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Linkages of Sustainable Development Goals with Integrated Coastal Zone Management Project in India: An Approach to Enhance Efficacy

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ABSTRACT

Sustainable development of a country helps to achieve the Sustainable Development Goals (SDGs) and advance the transition to low-carbon, resource-efficient and inclusive economies. Integrated Coastal Zone Management (ICZM) is one of the important process for the management of the coast using an integrated approach to achieve sustainability, regarding all aspects of the coastal zone, including geographical and political boundaries. In 2010, the Government of India had launched Integrated Coastal Zone Management Project (ICZMP) to conserve, protect and manage the coastal and marine ecosystems, pollution abatement and livelihood security of the coastal communities with the assistance of the World Bank. The ICZM project in India was implemented in identified coastal stretches of the states of Gujarat, Odisha and West Bengal. Under this project, activities related to conservation of the coastal ecosystems such as mangrove plantation, shelterbelt plantation, coral transplantation, enhancement of livelihood security of the coastal areas, capacity building, etc. was undertaken. After almost 10 years of the commencement of the project, the satisfactory implementation of various activities in all the three states is evident from the numerous achievements under ICZM.

Key words: ICZM, Sustainable Development, India, World Bank, Marine, Coastal, SDGs

Introduction

Promoting and achieving the sustainable development goals (SDGs) – is closely related to the understanding of opportunities and trade-offs amongst environmental and economic policies. Humans are directly dependent on the ecosystems and receive tangible and intangible benefit. Out of the many habitats explored the most reliant is the coastal ecosystem which offers essential components for social and economic development. However, during recent times these coastal habitats are under pressure due to increased human and environmental impacts. The principal areas of concern in coastal areas are loss of natural habitats, biodiversity, cultural diversity, decline in water quality, sea-level rise, competition for space, and seasonal variations (CEC, 1995). According to Kay and Adler (1999), "Coastlines are the worlds' most important and intensely used of all areas settled by humans". To progress the quality of these pressured ecosystems, governments need to have a clear understanding of the economic opportunities created by environmental preservation or the potential feedbacks regarding environmental damages that assist to achieve economic and environmental priorities for sustainable development. Sustainable development can serve as a vehicle to achieve the SDGs and advance the transition to low-carbon, resource-efficient and inclusive economies. Integrated Coastal Zone Management (ICZM) is a process for the management of the coast using an integrated approach to achieve sustainability, regarding all aspects of the coastal zone, including geographical and political boundaries. A management plan is required to minimize the environmental destruction resulting from the complexity of the property in coastal areas, of human activities and of natural systems and to utilize the coastal resources effectively (Bat *et al.*, 2012).

ICZM is a broad concept adopted initially in USA in the 1970s (Banica et al., 2003). This concept of ICZM was further emphasized for nations with coastal boundaries in 1992 during the Earth Summit at Rio de Janeiro, Brazil (Banica *et al.*, 2003). ICZM is a discipline which all coastal areas should highlight importance in order to develop sustainably (Bat et *al.*, 2012). It is a planning and management process which aims to balance multiple human activities and demands on coastal and marine space and resources with the protection of vulnerable coastal and marine ecosystems and the maintenance of the functions and services which they provide (Humphrey and Burbridge, 2003). Since, 1992 most of the developed nations started adopting the concept of ICZM. In its 1994 resolution on a community

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strategy for integrated coastal zone management, the Council of the European Communities invited the European Commission to prepare "a Community strategy for the integrated management of the whole of the community coastline that, while taking account of the specific problems and potential of the different zones, will provide a framework for its conservation and sustainable use" (CEC, 1994). Coastal zone can be defined as the interface where the land meets the ocean, encompassing the shoreline environments as well as adjacent coastal waters. For planning purposes, the coastal zone is a special area, endowed with special characteristics of which the boundaries are often determined by the specific problems to be tackled (Banica, 2003; Connolly, 2001). ICZM covers the full cycle of information collection, planning, decision making, management and implementation, however, as it is dynamic and iterative a continuous need of review and adaptation to the new conditions is needed (Banica, 2003). It is a multi-disciplinary approach involving geomorphology, marine geology, oceanography, law, economics; geography etc. Basically, ICZM is the management of the coastal zone taken as a whole in relation to local, regional and international goals with a particular focus on the interactions between various human activities and resource demands both within the coastal zone and between activities from the coastal zone and activities from other regions (Banica, 2003). A part of the management is the inte-



Fig. 1. An overview of the objectives and actions for the implementation of Integrated Coastal Zone Management

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gration of environmental protection goals into economic and technical decision making process (OECD, 1993) (Fig 1).

The Government of India had launched Integrated Coastal Zone Management Project (ICZMP) in 2010 to conserve, protect and manage the coastal and marine ecosystems, pollution abatement and livelihood security of the coastal communities with the assistance of the World Bank. This project has been implemented in identified coastal stretches in the States of Gujarat, Odisha and West Bengal. Under this project, activities related to conservation of the coastal ecosystems such as mangrove plantation, shelterbelt plantation, coral transplantation, enhancement of livelihood security of the coastal communities, pollution abatement in coastal areas, capacity building, etc. had been undertaken (Fig 2).



Fig. 2. The coastal states of India where the ICZM project was implemented from the year 2010

Sustainable Development: ICZM Approach

The Indian coastline is around 7500 km which include the mainland and the islands of Lakshadweep and Andaman & Nicobar home to the unique marine and coastal ecosystems. About 25% of the Indian population living along the coast/islands of India depends upon the coastal resources and opportunities (Koshy Varghese *et al.*, 2008). The vulnerability of these populations to the natural and man-made disasters arising from the sea including Tsunami is high. Hence, the Ministry of Environment, Forests & Climate Change (MoEF & CC), Government of India initiated Integrated Coastal Zone Management (ICZM) Project in India to protect and conserve the coastal and marine ecosystems and its environment through a holistic coastal management and to implement the National Environment Policy 2006, recommendations of "Final Frontier 2009", Public Accounts Committee (2009–2010) [PAC], and CRZ Notification, 2011 and Islands Protection Zone (IPZ) Notification, 2011 regulatory framework with public participation (Fig 3).



Fig. 3. Conceptual image of policies regulating ICZM and Economic development

India's ocean resources are rich in biodiversity which are crucial for growth, food production, and overall economic wellbeing (Deloitte, 2020). The country's Blue Economy (BE) assets are currently estimated at US\$ 24 trillion, with an expected annual value addition of US\$ 2.5 trillion (World Bank, 2018). ICZM approach helps in managing the coastal and marine ecosystems and its developmental pressures vis-a-vis its conservation and climate change mitigation and adaptation needs; with communities as the main partners in all coastal States/ UTs of India. It is envisaged to make the coastal communities better equipped to participate in the development and sustainable use of the coastal and marine resources while taking care of natural resource management and preparing for climate resilience. Keeping in view the importance of the coastal environment and to assist MoEF&CC in the implementation of Coastal Regulation Zone (CRZ) Notification 2011 and Island Protection Zone (IPZ) Notification, 2011, MoEF & CC simultaneously undertook the implementation of the World Bank assisted Integrated Coastal Zone Management (ICZM) project (Deloitte, 2020). MoEF & CC took the lead responsibility in the implementation of the project and to ensure that the project development objectives are met. The Departments of Forest and Environment (DoEF) of selected coastal States and Union Territories (UTs) were the key partners to MoEF&CC in project implementation in respective stretches. Each of the participating States/UTs set up State Project Management Units (SPMUs), as registered societies to exclusively lead and coordinate project activities on a full-time basis and directly implement some of the project sub-components. The Society of Integrated Coastal Management (SICOM) was established as an autonomous society under the aegis of the MoEF&CC with a vision of vibrant, healthy and resilient coastal and marine environment for continuous and enhanced outflow of benefits to the country and the coastal communities. Since 2010, SICOM has served as the National Project Management Unit (NPMU) of India for the ICZM Project. The institutional responsibility matrix for smooth implementation of ICZM in the three states is provided in Table 1.

Methods

The activities have been grouped under four main thematic components including: (a) Conservation, protection of coastal and marine resources and disaster management; (b) Pollution abatement, management and developing infrastructure for environment protection in coastal areas; (c) Livelihood en-

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hancement/security of coastal communities; and (d) Environment education, research and capacity building for implementation of the ICZM approach. The activities were selected considering the core principles of sustainability which includes: long term sustenance of coastal and marine resources (including conservation and measures to abate and control anthropogenic pressure), measures which will have high replication and demonstration value for coastal management, enhance livelihood security of coastal communities and resilience to climate change. The ICZM project in India was implemented in three coastal states namely Gujarat, Odisha and West Bengal from the year 2010. Interlinkages were made for the activities with SDGs to understand the various positive impacts of the activities in all the three states.

Project Activities

Conservation, protection of coastal resources

Initiatives were undertaken to ensure ecological management of the coastal and marine ecosystems, conservation and protection of critical habitats through measures such as comprehensive database creation of coastal and marine resources and implementation of activities to protect and enhance their value from the food/climate change security angles. Due attention was accorded to the specificities of coastal geomorphology while supporting geology and innovative coastal engineering interventions. Activities envisaged include mapping of remaining coastal area (specifically; island territories), coastal

 Table 1. The responsible institutions and their functions in the implementation of Integrated Coastal Zone Management (ICZM)

S. No	Responsible Institution	Main function
1	Ministry of Environment Forest and Climate Change, Government of India	Formulation of national policy, approval of annual plans and budgets.
2.	SICOM-National Project Management Unit under MoEF&CC	Project implementation, supervision and monitoring, annual plans and budgets, inter-ministry/inter-agency coordina tion, to ensure achievement of the project development objectives, implementation of the national component, overall coordina- tion and execution of the project.
3.	States/UTs- Department of Environment and Forest (DoEF) in each coastal State and UT	Formulating State/UT policy, project implementation and monitoring framework, approval of annual plans and budgets.
4.	SPMUs under the respective DoEF	Project implementation, supervision and monitoring, annual plans and budgets, inter-ministry/inter-agency coordination, to ensure achievement of the project development objectives, implementation of the state component, overall coordination and execution of the State/UT component of the project.

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resources, sand dunes and other coastal features, protection measures including stabilization of sand dunes, shoreline protection, mangrove/shelterbelt plantation with a view to enhance food security and protection from calamities.

Pollution abatement, management and developing infrastructure for environment protection in coastal areas

This component envisages prevention, abatement and control coastal and marine pollution effectively including marine litter. The aim includes creation of a database on the coastal/marine pollution sources. It intends to disseminate concepts of "Valued Coastal and Marine Resources" and enhance awareness among various stakeholders regarding the perils of coastal and marine pollution and to equip them to participate in improving the valued coastal and marine environmental resources. This component includes inter alia monitoring the quality of soil, air and water in coastal and marine areas, demonstrate replicable technologies for waste minimization, segregation and recycling and pollution prevention through soft and hard field level interventions and developing suitable infrastructure.

A important component is conservation, cleaning & eco-friendly development of the beaches and enhancement of their quality. Activities under this component aims to improve the environmental quality, ensure sustainable uses, visitor experience, resource protection, safety and access for all in the selected beaches. Sanitary surveys and monitoring protocols to be established for Eco-labelling of the beaches on lines of 'Blue Flag certification' or ISO 13009:2015 certification regimes, linking core themes such as conservation, sustainable activities, pollution prevention and coastal livelihoods security. In addition, there are several demonstrable and replicable interventions, especially of importance for urban areas along the costal stretches.

Livelihood enhancement/security of coastal communities

Coastal communities face immediate challenges to their livelihoods, from resource degradation and depletion, coastal erosion and pollution of coastal waters. With a combination of dwindling resources on land and in water, and with limited alternative income generating options the impoverished coastal communities are vulnerable. In addition, there are concerns of natural disasters such as cyclones and floods risking life, property, economy and health which might be linked to climate change as well. Their livelihoods are vulnerable and have only limited alternatives or viable options. Socio-economic aspects of the coastal communities have been suitably factored in to ensure their overall development through focus on enhancement of coastal and marine resource efficiency in order to make the coastal and marine ecosystems as one of the world's best managed productive ecosystems.

ICZM aims to promote the livelihoods security of the poor through access to assets, resources, new skills and value addition to existing skills through empowerment and full participation of coastal population both in planning and implementation. Activities envisaged under this program included organizing the coastal communities into self-help groups, handholding them to identify and partake in alternative income generating activities and providing technical and management support to upgrade and add value to their current livelihood activities.

Environment education, research and capacity building

This component aims to support capacity building of the National, State and UT level agencies and institutions for effective coastal and marine management and implement Coastal Regulation Zone (CRZ) Notification. It includes preparation of ICZM Plans for identified stretches of all the coastal States and UTs. This component is designed to demonstrate integrated management of physical, ecological, economic, and social concerns such as education assistance scheme and empowering girl child education in coastal communities, setting up of institute for training and exploration of marine resources and biodiversity. Mapping of coastal zones and shorelines of all coastal States of India during the ICZM Project may be used as the base resource for later planning and implementation. In addition, mapping of the coastlines of Island Territories may be undertaken. Coastal Regulation Zone Notification, ICZM Plans prepared for the pilot States and the guidelines developed by the National Centre for Sustainable Coastal Management (NCSCM) would guide the preparation of plans in future. Nationwide training programmes for ICZM project, exposure visits, workshops, conferences and strengthening of institutional capacity at State and national levels have been done.

Objectives

- To conserve, protect and manage the fragile coastal and marine ecosystems such as the mangroves, brackish water wetlands, coral reefs, etc.
- To improve resilience and management of coastal and marine ecosystems and its services while ensuring enhanced annual CO2 sequestration potential of vegetated coastal habitats and coastal wetlands (mangrove forests, sea grass meadows, salt marshes, coral reefs etc.).
- To address impacts of sea level rise on coastal and marine ecosystems, infrastructure and communities in coastal areas through a combination of adaptation and mitigation measures which include strengthening natural shields against extreme weather conditions to protect shorelines, assets and communities, improved employment generation opportunities for coastal communities for reducing pressure on coastal and marine ecosystems, enhancing productivity of coastal and marine ecosystems sustainably etc.
- Effective shoreline management to protect the coastal communities and infrastructure located in the coastal regions.
- To provide livelihood options/security to coastal communities impacted by coastal hazards and pollution as well as to reduce pressure on marine and coastal natural resources.
- To control pollution of coastal and marine waters from land-based sources and developing infrastructure for environment protection to support pollution prevention and quality enhancement of coastal and marine areas.
- To develop the capacity and institutions to implement the Coastal Regulation Zone Notification and achieve the objectives of integrated and sustainable coastal management as per the National Environmental Policy, 2006 and in consonance with the SDG 14 as applicable to marine resources.
- To develop Integrated Coastal Zone Management Plans and Marine Spatial Plans for better management of coastal and marine areas.

Results

The World Bank extended financial assistance to the "Integrated Coastal Zone Management Project" (ICZM Project) which was implemented in three coastal states namely Gujarat, Odisha and West Bengal from the year 2010 for pilot investments under three thematic areas namely, conservation and protection of the coastal and marine ecological resources, pollution prevention and abatement, livelihood improvement/ security of the coastal communities etc.

along with preparation of ICZM Plan for a comprehensive environment management strategies for selected stretches at a total cost of Rs. 1740.10 cr (US\$ 285.67 million).

ICZM Project for the first time piloted ICZM approaches in India and has provided satisfactory results. Due to implementation of ICZM, there has been a corresponding growth in awareness of the need for a more integrated approach to coastal management in Europe (Burbridge and Humphrey, 2003). The same sense of awareness can be observed in India after the implementation of ICZM in the first phase with the financial assistance from the World Bank. The project has established the benchmarks for coastal management by: mapping the entire coastline and delineating hazard line for planning purposes and addressing the vulnerabilities, identifying and mapping ecologically sensitive areas, and establishing draft guidelines for ICZM approach. Through pilot investments, the three ICZM Project participating States have demonstrated different measures and strategies in achieving ICZM results including, micro/macro level plans, programs, sub-projects, and policy actions. The Project has also established strong institutional mechanism including establishment of Society of Integrated Coastal Management (SICOM), New Delhi and National Centre for Sustainable Coastal Management (NCSCM), Chennai.

Major tasks completed under the ICZM project in the three states include-

- 1. ICZM plans for selected coastal stretches.
- 2. Shoreline protection against coastal erosion.
- 3. Conservation of mangroves, shelterbelt, sand dunes, sea grass meadows, coral reefs and other resources.
- 4. Development of ecofriendly beaches.
- 5. Demonstrable and replicable infrastructure

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established for waste minimization and pollution prevention. It includes replicable model technologies for sanitation/run-off and drainage/sewage treatment, demonstration of integrated solid waste management technologies of demonstration value.

- 6. Formation of SHGs for alternate livelihood security and entrepreneurial opportunities such as seaweed culture, aquaculture, pearl culture etc.
- 7. Training of coastal communities and SHGs livelihood security, models for climate proofing of coastal livelihoods, community-based beach management systems.
- 8. Enhancement in scientific database for evidence-based decision making for integrated coastal zone management as well as marine environment in sustainable manner.
- 9. Improved institutional capacity at both the State and national levels.

Four broad themes were categorized under ICZM (Table 2) for implementation of various activities. For all the three states activities related to environment education, research and capacity building

Table 2. Interlinkages of ICZM activities with SDGs

were the highest. Most of the activities are linked to four to five SDGs which suggest the significance of the activities undertaken under ICZM. It is estimated that most of the activities will further enhance the capacities of the three states in the future especially under capacity building of various institutes and universities.

ICZM and Vulnerable Population Groups

The programme had a focus on the needs of marginalized section of coastal areas such as fishermen communities, agricultural population and other communities. The majority of the project activities implemented by the SPMUs target the coastal communities who depend on the coastal and marine resources. The coastal areas of the country are mainly inhabited by vulnerable and marginalized communities including tribal/SC/ST and other communities below poverty line. Components like enhanced/alternate livelihood programmes and entry point activities through SHGs, Community Building Organisations (CBOs) and Eco Development Committees (EDCs) were undertaken to promote livelihood security to reduce

	Main Thematic	State wise total projects			SDGs Linked
	Components	Gujarat	West Bengal	Odisha	
1.	Conservation, protection of coastal resources	2	1	2	8 ECON MORAN CONSIGNATION TO A CONSIGNATION OF
2.	Pollution abatement, management and developing	1	2	3	15 of use 17 Partnersers
	ment protection in coastal areas				3 COOPERATE
					15 unitado
3.	Livelihood enhancement/ security of coastal communities	2	4	3	1 ¹
					8 CONTRACTOR NOTION
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4.	Environment education.	6	6	5	13 Galwite 16 PLUCE, ASTICA AND STREME STRE
1.	research and capacity building	0	č	0	

the pressure on the coastal and marine resources.

SHGs, CBOs and Eco Development Committees (EDCs) are important components of socio-economic intervention of ICZM Project aimed at marginalized sections of coastal areas such as fishermen communities, agricultural population, BPL families/SC/ST etc. 320 CBOs/SHGs/EDCs in Gujarat, 600 SHGs /CBOs in Odisha and 2134 SHGs in West Bengal were formed under ICZM Project. The project targeted the pockets of marginalized areas in the identified coastal stretches.

ICZM and Gender

Community Based Organisations (CBOs) and Self-Help Groups (SHGs) etc specially consisting of women fisher folks were formed. Under ICZM project, CBOs and SHGs were registered trusts/ organisations. SHGs comprised of about 11-15 women members. There were certain activities envisaged under the project which were implemented by the SHG/CBOs. Funds were transferred to State SPMUs and SPMUs transferred the funds to SHG/ CBOs. However, the State Governments and UTs were responsible for identification of target beneficiaries under the proposed activities. The States and UTs were advised to put in place a suitable mechanism for identification of beneficiaries and linking them with their Aadhaar/Unique Identification (UID) Numbers. Maintenance of beneficiary database with their addresses, bank detail, contact details were made mandatory and DBT guidelines were followed, if applicable

ICZM and Participatory Governance

Components like alternative/enhanced livelihood programmes and entry point activities were undertaken through SHGs and CBOs to promote livelihood security and to reduce the pressure on the coastal resources. The funds were directly transferred to CBOs and SHGs which were registered trusts and organizations comprising of 10-20 or similar number of members of a village including women members. To carry out entry point activities etc, engagement with Gram Panchayats/PRIs and ULBs was part of the implementation plan and after completion of such activities, the assets created were handed over to the PRIs/ULBs for their maintenance and sustenance. Gram Panchayats also monitored the entry point activities. ICZM project was successfully implemented in the selected stretches of the three States Gujarat, Odisha and West Bengal.

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Major achievements of the ICZM Project include (i) the mapping and delineation of over 78000 sq. km of the coastal Hazard Line for India's entire mainland coast based on projections for the first time in India (ii) establishment of science-based foundation for Coastal Regulation Zone (CRZ) Notification implementation (iii) identification of 12 Environmentally Sensitive Areas (ESAs) (iv) completed first regional coastal process study covering 482 kms of the Odisha Coast (v) Comprehensive Integrated Coastal Zone Management Plans (ICZM Plans) piloted in Gujarat, Odisha and West Bengal (vi) piloted coral transplantation for the first time (vi) first-of-a-kind inventorisation and mapping of microbial diversity in Sundarbans, a World Heritage site (vii) enhanced livelihood security and environmental services of coastal communities (ix) innovative environmental infrastructure, including Sewage Treatment Plant (STP) (PPP model adopted State-wide in Gujarat), demonstration of soft coastal protection technologies (x) 16000 ha of mangroves and 2000 ha of shelterbelt plantation and restoration in Gujarat (xi) 39 multipurpose cyclone shelters in Odisha and West Bengal (xii) establishment of two professional bodies namely SICOM-Delhi and NCSCM-Chennai (xiii) establishment of three data centers-Delhi, Chennai and Bengaluru.

Discussion

Although coastal zones occupy less than 15% of the Earth's surface, they are inhabited by more than 60% of the world's population. If the present trend continues, by 2025 there could be up to 75% of humanity living in coastal areas (Banica, 2003; European Environment Agency, 2003). Global factors like climate change, international trade and development and mass tourism affect coastal areas (Smith, 2003). Coastal zone management has been considered as an instrument proposed for the coastal areas towards the sustainable development for the purpose of overcoming the environmental problems (Bat et al., 2012). The European Commission established the European Demonstration Programme on Integrated Coastal Zone Management in 1996 to provide information on how member states deal with coastal development issues and to provide examples of good practice that could be embodied into a communitywide integrated coastal management strategy (Burbridge and Humphrey, 2003). The European coastal areas confront with problems related to both

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densely populated and remote areas consisting of unplanned development, decline of traditional sectors coastal erosion and insufficient transport and communication networks. (European Environment Agency, 2003). A European ICZM strategy was announced by the European Commission in 2000 and the strategy consists of a package of tools and instruments that European Commission can use to promote ICZM (CEC, 2000). The success of ICZM in Europe led to the implementation of the same idea in many developing nations including India. ICZM project will help further in achieving the objectives of envisaged National Coastal Mission. National Action Plan on Climate Change (NAPCC) encompasses eight core missions on specific areas of Solar Energy; Enhanced Energy Efficiency; Sustainable Habitat; Water; Sustaining the Himalayan Ecosystem; Strategic knowledge for Climate Change; Green India and Sustainable Agriculture (Deloitte, 2020). The National Coastal Mission has similar objectives of conservation and development of coastal areas and providing livelihood opportunities to coastal communities, and ICZM has played an important role in initiating the sustainable development of the coastal states in India. It will be pertinent to mention here that India's ICZM Project has won World Bank's internal award from the Vice President, South Asian Region for exceptional performance in achieving many developmental goals. ICZM Project is one among the 8 projects awarded, selected out of 42 final nominations received from The World Bank Task Teams in the South Asian Countries, after a rigorous screening process. The growing pressure in coastal and marine areas and their resources is one the significant threat in the coming years. ICZM can play a vital role in this regard and help in efficient management of coastal and marine boundaries of countries around the world.

Conclusion

The ICZM framework is a paradigm shift from the traditional approach of sectorial management of the coastal and marine resources and ecosystems to a comprehensive and integrated approach for better governance and management. The concepts and policies of ICZM are aimed at protecting and sustainably managing the coastal and marine resources and ecosystems of a country. This can be achieved through awareness creation among stake-

holders, through capacity building with the aid of state of art tools like Geomatics and satellite remote sensing. The success of policy implementation is bestowed on each individual on a consensus basis evolved by means of public participation.

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