unique providing several economic resources to the stakeholders at diverse levels from the local inhabitants to the State and the Central Governments. These various resources are extracted by the end users as and when needed. In India there is no concrete mechanism for the conservation and management of these resources at large scale with some exceptions. Therefore, it is a need of hour to identify and implement some unique strategies and policies for the conservation of this unique flora and fauna including the land areas. Integrated Coastal Zone Management is an important mechanism for the protection of all these coastal resources whereby the implementation of strategies at large scale incorporating all the end users is possible. The Government of India has attempted initiatives on some of the states but its implementation throughout the coasts of India is essential.

*Key words: Integrated, Coastal, Zone, Management, India*

## Introduction

The world 'coastal zone' means the bordering areas of land and sea in an ecological perspective, a small island or a watershed on a large volcanic island and the 'management' is making best use of available resources to achieve a goal.

Integrated Coastal Management defined as "a dynamic process implementing the coordinated strategies for allocation of environmental, socio-cultural and institutional resources for achieving the conservation and sustainable use of the coastal zones" (1<sup>st</sup> international meeting 1989) and Integrated Coastal Zone Management (ICZM) as the "caretaking of common property resources," including, but not limited to, mangrove forests, coastal waters, and coral reefs (Clark, 1992). The ultimate goals of ICZM were the sustainable quality of coastal ecosystem and coastal communities, incor-

porating the human factor (Olsen and Christie, 2000). It is a balance of development and conservation that ensures multi-sectoral planning, public participation, and conflict mediation (Christie, 2005) with the involvement of both the government and local communities (Christie, 1997).

Historically ecosystem management evidenced at local level in relatively small scale and as colonization progresses the control was transferred from communities to local and national governments. This transition led to commercial operations, overexploitation of resources, and numerous environmental impacts (Christie and White, 1997, Beatley *et al.*, 2002).

ICZM recognized as fundamental to good management of coastal resources, (World Bank, United Nations Environment Programme (UNEP), and the Food and Agriculture Organization, FAO) and involved in promoting, developing or implementing

ICZM programs worldwide (Ramessur *et al.*, 2001a and, 2001b; Ramessur, 2002 and 2015).

In 2003, Olsen furthered this idea by stating ICZM is a process that helps managers to achieve sustainable coastal development by providing less complicated avenues for public policy negotiation and implementation. Ehler (2003) brought the term "multiple-use" into the definition and addressed the responsibility of national, state and local government in facilitating the coordination of agencies, organizations, and economic sectors.

The current goal of ICZM is to benefit the natural resources and also the coastal communities, industries, businesses and governments (Van *et al.*, 2012; Christie, 2005). Thus, ICZM must manage human activities and behavior as well as the state of natural resources (Cicin-Sain and Knecht, 1998; Christie, 2005).

One of the first formal efforts to conserve coastal resources was the U.S. Coastal Zone Management Act (1972) and following this a number of other countries formed CZM programs. On the other hand, these early initiatives were focused on individual sectors as well as the habitats, rather than integrated and comprehensive approach (Cicin-Sain and Knecht, 1998).

ICZM is the continuous, proactive and adaptive process of resource management for future uses of coastal and ocean resources and the approach is process oriented aimed to focus practical and achievable parameters (Ramessur, 2015).

ICZM is considered the key approach for implementing sustainable development in coastal areas by integrating the different dimensions such as intersect oral integration, involving different coastal, marine and land based sectors, integration among different level of government and the integration between the land and ocean side of the coastal zones (Rochette and Comley, 2015).

ICZM must be based on the relationships between ecosystems, socio-economic and political systems, tailored on the specific conditions of coastal areas. It is multi scale process that requires coordination and cooperation between different administrative bodies and requires adaptive styles of management. It is a participatory process and requires involvement of all the relevant stakeholders. ICZM requires a long term strategic view and initiatives have to adopt a spatial planning, management programs, environmental education, communication, and economic instrument etc. (Stefano *et al.*, 2015).

## Need of ICZM

Huge pressure for coastal development particularly the tourism, energy infrastructure and port activity are among the few major difficulties. The conflicting uses and the uncoordinated legislation require the development of new governance models on partnerships and participatory processes (Stefano *et al.*, 2015)

Especially in the last 25-30 years, our coasts going under an intense population pressure based on the tourism, excessive and unplanned housing, industrial institutions, use of coastal areas as disposal areas, uncontrolled sand extraction, construction such as ports, piers, seawalls, etc. without caring for aesthetic and ecology, filling made for land reclamations, excavations made in the name of coastal recreation and even highways constructed in the name of coastal solution for transportation and many other practices clearly show the cradle of civilization and life lines of ecology, are under huge pressure (Oylum and Osman, 2016).

There are contradictions related to use of coastal resources the benefit of humans and necessity of consumption which preservation and protection of these resources for long term use which become extremely critical stage in many countries, coastal area and resources have non recoverably deteriorated (World Bank, 1993).

The development of science and technology wants the government to be more proactive and should focus on the change of environment and ecosystem with respect to the development and economy has to identify the mechanism to prevent pollution and/or damage to the ecosystems at large (Dina *et al.*, 2016). Surely, the ecologic development is the urgent need of the time. Urbanization and economic developments creating environmental issues in terms of quantity and quality by putting pressure on coastal areas (UNSD, 1993).

The coastal zone is rich, dynamic and vibrant areas due to continuous interaction between land and ocean of any country. Most of the metro cities are located in the coastal zones. In India also metropolitan cities like Mumbai, Chennai, Kolkata etc, are located in this corridor which leads to increasing pressures of population growth and diversifying resource use (Murthy and Reddy, 2014).

For the sustainable management of coastal zones, the fragility of ecosystems, the activities their uses and interactions, the marine orientation of certain

activities and their impact on both the marine and land parts should be taken into account (Soriani, 2015; UNEP/MAP/PAP, 2008).

### Mangroves and ICZM

Mangrove resources are available in approximately 117 countries, like Indonesia, Nigeria and Australia have the largest mangrove areas. These ecosystems harbor 193 plant species, 397 fishes, 259 crabs, 256 molluscs, 450 insects and more than 250 other associated species. Mangrove ecosystem has the highest level of productivity among natural ecosystems, and performs several ecosystem services. The Continued exploitation of mangroves worldwide has led to habitat loss, changes in species composition, loss of biodiversity, shifts in dominance and survival ability. Worldwide about half of the mangroves have been destroyed (Upadhyay *et al.*, 2002).

The biodiversity in Indian mangroves is high. The increase in the biotic pressure on mangroves due to land use pattern and multiple uses of mangroves as for fodder, fuel wood, fiber, timber, alcohol, paper, charcoal and medicine etc. Along the west coast almost 40% of the mangrove area has been converted to agriculture and urban development. Environmental awareness, proper management plan and greater thrust on ecological research on mangrove ecosystem may help save and restore these unique ecosystems. (Upadhyay *et al.*, 2002; Jagtap, 1994)

The exploitation of mangroves for financial gain became more prevalent in the 1960s, simultaneously, this period was the beginning of single-sector management and divisions were made among fishery, forestry, coastal navigation, and many other sectors involved in coastal zone activities (Ehler, 2003). The result was an overburden of agencies and departments, each managing one component of the larger coastal ecosystem. Single sector management led to confusing and overlapping jurisdictions within the coastal zone and disregard for protection of the coastal ecosystem as a whole regrettably, the main goal of coastal management during the 1960s was production and utilization of coastal resources rather than conservation (Ellison, 2008).

It is widely advocated as a systemic and holistic governance approach for dealing more effectively with coastal issues. However, the technical reports and research surveys confirm the implementation of ICZM principles remains very problematic and

complex (Burbridge and Humphrey, 2003; Upadhyay *et al.*, 2002).

### Coastal resources

Indian coastline is about 7516.6 km including its island territories comprising of nine states and two union territories comprising 77 towns including three metropolitan cities like Mumbai, Calcutta and Chennai and 75 coastal districts. India's coastline supports a number of economically important infrastructures such as oil and gas, power plants, ports and harbors, aquaculture, agriculture, marine fishing, tourism, mining, reclamation, etc. Currently, there are 12 major ports and 187 minor ports, several industries including power plants and urban sprawl occupying 43 per cent of the coast (Dhiman *et al.*, 2016). Around 25% of India's population is living within 100 kms of the coastline. India has around 3300 fishing villages and 1 million sea going fishermen. There is a population of 5 million in fishermen households/villages. 5-10 million people are employed in fishing and fish value chain (CMFRI, 2017).

India's coastal and marine ecosystems include a wide range of mangroves, coral reefs, sea grasses, salt marshes, mud flats, estuaries, lagoons, and unique flora and fauna. The coastal stretch is made up of diverse ecosystem such as sand dunes, beaches, wetlands, mangroves, estuaries, backwater lagoons and coral reef. Coastal ecosystems harbour the wealth of species and genetic diversity, store and cycle nutrients, filter pollutants and help to protect the shorelines from erosion and storms. Marine ecosystems act as a major carbon sink and oxygen source. The industrial development of coast has resulted in degradation of coastal ecosystems and diminishing the living resources of Exclusive Economic Zone (EEZ) in the form of coastal and marine biodiversity and productivity (Nayak, 2010; Sawale and Mahadevia, 2011). India also has major stocks of corals, fish, marine mammals, reptiles and turtles, sea grass meadows, and abundant sea weeds. Coastal fishing employs a million people full time, and the post-harvest fisheries employ another 1.2 million.

Increasing stress due to development of industries, trade and commerce, tourism and resultant human population growth and migration towards coastal cities and urban centers pose a serious threat to the health of these coastal ecosystems and to lives

and livelihoods of coastal communities (Sawale and Mahadevia, 2011)

In spite of their ecological richness and contribution to the national economy, India's coastal and marine areas have not received adequate protection and are under stress (Banerjee, 2012). These coastal areas are also the important harbor centers for marine fish stock, ornamental fish and sea cucumber etc. which have direct impact on livelihood and well being of coastal population as they are partially and fully dependent on these natural resources from coast in the absence of alternative livelihood opportunities (CMFRI, 2017). As per the Economic Survey of India (2019) report the state has allocated a fund of Rs. 13.95 Cr. for up scaling the various livelihood activities such as mud crab farming, sea Bass cage culture, oyster and Mussel farming, ornamental fish culture, ecotourism etc.

### Indian Scenario

In India for Integrated Coastal Zone Management Program has been initiated and institutional structure at National, and State level supporting of Integrated Coastal Zone Management has been established. As part of establishing knowledge and planning base, National Centre for Sustainable Coastal Management (NCSCM), a Centre of Excellence for Coastal Management, is established with state-of-the-art research facilities. NCSCM is already supporting coastal management with seven major coastal research theme areas. Piloting ICZM approaches has been implemented in Gujarat, Odisha and West Bengal and some of the planned activities under this component are completed such as enhanced coastal and marine pollution monitoring capability of the Gujarat Pollution Control Board; completion of livelihood activities in 169 coastal villages; Odisha Pollution Control Board; construction of 14 cyclone shelters with community support for Operation and Maintenance (World Bank Report, 2017).

Government of India prepares an ICZM plan as a case study in Andaman Islands which covers database and knowledgebase development, framework of methodology, conflict identification, risk analysis, alternative opportunities, cost benefit analysis, strategic and action plans and recommendations of institutional changes etc. (Devaraj and Arumugam, 2011).

In Tamil Nadu, the Tamil Nadu ICZM plan had

amended in terms of financial, administrative, environmental and Coastal Regulation Zone (CRZ) aspects with the accommodation of the views of the local population and their interests. For the implementation of the ICZM plan, conducted land use, capability and vulnerability mapping, developed a Special Area Management Plan (SAMP), conducted an inter sector impact assessment etc. (DHI Case Story, 2018).

Ministry of Environment, Forest and Climate change established a Society of Integrated Coastal Management (SICOM) for vibrant, marine and resilient coastal and marine environment with the objective to support implementation of ICZM activities in India. The SICOM has established and operationalized a world-class Institute- National Centre for Sustainable Coastal Management (NCSCM) at Anna University, Chennai, which aids in the better protection, conservation, rehabilitation, management and policy design of the coast. They have also completed cell mapping and ESA mapping of the entire coast under project phase 1 (ICZM project Phase 1 report 2018) and Phase 2 is designated to Conservation of coastal and marine ecological resources, Coastal pollution management and related infrastructure upgrade, and Capacity building and implementation of ICZM Plans (ICZM project Phase II report, 2018).

The coastal and marine areas of Maharashtra are under great threat due to ill planned developmental activities around the coastal areas. Maharashtra has 720 km coastline and 304 Sq. Km. area is under the mangroves cover (FSI, 2017). In order to protect the coastline, under the Environment (Protection) Act-1984, the Central Government has constituted Maharashtra Coastal Zone Management Authority (1998), State Level Environment Impact Assessment Authority (2008), State Level Expert Appraisal Committee; The Mangrove Cell created by the Government of Maharashtra (Economic Survey of Maharashtra, 2019) for the sector based conservation and management for coastal zones but there is no concrete initiative for the multisectoral management. The Maharashtra Coastal Zone Management Authority (MCZMA) has approved Rs. 300 Cr. proposals, partly funded by the World Bank, to protect fragile coastlines and create sustainable management of coastal and marine resources in Sindhudurg and Ratnagiri districts with the share of World Bank, Central Government and State Government (Hindustan Times, 2018).

The Ministry of Earth Sciences, in 1998 initiated a programme on Integrated Coastal and Marine Area Management (ICMAM) to promote research addressing issues related to coastal processes, ecosystems, shoreline erosion, pollution, hazards and coastal vulnerability. This concept facilitates sustainable management of coastal zone and rational utilization of resources by incorporating environmental and social concerns in all the sectoral developmental activities by selecting the tools such as Geographic Information System (GIS), Remote Sensing, Mathematical Modeling and Environmental Impact Assessment (EIA) in the coastal areas (NCCR, 2019).

## Conclusion

The coastal ecosystems have ecological, economical and socio cultural significance but due to increased industrial expansion, commercial pressure and opportunistic development there is huge alteration in marine resources. Establishment of the coastal infrastructure violating the protection law leads into the loss of the important biodiversity resource centers. Integrated Coastal Zone management is the unique mechanism.

## Acknowledgement

Authors are thankful to the Department of Science and Technology (Science and Engineering Research Board) for financial support through major research project entitled "Resource Monitoring and Integrated Management of Mangroves on Maharashtra Coast India".

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