

CASE STUDIES RELATED TO COASTAL MARINE CONSERVATION SCIENCE AND POLICY WITH REFERENCE TO INDIAN MARITIME STATES

Coastal and marine ecosystems are among the most productive ecosystems in the world, provide many services to human society and are of great economic value (UNEP, 2006).

The services include provision of food and water resources, and raw materials like sand, and other high-value heavy minerals like ilmenite, zircon, monazite etc., which are collected from beach sand.

They also provide regulating and cultural services, like storm protection, erosion control, tourism and support functions such as climate regulation, water balance, flood control, waste management etc.

According to some estimates, the oceans and coastal biomes may provide as much as, two-thirds of the ecosystem services that make up the planet's natural capital (TEEB, 2010).

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THE ECONOMICS OF ECOSYSTEMS AND BIODIVERSITY

- Indian coastal ecosystems comprising of mudflats, sandy beaches, estuaries, creeks, mangroves, coral reefs, marshes, lagoon, sea grass beds, and sandy and rocky beaches extend to 42,808 sq km. The Exclusive Economic Zone of India is 2.02 million sq km.
- The number of species in the coastal and marine ecosystems is suggested to be more than 13,000. It is also known for high biological productivity, which provide a wide range of habitat for many aquatic flora and fauna. India has established 31 Coastal and Marine Protected Areas (CMPAs) and several species have been listed under Wildlife (Protection) Act 1972.
- Major human-induced drivers of ecosystem degradation include habitat conversion to other forms of land use, overexploitation of resources and associated destructive harvesting practices, spread of invasive alien species, pollution from agricultural, domestic and industrial effluents, and climate change.
- All the maritime states of India are implementing Marine Fishing Regulation Act for the last 15 to 25 years.

THE ECONOMICS OF ECOSYSTEMS AND BIODIVERSITY

- Marine fish production has increased from 0.5 million tonnes in 1950 to 3.8 million tonnes in 2013, contributing substantially to nutritional security, income and livelihood of a large population of the country.
- Available information indicates that the oceans and coastal biomes contribute substantially to the ecosystem services that make up the country's natural capital. India has opportunities to reap many economic benefits from living and non-living resources of coastal and marine areas including fisheries and biodiversity.
- A TEEB approach at country level could provide much needed data on the economic value of these resources as well as on the full range of costs associated with extracting and using them. Managing the marine and coastal ecosystems requires an understanding of the socio-ecological systems and their inter-connections.
- Recognising blue carbon ecosystem services, Marine Spatial Planning and suggestions on the effectiveness of current management measures are a few initiatives that would pave the way for enhancing delivery of ecosystem services.
- In order to achieve this, there is a need to bridge the gaps in knowledge on coastal and marine ecosystem services and functions and support mainstreaming of biodiversity and ecosystem considerations into both national policy-making and broader societal perspectives.

Coastal Ecosystems of India

Coastal ecosystem	Area (sq km)
Tidal/Mudflats	23,621
Sandy beaches/bars/spits	4,210
Mangroves	4,445
Coral reefs	2,375
Estuaries & backwaters	1,711
Salt marshes	1,698
Lagoons	1,564
Other vegetation (including seagrass beds)	1,391
Aquaculture ponds	769
Salt pans	655
Creeks	192
Rocky coasts	177
Total	42,808

India and International Agreements

Instrument	Accession, Acceptance Ratification	Entry Into Force
International Convention for the Regulation of Whaling (Washington DC, 1946)	Adherence 09 March 1981	09 March 1981
Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington DC, 1963)	Ratified 20 July 1976	18 October 1976
Convention on Wetlands (Ramsar, Iran, 1971)	01 February 1982	01 February 1982
Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1973	20 July 1976	01 July 1975
The Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 1979)	1 November 1983	1 November 1983
Convention on the Conservation of Antarctic Marine Living Resources (Canberra, 1980)	Acceptance 17 June 1985	17 July 1985
United Nations Convention on the Law of the Sea (Montego Bay, 1982)	29 June 1995	29 July 1995
Convention on Biological Diversity (Rio de Janeiro, 1982)	Ratification 18 February 1994	18 February 1994
Global Plan of Action for the Protection of the Marine Environment from Land-Based Activities (Declaration, Washington DC, 1995)	23 November 1995	23 November 1995
Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (New York, 1995)	Accession 19 August 2003	19 August 2003

List of selected case study sites in coastal & marine ecosystem and their key aspects

Study site and partners	Key biodiversity and ecosystem service values	
Assessment of eco-labelling as tool for conservation and sustainable use of biodiversity in Ashtamudi Lake, Kerala (south-west coast of India) <i>Sunil K Mohammed, Central Marine Fisheries Research Institute</i>	Since Ashtamudi Lake is a clam dominated estuarine ecosystem, we considered clams as the key species controlling the bio-physical processes in the system. Their unique filter feeding behaviour influences the productivity and the benthopelagic coupling in the ecosystem. Depletion of the clam stock was reverted with the help of management plan which includes introduction of Marine Steward Council (MSC) certification for obtaining higher value for the harvested catch using sustainable practices.	
Economic valuation of seasonal fishing ban on marine fisheries services in selected maritime States of India <i>R Narayan Kumar, Central Marine Fisheries Research Institute</i>	Seasonal Fishing Ban (SFB) during the breeding and spawning seasons of fishes is supposed to impact remaining fish stock to be harvested throughout the year. But there are some questions pertaining to the following points: a) Has the quantum of the natural capital and its value of the marine ecosystem increased due to SFB? b) Is there an improvement in the services provided by the marine ecosystem due to SFB?	Ac Go

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Economic value of biodiversity loss: A study of by-catch from Andhra Pradesh marine fisheries <i>Jyothis Sathyapalan, Centre for Economic and Social Studies</i>	Non-compliance with fishery regulations and destructive fishing practices also contribute to the waste generation in the form of by-catch, which has serious implications on marine biodiversity. In India, various studies on bottom trawling concluded that by-catch is within a range of 25 to 54 % of the total catch. This practice is leading to marine biodiversity loss and loss to total economic value and consequently to be discouraged.	
Evaluating the flow of ecosystem services from regenerated mangroves compared to natural mangrove forest: <i>Saudamini Das, Institute of Economic Growth</i>	Ecological restoration of degraded and depleted mangrove habitats by planting mangroves is a worldwide phenomenon because Mangroves are considered to provide a bunch of welfare enhancing ecosystem services to coastal community especially fisheries. It is empirical to assess whether the flow of ecosystem services from these regenerated ecosystems are similar to the flow of such services from the natural mangrove forests? The study will evaluate (a) the role of planted mangroves as nursery ground and habitat for fishery and (b) impact of mangrove plantation on coastal erosion.	Act Go to

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Policy context	Contribution to TII – India
The outcome from the project would serve as policy guidance for similar ecosystems and small-scale fisheries in the developing world. This assessment will guide policy in understanding cost and benefit to ecology and economics of the stakeholders while replicating this model to other fisheries.	The study will provide overall assessment of cost and benefit of MSC certification to ecological services of clam and the lake.
This study will guide the policy of seasonal fishing ban in the following context: a) To substantiate SFB as a single regulatory measure or to implement along with a combination of other regulatory measures. b) Formulate more efficient and alternate management options to achieve enhanced ecosystem services and net social benefits. c) Help the government to decide the level of institutional support and quantum of financial support (towards compensation) to the fishers during SFB. d) Reduced fuel consumption and carbon emission due to SFB as the potential for use in carbon trading and saving in foreign exchange.	The study will assess the effectiveness of SFB. This study will provide the net social benefit of implementation of SFB. The difference between the value of the marine fish landings and the cost of enforcement of SFB will give the net social benefit or otherwise. If the result is a benefit, the Government can substantiate and/or plan to improve the outcome of SFB.

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The Indian mechanised fishery is subsidised by providing fuel and fleet subsidies, which may act as an incentive for overfishing. This study will review the subsidy policy and suggest measures to revise it. Moreover, by-catch does not appear generally in any official statistics. So the database of this study will help to understand the proportion of catch and by-catch, which will be useful in formulating policies.

The study will attempt to assess the total value lost due to by-catch as the total value lost will be estimated by shadow price time total quantity of by-catch produced in a given period of time. From an operational point of view the study will focus on the by-catch generated by the mechanised fishing and its effects on future mechanised fishery as well as inshore small-scale fisheries of Andhra Pradesh.

The results will have the following policy connect: (a) Provide important guidelines (like where the plantation is working best) to coastal forestry department engaged in mangrove restoration and management in Gujarat and elsewhere in the country or outside the country; (b) Help in correct accounting of ecosystem service flow from regenerated forests in green national accounting, which has become an important objective of the government; (c) Work as a baseline survey to find out if investment in coastal afforestation is paying results.

The study will make the following important contribution to TII: (a) Provide evidence on whether and to what extent the ecological restorations are contributing to flow of ecosystem services; (b) Evaluation of ecosystem restoration through the use of a sophisticated technique like difference-in-difference; (c) Help in preparing guidelines for ecological restoration; (d) Provide link between forest health and flow of ecosystem services.



Thanks