

MARINE FISHERIES CONSERVATION AND MANAGEMENT IN INDIA

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EXECUTIVE SUMMARY

This paper contains information on steps and initiatives taken or recommended by India to improve the conservation and management of fishery resources and other marine living resources with a view to achieving sustainable fisheries and protecting vulnerable marine ecosystem and biodiversity. The paper is based on information provided by States, relevant specialized agencies, in particular the Food and Agriculture Organization of the United Nations, and other appropriate organs, organizations and programmes of the United Nations System, sub-regional and regional organisations and arrangements for the conservation and management of fishery resources as well as other intergovernmental bodies and non-Governmental organizations.

The paper emphasizes the importance of the full implementation by India of all international fishery instruments, whether legally binding or voluntary, which promote the conservation, management and sustainable use of marine living resources. It also emphasizes the importance of cooperation among States, directly or through sub-regional and regional fisheries management organizations or arrangements (RFMO/As) to address unsustainable fishing practices and promote sustainable fisheries in areas beyond national jurisdiction, including through implementing their responsibilities as flag States, improving governance of RFMO/As, and cooperating in the establishment of new organizations or arrangements where none exist.

Certain fish stocks in India are depleted and the Marine Fishing Regulation Act of the Federal Governments and the Maritime Zones of India (Regulation of fishing by foreign vessels), Act, 1981 need amendments so as to be in tune with the Code of Conduct for Responsible Fisheries (CCRF) and other legal instruments. India has only acceded to the 1995 UN Fish Stock Agreement and yet to accede the 1993 FAO Compliance Agreement. CCRF have been disseminated to the end users through translations etc. to the regional languages of India. Considering all these aspects, a marine fisheries management model for fishery resources in the Exclusive Economic Zone (EEZ) of India which includes depleted stocks, is formulated based on the legal instruments, CCRF, including the National Plan of Action (NPOA) for fishing capacity, sharks, sea birds and illegal, unreported and unregulated (IUU) fishing.

DEDICATION

To

My heavenly mother

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LIST OF ABBREVIATIONS

APFIC	Asia-Pacific Fishery Commission
ARF	ASEAN Regional Forum
ASEAN	Association of Southeast Asian Nations
BE	Budget Estimate
BFDA	Brackishwater Fish Farmers' Development Agency
BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation
BOBP-IGO	Bay of Bengal Programme-Inter Governmental Organization
BOBLME	Bay of Bengal Large Marine Ecosystem
BPA	Barbados Plan of Action
CAA	Coastal Aquaculture Authority
CAGR	Cumulative Annual Growth Rate
CB	Community-Based
CBD	Convention on Biological Diversity
CBFM	Community Based Fisheries Management
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCRF	Code of Conduct for Responsible Fisheries
CIBA	Central Institute of Brackishwater Aquaculture
CICEF	Central Institute of Coastal Engineering for Fishery
CIFA	Central Institute of Freshwater Aquaculture
CIFE	Central Institute of Fisheries Education
CIFNET	Central Institute of Fisheries Nautical and Engineering Training
CIFRI	Central Inland of Fisheries Research Institute
CIFT	Central Institute of Fisheries Technology
CITES	Convention on International Trade in Endangered Species
CMFRI	Central Marine Fisheries Research Institute
CMLRE	Centre for Marine Living Resources and Ecology
CMS	Convention on Migratory Species
COFI	Committee on Fisheries

CORDIO	Coastal Oceans Research and Development in the Indian Ocean
CPUE	Catch Per Unit Effort
CSIR	Council of Scientific and Industrial Research
CWPRS	Central Water and Power Research Station
DADF	Department of Animal Husbandry, Dairying and Fisheries
DANIDA	Danish International Development Assistance
DARE	Department of Agricultural Research and Education
DFID	Department for International Development
DoF	Department of Fisheries
EAS	East Asia Summit
EEZ	Exclusive Economic Zone
EMS	Environmental Management System
ENEA	Italian National Agency for New Technologies, Energy and Environment
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FEE	Foreign Exchange Earnings
FFDA	Fish Farmer's development Agency
FLC	Fish Landing Centre
FOB	Freight On Board
FRP	Fibre-Reinforced Plastic
FSI	Fishery Survey of India
GA	General Assembly
GDP	Gross Domestic Product
GEF	Global Environment Facility
GPA	Global Programme of Action
HACCP	Hazard Analysis and Critical Control Points
HRD	Human Resource Development
ICAR	Indian Council of Agricultural Research
ICAM	Integrated Coastal Area Management
ICM	Integrated Coastal Management

ICMAM	Integrated Coastal and Marine Area Management
ICOM	Integrated Coastal and Ocean Management
ICZM	Integrated Coastal Zone Management
IDBI	Industrial Development Bank of India
IFCI	Industrial Finance Corporation of India
IITM	Indian Institute of Tropical Meteorology
IMD	Indian Meteorological Department
IMO	International Maritime Organisation
INCOIS	Indian National Centre for Ocean Information Services
INR	Indian Rupees
IOI	International Ocean Institute
IOMAC	Indian Ocean Marine Affairs Commission
IOR-ARC	Indian Ocean Rim Association for Regional Cooperation
IOTC	Indian Ocean Tuna Commission
IPCC	Intergovernmental Panel on Climate Change
IPOA-Capacity	International Plan of Action for the Management of Fishing Capacity
IPOA-IUU	International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing
IPOA-Seabirds	International Plan of Action for Reducing Incidental Catch of Seabirds in Longline fisheries
IPOA-Sharks	International Plan of Action for the Conservation and Management of Sharks
IRDP	Integrated Rural Development Programme
ISO	International Organization for Standardization
ITLOS	International Tribunal for the Law of the Sea
ITQ	Individual Transferable Quota
IUCN	International Union for Conservation of Nature
IUU Fishing	Illegal, Unreported and Unregulated Fishing
LME	Large Marine Ecosystem
LOSC	Law of the Sea Convention
MCS	Monitoring, Control and Surveillance
MFPI	Ministry of Food Processing Industries

MFRA	Marine Fishing Regulation Act
MMD	Mercantile Marine Department
MoEF	Ministry of Environment and Forests
MoES	Ministry of Earth Sciences
MPA	Marine Protected Area
MPEDA	Marine Production Export Development Authority
MSC	Marine Stewardship Council
MSY	Maximum Sustainable Yield
MZI	Maritime Zones of India
NABARD	National Bank for Agriculture and Rural Development
NBFGR	National Bureau of Fish Genetic Resources
NCDC	National Co-operative Development Corporation
NCMRWF	National Centre for Medium Range Weather Forecasting
NFDB	National Fisheries Development Board
NGO	Non-Governmental Organization
NIFPHTT	National Institute of Fisheries Post Harvest Technology and Training
NIO	National Institute of Oceanography
NIOT	National Institute of Ocean Technology
NMFC	National Marine Fisheries Census
NORAD	Norwegian Agency for Development Cooperation
NPOA	National Plan of Action
NRCCWF	National Research Centre on Coldwater Fisheries
OAL	Over All Length
ODA	Overseas Development Administration
OSCE	Organisation for Security and Cooperation in Europe
OSY	Optimum Sustainable Yield
PL	Post Larvae
POP	Persistent Organic Pollutant
PPP	Purchasing Power Parity
R&D	Research and Development
RE	Revised Estimate

RFMO/A	Regional Fisheries Management Organization or Arrangement
SAARC	South Asian Association for Regional Cooperation
SACEP	South Asia Co-operative Environment Programme
SAU	State Agricultural University
SCICI	Shipping Credit and Investment Company of India
SFC	State Finance Corporation
SHG	Self Help Group
SPS	Sanitary and Phyto-Sanitary
TAC	Total Allowable Catch
TCG	Technical Cooperation Group
TD	Top-Down
ToR	Terms of Reference
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFSA	United Nations Fish Stock Agreement
UNTS	United Nations Treaty Series
USA	United States of America
UT	Union Territory
VME	Vulnerable Marine Ecosystem
VMS	Vessel Monitoring System
WCMC	World Conservation Monitoring Centre
WSSD	World Summit on Sustainable Development
WWF	World Wildlife Fund

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Introduction

Marine capture fisheries face major and complex challenges: habitat degradation, poor economic returns, social hardships from depleted stocks, illegal fishing and climate change. The key factors that prevent the transition to sustainable fisheries are information failures, transition costs, use and non-use conflicts and capacity constraints (Grafton *et al.*, 2008). It is affected by (and also contributes to) the “globalisation syndrome” (Ludeke *et al.*, 2004) characterised by overexploitation of natural ecosystems, environmental degradation, accumulation of waste, biodiversity loss, increasing mobility of humans, increasing energy consumption and amplification of worldwide disparities, as well as range of other environmental and human concerns.

The scientific challenge is in developing coherence between the disciplinary projections of the multi-dimensional system on its ecological, economic, social (and societal) and institutional planes. This requires the use of all relevant knowledge – through participatory research, incorporation of validated traditional knowledge, and increasing scientific rigour – as well as approaches to account for uncertainty; dealing simultaneously with long and short-term scales (operations research and strategic planning); improving communication with stakeholders and the public; and developing inter-disciplinary integrated assessment processes (Garcia and Charles, 2008).

The governance challenge is in developing the enabling environments, at local, regional and global levels, with the institutional structures, processes, and instruments, including incentives, necessary to guide and control the uses of fishery systems. Action required to deal with systemic complexity includes: decentralization and devolution of management responsibilities, empowering stakeholders; simultaneous development of environmental and other national norms against which to frame and assess decentralized governance; coordination with other sectoral administrations for integrated area-based management; ensuring sufficient research capacity to deal with added requirements; and nesting tactical (stock-based) plans (Garcia and Charles, 2008). Paraphrasing Yorke *et al.* (2002), due to the complexities of relationships, multiple solutions, and inevitable surprising outcomes,

there will be no fixed optimal strategy, or mixture of strategies for seeking sustainability, but rather pathways in an ever changing landscape. Governance will need to be truly adaptive, rationally determining expectations and developing measures to be considered if failures are detected (Garcia and Charles, 2008).

The Societal challenge is in clarifying overall national objectives and acceptable levels of impacts as well as in equitable allocations of resources and costs among all potential stakeholders and beneficiaries of the aquatic systems. It is also in raising citizens' awareness of societal stakes and the need for an effective but rational integrated response (Garcia and Charles, 2008).

Multiple causes of failure: Garcia (2005) summarizes some key problems as follows: It is recognized that the present problems are of an institutional nature, related, *inter alia*, to (a) the inadequacy (or absence) of tenure systems (free and open access); (b) the political difficulty of resource allocation; (c) the insufficient delegation of managerial powers (e.g., in regional commissions or decentralized national systems); (d) the weaknesses of the decision making systems at the regional level (often based on consensus); (e) the weak deterrence of most enforcement systems (particularly regional); (f) the lack of integration of national and regional policies; and (g) the rigidity of the sectoral structures (capital and labour, cultural and historical biases, etc.). Many of these forces operate at the macro level with irresistible power.

Examined from systemic origin, the problems might be summarized in three key areas (Garcia and Charles, 2008):

(a) *Conventional management paradigm:* The conventional fishery management paradigm, concerned mainly with resource conservation and supply regulation, often failed to account for fishers' incentives, lack of rights and the implications of individual preferences, as well as the practical operational constraints of the fleets and processing systems. Disregarding the potential effects of vertical, horizontal and cross-sectoral integration on fisher response to management, the paradigm is not able to deal with the complexity of small-scale fisheries, and is not much better suited for large-scale fisheries, particularly in the high seas. The reluctance of

management to deal explicitly with complex species interactions and medium-term natural oscillations is another important cause of poor management performance.

(b) *Administration and institutions*: The linkages between fisheries operations and institutions regulating these operations are fundamental. Many fisheries with “failed management”, in reality, are not managed at all, because the administrative structure that is supposed to deliver management functions is most often understaffed, poorly trained, with insufficient scientific and enforcement capacity and quite possibly lacking in general support from the fishing sector. As a consequence, basic statistics are inadequate, formal assessments rare and weak, and compliance poor. The legislative framework is also often incomplete, lacking defensible user rights or protection of vulnerable ecosystems, for example. Chronically under-funded fishery research aggravates the situation, crippling the advice provided.

(c) *Governance*: Public policies and legislative systems provide the broader framework for fisheries system administration and management. The objectives found in higher-level policy – such as the generation of foreign currency, the reduction of inter-Governmental conflicts, maximum employment or social peace - strongly affect fisheries management outcomes and performance. Yet fishery sector policy and planning and fishery management itself – which operate respectively at strategic and tactical/operational levels – are rarely developed in harmony. In addition, the governance momentum and the information base within Ministries may well change at each election, resulting in slow institutional learning. The lack of decentralisation and devolution of powers to lower levels and the lack of capacity at these levels are also factors of failure. Most of these problems also affect the management of other sectors interacting with fisheries, complicating the issue.

Almost all the issues encountered in coastal management fall into two main domains (Noronha, 2004): resource depletion or degradation, or resource-use conflicts, either within or between sectors. Cardinale and Svedäng (2008) argued that managers and politicians have had the necessary scientific instruments for managing stocks and avoid stock collapse, but they failed as they tried to minimize the impact of policy on those who are most affected (i.e. the fishing industry) in a

short-term perspective. Thus it is the practice of ignoring the scientific advice more than the advice itself that is to be blamed for the waste of former large marine resources. What we urgently need for securing marine ecosystems is not more data but immediate actions. Rosenberg (2007) and Cardinale and Svedäng (2008) stated adhering to the scientific advice is always the best course. What is lacking is the political will to implement restrictive management measures (Mace, 1997, 2001). Massive and prolonged over-exploitations, leading to collapses in abundance, may significantly increase the probability of extinction of both exploited and incidentally harvested fish populations (Hutchings, 2000). Frid *et al.* (2006) opined that scientists advocate that single-species advice need to incorporate ecological and ecosystem aspects in order to move towards an ecosystem approach to fisheries and assure sustainability in the long term. The catch of a certain species by a fishery will have some effects on populations of other species. In addition, fluctuation of population levels of some species as a result of changes in oceanographic conditions (e.g. El Nino phenomenon) could affect the stock level of a target species of a fishery (Morishita, 2008).

Projects have been designed without consideration of the unique resource and institutional characteristics of fisheries, planners have failed to recognize necessity of making difficult choices between increasing exports, increasing domestic fish supply, raising producer's income and expanding employment opportunities in a fishery, fundamentally political and moral rather than technical and economic in nature because they involve considerations of equity and fairness, lack of project success can be traced to a lack of understanding and respect for social and cultural characteristics of the target populations (Bailey and Jentoft, 1990).

The hard choices in fisheries development are changes in practice and technology and these have been responsible for the intensification of use and in some instances over fishing. Over fishing reduces potential harvest in specific areas and have forced nations to turn their attention to the management of fishery resources (Juda and Burroughs, 1990).

The international community faces a significant challenge in achieving the sustainable use of fishery resources when the level of demand for the resources has

increased beyond what the marine environment can supply. Most of the world's main capture fisheries have reached their maximum potential, with over 75 per cent of world fish stocks estimated to be either fully exploited or over exploited.¹ Impediments to the sustainable development of fisheries also persist in virtually all fishing areas of the world, including overfishing, overcapacity and illegal, unreported and unregulated fishing (IUU fishing).² At the same time, demand for fish products has increased and is expected to increase as a result of population growth and further expansion of trade.³

Fisheries provide a vital source of food, employment, trade and economic well being for people throughout the world, and may therefore be conducted in a responsible manner in order to meet the needs of both present and future generations. The occurrence of unsustainable fishing practices in the fishing sector, such as the persistence of overcapacity and institutional overfishing, IUU fishing, the use of unselective fishing gear and techniques with their toll of excessive by-catch and destruction of marine habitats, as well as the continuation of large-scale pelagic

¹ A/62/260, paras.5-6. The Food and Agriculture Organization of the United Nations (FAO) estimated that more than 75 per cent of world fish stocks were already fully exploited or overexploited, confirming earlier observations that the maximum wild capture fishery potential from the world's oceans had probably been reached. Those findings also reinforced calls for more cautious and effective fisheries management to rebuild depleted stocks and prevent the decline of stocks being exploited at or close to their maximum potential. The situation was more critical for some highly migratory, straddling and other fishery resources that were exploited solely or partially in the high seas, in particular, straddling stocks and highly migratory oceanic sharks.

² A/63/79, para.13. The Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction, which met at United Nations Head Quarters in New York, from 28 April to 2 May 2008, identified certain anthropogenic impacts on marine biodiversity beyond areas of national jurisdiction that required particular attention, including impacts caused by unsustainable fishing activities, such as overfishing, overcapacity, by-catch, destructive fishing practices and IUU fishing.

³ FAO website: <http://www.fao.org/fishery/topic/2883/en>. The value of world exports of fish and fish products grew 9.5 per cent in 2006 to US\$ 86 billion and nearly 7 per cent in 2007 to \$92 billion, with developing States accounting for 50 per cent of all fish exports. The proportion of world fish production traded internationally represented 38 per cent of the total, or 55 million tonnes (FAO News Release 2 June 2008, <http://www.fao.org/newsroom/en/news/2008/1000850/index.html>). The eleventh session of the FAO Subcommittee on Fish Trade (2-6 June 2008, Bremen, Germany) endorsed a set of technical guidelines aimed at promoting responsible international trade in fish and fishery products, which were intended to ensure that international trade in fish and fishery products did not compromise the sustainable development of fisheries and responsible utilization of living aquatic resources (FAO News Release, 17 June 2008. <http://fao.org/newsroom/en/news/2008/1000867/index.html>).

drift-net fishing, have adverse impacts on long-term conservation, management and sustainable use of marine fishery resources (A/62/260, paras. 101-105).⁴

Overfishing, IUU fishing and destructive fishing practices continue in many regions and are a source of concern in the fishing industry and for the international community. According to the 2006 Food and Agriculture Organization (FAO) World Fisheries Report (FAO, 2006), many stocks are fully exploited or overexploited, depleted or recovering from depletion, confirming earlier observations that the maximum wild capture fishery potential from world's oceans has probably been reached.

IUU fishing is a serious global problem, one of the main impediments to the achievement of sustainable fisheries. It thrives due to the weak governance and failure to meet international responsibilities. It puts unsustainable pressure on fish stocks, marine wildlife and habitats, subverts labour standards and distorts markets. IUU fishing is a major contributor to over fishing, targets juveniles which would otherwise be protected by rules on minimum sizes, or is carried out during periods or in areas which are normally closed, thus jeopardizing the renewal of the fish stocks. IUU fishing with prohibited methods can result in a high proportion of unwanted species being taken as by-catch and then discarded. Such discards include not only fish species, but other animals, such as sea birds or turtles. Fishing in protected areas may also be the direct cause of irreversible damage to vulnerable marine ecosystems, such as coral reefs. Some of the coastal developing countries lack the means and capacity to manage and control properly the maritime waters under their jurisdiction (FAO, 2005).

The major motive for IUU activities is the potential for high profits. The operating costs of firms involved in IUU fishing are generally lower than those of the

⁴ The issue of IUU fishing was considered by the ninth meeting of the United Nations Open-Ended Informal Consultative Process on Oceans and the Law of the Sea, held at United Nations Head Quarters in New York, from 23 to 27 June 2008, during its discussions on the topic "Maritime Security and Safety". It was proposed that the General Assembly recognize that illegal fishing poses a threat to the economic, social and environmental pillars of sustainable development. Divergent views were expressed on the existence of a link between IUU fishing and organized crime, and some countries suggested that an in-depth dialogue with relevant stakeholders at all levels be carried out with a view to producing a multidisciplinary study on the issue (Agreed Consensual Elements to be suggested to the General Assembly for consideration under its agenda item entitled "Oceans and the law of the sea". www.un.org.Depts/los/index.htm)

average fishing from operating legally. Costs resulting from social and tax charges can be reduced to a minimum or may even be non-existent for fleets engaged in IUU activities under cover of offshore companies or flags of convenience. Non-respect of fisheries rules and trading of catches outside official channels also translate into reduced expenses (FAO, 2005).

IUU operators are rarely penalized, and the sanctions they incur are usually not sufficient to act as an effective deterrent, they thus come to be considered as simply additional operating costs. While costs are low, the probable profits from IUU activities are generally high subject to the number of other IUU fishing fleets, since illegal operators tend to target valuable species which command higher market prices. Under the Law of the Sea, the duty to exert control over a vessel is primarily incumbent upon the flag State (United Nations Convention on Law of the Sea (UNCLOS), 1982). When flag States are unable to exert such control, their flags can be used by those whose intention is to evade fisheries law. This then encourage flag-hopping where vessels regularly change flags in order to benefit from the least demanding regimes and make it more difficult for inspection and control services to keep track of them (FAO, 2005).

Through better governance and institutional change that encompasses the public good of the oceans (biodiversity, ecosystem integrity, sustainability) and social values (existence, aesthetic and amenity) will fisheries be made sustainable (Grafton *et al.*, 2008). In view of the consequences of regulation of marine fisheries like tendency for fish stocks to be fished above biologically optimum levels, tendency for more fishermen to engage in a fishery than is economically justified, likelihood of competition and conflict between different groups of fishermen (Churchill and Lowe, 1999), the UNCLOS,⁵ the United Nations Conference on Environment and Development (UNCED),⁶ the World Summit on Sustainable Development (WSSD)⁷

⁵ UNCLOS 1833 United Nations Treaty Series (UNTS) 396, refers to the international agreement that resulted from the Third UNCLOS that took place from 1973 through to 1982 with modifications that were made by the November 1994 Agreement on Implementation. The Convention defines the rights and responsibilities of nations in their interaction and use of the world's ocean.
www.un.org/Depts/los/convention_agreements/convention_overview_convention.htm

⁶ UNCED also called Earth Summit took place in Rio de Janeiro, Brazil from 3-14 June 1992. The theme was to discuss environment and sustainable development. It resulted in Agenda 21, the Rio Declaration on Environment and Development, the Statement of Forest Principles, the United Nations

and many other international and regional conventions, agreements and initiatives entered into force.

Chapter 17 of Agenda 21 addresses the protection of the oceans, seas and coastal areas and outlines the needs, priorities and guiding principles for all nations in as far as the management of the ocean. Since its conclusion in 1992, and with the realization of the importance of harmonizing the various uses, the existing legal framework and general management of the coastal and ocean regimes as carried out by various Government institutions and other stakeholders, there has been remarkable increase in interest by many coastal States to manage their coastal and ocean spaces in a more holistic manner through the adoption of various strategies. Such approaches include, *inter alia*, Integrated Coastal Management (ICM)⁸ and Integrated Coastal and Ocean Management (ICOM). ICM has been defined as ‘A continuous and dynamic process by which decisions are made for the sustainable use, development, and protection of coastal and marine areas and resources’ (Cicin-Sain and Knecht, 1998). The ICOM concept involves rational decisions, comprehensive planning and management of human activities in both the ocean and the adjacent coastal area for the purposes of achieving sustainable use of the resources within them. Such an approach is better placed to address the associated resource exploitation opportunities, environmental, social and economic challenges (Cicin-Sain and Knecht, 1998).

Framework Convention on Climate Change and the United Nations Convention on Biological Diversity. www.un.org/geninfo/bp/enviro.html Divided into 4 major sections and 40 chapters, Agenda 21 is a comprehensive plan of action intended to be taken globally, nationally and locally by Governments, major groups and organisations of the United Nations system with regard to environment, development and social issues. United Nations, Report of the United Nations conference on Environment and Development. Rio de Janeiro, 3-14 June, 1992. A/CONF.151/26 (Vol.I), p. 1-6.

www.un.org/esa/sustdev/documents/agenda21/english/agenda21toc.htm

⁷ WSSD also known as Earth Summit 2002 took place in Johannesburg, South Africa, from 26 August to 4 September 2002. Organised by the UN, WSSD was convened to discuss sustainable development in the world and to evaluate the effectiveness of Agenda 21 and other agreements reached at the 1992 Earth Summit. WSSD brought together heads of State and Government, national delegates and leaders from Non-Governmental Organisations (NGOs), business and other major groups. www.earthsummit2002.org

⁸ On the holistic management approach of coastal areas, terminologies like ICM, Integrated Coastal Area Management (ICAM) and Integrated Coastal Zone Management (ICZM) have been adopted with similar objectives.

Paragraph 17.6 of Agenda 21 encourages coastal States to consider establishing, or where necessary strengthening appropriate coordinating mechanisms (such as high level policy planning body) for the integrated management and sustainable development of coastal and marine areas and their resources, at both the local and national levels. Such mechanisms may include consultation with the academic and private sectors, Non-Governmental Organizations (NGOs), local communities, resource user groups and indigenous people.⁹ Section 17.6 (b) calls for the implementation of integrated coastal and marine management and sustainable development plans and programmes at appropriate levels.¹⁰

The Convention on Biological Diversity (CBD),¹¹ The Barbados Plan of Action (BPA),¹² the Global Programme of Action (GPA) for the Protection of the Marine Environment from Land-Based Sources of Pollution¹³ and the FAO Code of Conduct

⁹ www.un.org/esa/sustdev/documents/agenda21/english/agenda21chapter17.htm

¹⁰ *Ibid*

¹¹ Signed by 150 Government leaders at the 1992 Rio Earth Summit, the CBD is dedicated to the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies and by appropriate funding. Article 6 (b) calls for the integration in as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies. www.cbd.int/convention/default.shtml The objectives of CBD, 1760, UNTS 79, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources. India signed and ratified it on 5th June 1992 and 18th February 1994. www.cbd.int/convention/articles.shtml?a=cbd-01

¹² In April 1994, a global conference was held in Barbados to consider how small island States could face up to their special challenges. The Global Conference on the Sustainable Development of Small Island Developing States determined that sustainable development was the logical answer, and adopted the BPA for the Sustainable Development of Small Island Developing States to help bring it about. Paragraph 239(a) calls for the application of ICAM approaches, including provisions to involve stakeholders, in particular local authorities and communities and relevant social and economic sectors, including NGOs, women, indigenous people and other major groups. www.unep.ch/regionalseas/partners/sids.htm

¹³ The GPA is designed to be source of conceptual and practical guidance to be drawn upon by national and/or regional authorities for devising and implementing sustained action to prevent, reduce, control and/or eliminate marine degradation from land based activities. The GPA aims at preventing the degradation of the marine environment from land based activities by facilitating the duty of States to preserve and protect the marine approaches, including provisions to involve stakeholders. www.gpa.unep.org/content.html?id=ln=6

for Responsible Fisheries (CCRF)¹⁴ all call for cross sectoral approaches to the management of coastal and marine areas.

Unfortunately, the lack of, or insufficient implementation of, instruments such as the 1995 FAO CCRF, the 2001 International Plan of Action to Prevent, Deter and Eliminate IUU Fishing adopted under the Code of Conduct (A/59/63 and Corr. I, paras 53-85)¹⁵ and the FAO 2005 Model Scheme on Port State Measures to Combat IUU Fishing (A/CONF.210/2006/1 and Corr.1, para.275)¹⁶ has diminished their effectiveness in improving fisheries governance and sustainable management for fish stocks. Consequently, a number of new initiatives are being put forward by States and Regional Fisheries Management Organization/Associations (RFMO/As) to ensure effective measures and also provide for better protection of Vulnerable Marine Ecosystems (VMEs) and marine biodiversity.

General Assembly (GA) Resolution 62/177 on sustainable fisheries and 62/215 on oceans and the law of the sea, adopted on 18 and 22 December 2007, respectively, cover a broad range of ocean issues and attest to the ever-increasing importance of the role of the General Assembly as the global institution having the competence to undertake an annual review and evaluation of the implementation of UNCLOS and other developments relating to ocean affairs and the law of the sea. (Report of the Secretary-General, United Nations General Assembly, 2008a, A/62/177).

In its Resolution A/62/177, the General Assembly reaffirmed the importance of achieving sustainable fisheries through the long-term conservation, management and sustainable use of the marine living resources of the world's oceans and seas, and the obligations of States to cooperate to that end, in accordance with international law, as reflected in the relevant provisions of UNCLOS and related

¹⁴ Paragraph 6.9 of the FAO Code of Conduct outlines that States should ensure that their fisheries interests, including the need for conservation of the resources, are taken into account in the multiple uses of the coastal zone and are integrated into coastal area management, planning and development. www.fao.org/DOCREP/005/v9878e00.htm#6

¹⁵ Report of the Secretary General, 5 March 2004. Oceans and the Law of the Sea. Consultative Group on Flag State Implementation. General Assembly, 59th Session.

¹⁶ Delegations to the Review Conference, New York, 22-26 May 2006: Review Conference on the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks.

international fisheries instruments. The General Assembly requested States to urgently reduce the world's fishing fleet overcapacity to levels commensurating with the sustainability of fish stocks, implement the International Plan of Action (IPOA)-Capacity and eliminate subsidies that contributed to IUU fishing and overcapacity (Report of the Secretary-General, United Nations General Assembly, 2008b, A/62/215).

Promoting responsible fisheries will help to ensure that fisheries resources will continue to provide important nutritional, economic, social, environmental and cultural benefits for both present and future generations. States must conserve and manage marine living resources in an effective manner, recognizing the importance of fisheries and the interests of those involved in the fishery sector, while at the same time taking into account the biological characteristics of the resources, the interdependence between the harvested species and associated and dependent species, as well as the importance of marine ecosystems, including VMEs, as habitats for many fish species and other components of marine biodiversity. Measures need to be taken in this regard to avoid the adverse impacts of fishing on the marine environment, maintain the integrity of marine ecosystems, and minimize the risk of long-term or irreversible effects of fishing operations.¹⁷ There is also a need to improve cooperation and coordination to further promote responsible fisheries in the marine ecosystem and provide international partnerships and funding for capacity-building in developing States.

The number of parties to the UNCLOS and its implementing Agreement is 155 including the European Community. The number of parties to the Agreement relating to the implementation of Part XI of the UNCLOS (the "Part XI Agreement") is 131 and the number of parties to the United Nations Fish Stocks Agreement is 68 (Report of the Secretary-General, United Nations General Assembly, 2008a).¹⁸

India is one of the oldest civilisations and largest democratic countries in the world with a kaleidoscopic variety and rich cultural heritage. It has achieved all-round socio-economic progress during the last 61 years of its independence. India has

¹⁷ The Code of Conduct, the Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem, and the Agreement.

¹⁸ http://www.un.org/Depts/los/general_assembly/general_assembly_reports.htm

become self-sufficient in agricultural production and is now the tenth industrialised country in the world and the sixth nation to have gone into outer space to conquer nature for the benefit of the people. India became the fourth nation after the United States of America (USA), Japan and Russia to have successfully planted their flags on the moon. India, a union of States, is a Sovereign, Secular and Democratic Republic with a Parliamentary system of Government. The President is the constitutional head of the Executive of the Union. In the states, the Governor, as the representative of the President, is the head of the Executive. The system of Government in States closely resembles that of the Union. There are 28 States and 7 Union Territories (UTs) in the country. Union Territories are administered by the President through an Administrator appointed by him. From the largest to the smallest, each State/UT of India has a unique demography, history and culture, dress, festivals, language etc.¹⁹

After independence in August 1947, the country adopted a socialistic style of development through centralized planning. The National Five-year Plans were formulated and implemented to harmonize the use of resources for parallel development of capital-intensive heavy industries, with labour intensive small-scale industries and the rural and agricultural sectors. However, the lukewarm growth of the economy during this period and the worsening balance of payment situation led the Government to undertake a series of reforms. India now stands as the third largest economy in the world in terms of purchasing power parity (PPP).²⁰

The fisheries sector occupies a very important place in the socio-economic development of India. It has been recognized as a powerful income and employment generator as it stimulates growth of a number of subsidiary industries, and is a source of cheap and nutritious food besides being a foreign exchange earner. Most importantly, it is the source of livelihood for a large section of economically backward population of the country (Handbook on Fisheries Statistics, 2006).

¹⁹ http://india.gov.in/knowindia/state_uts.php

²⁰ World Development indicator database, World Bank, 2007.

Scope of fisheries management in India

Fisheries management implies a Governmental system of management rules based on defined objectives and a mix of management means to implement the rules, which is put in place by a system of monitoring, control and surveillance (MCS). Modern fisheries management is most often based on biological arguments where the idea is to protect the biological resources in order to make a sustainable exploitation possible. As per the 'ecosystem approach', fisheries management is defined as management actions aimed at conserving the structure and functions of marine ecosystems, in addition to conserving the fishery resources (Yadava, 2008).

The scope of Indian fisheries management can be traced through the Five-Year Plans. Until the Seventh Five-Year Plan (1985-1990), the Government was mainly concerned with increasing fish production and promoting capitalization of the fishing fleet. During the Eighth Five-Year Plan (1992-1997), fisheries management figured in the scope of Plan budget, which was then carried on to the subsequent Plans also. Indian institutions are taking a leading role in the conservation of natural resources and biodiversity by joining hands with the local community. This has been possible through rigorous education campaigns, public participation and joint participation programmes. If all these are well planned and organized, they have a potential of bringing in important funds to the local economy thus uplifting living standards (Yadava, 2008).

The main challenges facing fisheries development in the country includes accurate data on assessment of fishery resources and their potential in terms of fish production, development of sustainable technologies for fin and shell fish culture, yield optimization, harvest and post-harvest operations, landing and berthing facilities for fishing vessels and welfare of fishermen.²¹

Poverty and marginalization among fishers, lack of awareness and communication of the potential benefits of co-management, lack of equity and power-sharing between Government and resource users (small scale fishing communities), limits empowerment of resource users, national policy and legislative frameworks are not conducive, insufficient institutional linkages and communication

²¹ <http://www.dadf.gov.in>

between relevant stakeholders, lack of personnel with requisite capacity to implement co-management successfully are to be addressed for the fisheries management in India (Hand Book on Fisheries Statistics, 2006).

The Maritime Zones of India (MZI) (Regulation of Fishing by Foreign Vessels) Act, 1981 needs to be amended so as to take into account the CCRF and other legal instruments. India is yet to accede to the 1993 Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (Compliance Agreement). Marine fisheries management for fishery resources in the Exclusive Economic Zone (EEZ) of India including depleted stocks will be formulated based on legal instruments, CCRF, including a National Plan of Action (NPOA) for fishing capacity, sharks, sea birds and IUU fishing. Fisheries conservation models developed during the study will be useful for implementation of various schemes and policies for sustainable development of marine fisheries in India.

This research paper is an attempt to address the ocean policy formulation process in India and dealing the main policy components including the existing legal and institutional framework. This is done in three major and interrelated chapters. Chapter 1 gives the Physical profile and status of fisheries. It outlines geobiodiversity, marine fisheries resources and status, stress factors and problems. Chapter 2 gives the Background information on fisheries law and policy in global framework, regional framework and national framework. Chapter 3 outlines Conclusion and recommendations for sustainable fisheries management.

Chapter 1. INDIA: THE PHYSICAL PROFILE AND STATUS OF FISHERIES

India faces a myriad of environmental challenges and impacts due to rapid development and socio-economic activities in its coastal and marine areas. These activities are mostly associated with industry, tourism, agriculture, fishing and oil exploration in the offshore area. While these activities are going on, there is no effective implementation of legal and institutional framework to guide them comprehensively, thus the many challenges and pressures being faced by the users, the existing institutional arrangement and the associated ecosystems. In order to implement legal and institutional framework effectively, the physical profile and status of fisheries are to be studied. The objectives of this study are to understand, monitor and conserve the geobiodiversity, the condition and extent of ecosystems, distribution and status of species. This Chapter illustrates the geobiodiversity, marine fisheries resources and status and stress factors and problems.

1.1. Geobiodiversity

India covers an area of 3.29 million sq. km, extending from the snow-covered Himalayan heights to the tropical rain forests of the south. As the 7th largest country in the world, India stands apart from the rest of Asia, marked off as it is by mountains and the sea, which give the country a distinct geographical entity. Bounded by the Great Himalayas in the north, it stretches southwards and at the Tropic of Cancer, tapers off into the Indian Ocean between the Bay of Bengal on the east and the Arabian Sea on the west (Figure 1).

Lying entirely in the northern hemisphere, the mainland extends between latitudes 8°4' and 37°6' north, longitudes 68°7' and 97°25' east and measures about 3,214 km from north to south between the extreme latitudes and about 2,933 km from east to west between the extreme longitudes. It has a land frontier of about 15,200 km. The total length of the coastline of the mainland, Lakshadweep Islands and Andaman and Nicobar Islands is 8,118 km.



Figure 1. Physical Map of India²²

Border countries, geography, climate, population, political systems are influencing the sustainable development of resources. So, cooperation between neighbours; knowing geography, climate, population, political system may help in the conservation and management of resources.

Border countries are Afghanistan and Pakistan to the north-west; China, Bhutan and Nepal to the north; Myanmar to the east; and Bangladesh to the east of

²² http://www.nationsonline.org/bilder/map_of_india50.jpg

West Bengal. Sri Lanka is separated from India by a narrow channel of sea, formed by the Palk Strait and the Gulf of Mannar. The climate of India can broadly be classified as a tropical monsoon one. But, in spite of much of the northern part of India lying beyond the tropical zone, the entire country has a tropical climate marked by relatively high temperatures and dry winters. There are four seasons – (i) winter (December-February), (ii) summer (March-June), (iii) south-west monsoon season (June-September), and (iv) post monsoon season (October- November). The mainland comprises of four regions, namely the great mountain zone, plains of the Ganga and the Indus, the desert region, and the southern peninsula. A vast plateau flanked by two hilly coastal ranges, the Western Ghats and the Eastern Ghats, covers the southern part of the country. Several rivers weave their way around the country, including the Ganges, the Brahmaputra, and the Yamuna. India's varied habitats are coasts, rainforests, swamps, mountains and are home to 7.6% of all mammalian, 12.6% of avian, 6.2% of reptilian, and 6.0% of flowering plant species globally. Strong summer monsoons cause seasonal changes in vegetation and habitat every year. The total population is estimated at 1,147,995,898 and is growing at a rate of 1.578% (July 2008 est.). Real Gross Domestic Product (GDP) expanded by 9.2% in 2007 and is continuing to grow at an impressive rate.²³

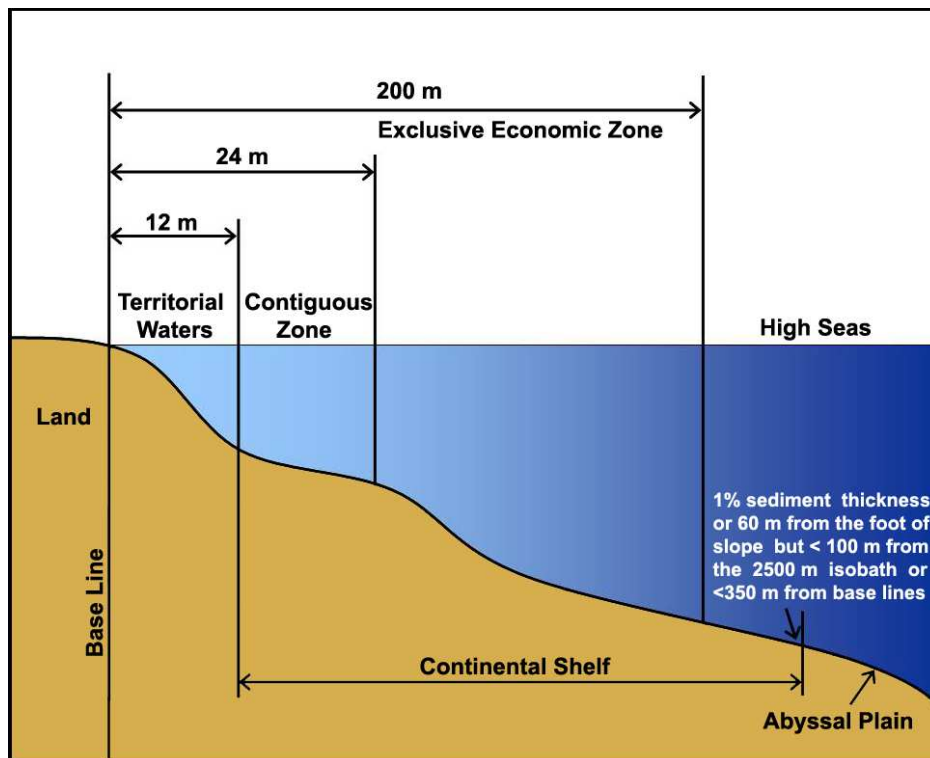
1.2. Marine Fisheries Resources and Status

The fisheries sector occupies a very important place in the socio-economic development of the country. The fisheries sector is a source of livelihood for over 14 million people and an earner of foreign exchange of US\$ 160.48 million per annum from 0.551 million tonnes (Hand Book on Fisheries Statistics, 2006). It is an employment generator as it stimulates growth of a number of subsidiary industries and is a source of cheap and nutritious protein. More than 6.7 million fishers depend on fisheries and aquaculture for their livelihood (Hand Book on Fisheries Statistics, 2006).

The country has a long coastline and an equally large area under estuaries, backwaters and lagoons, etc. The continental shelf area amounts to 0.53 million sq.

²³ http://india.gov.in/knowindia/india_at_a_glance.php

kms of which 71 per cent area is available to the Arabian Sea (west coast) and the remaining 29 per cent in the Bay of Bengal (east coast). After declaration of the EEZ in 1977, the area available to India is estimated at 2.02 million sq. kms, comprising 0.86 million sq. kms on the west coast, 0.56 million sq. kms on the east coast and 0.60 million sq. kms around the Andaman and Nicobar islands (Figure 2 and Figure 3).



(Source: Tsamenyi, 2006)

Figure 2. Zones delimitation according to the UNCLOS (Part V)

In the Territorial Waters, Continental Shelf, Exclusive Economic Zone (EEZ) and other Maritime Zones Act, 1976 (Act No. 80 of 28 May 1976), “limit” in relation to the territorial waters, the EEZ or any other maritime zone of India, means the limit of such waters, shelf or zone with reference to the mainland of India as well as the individual or composite groups of islands constituting part of the territory of India (Territorial Waters, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Act, 1976).²⁴

²⁴ http://www.un.org/Depts/los/LEGISLATIONANDTREATIES/PDFFILES/IND_1976_Act.pdf

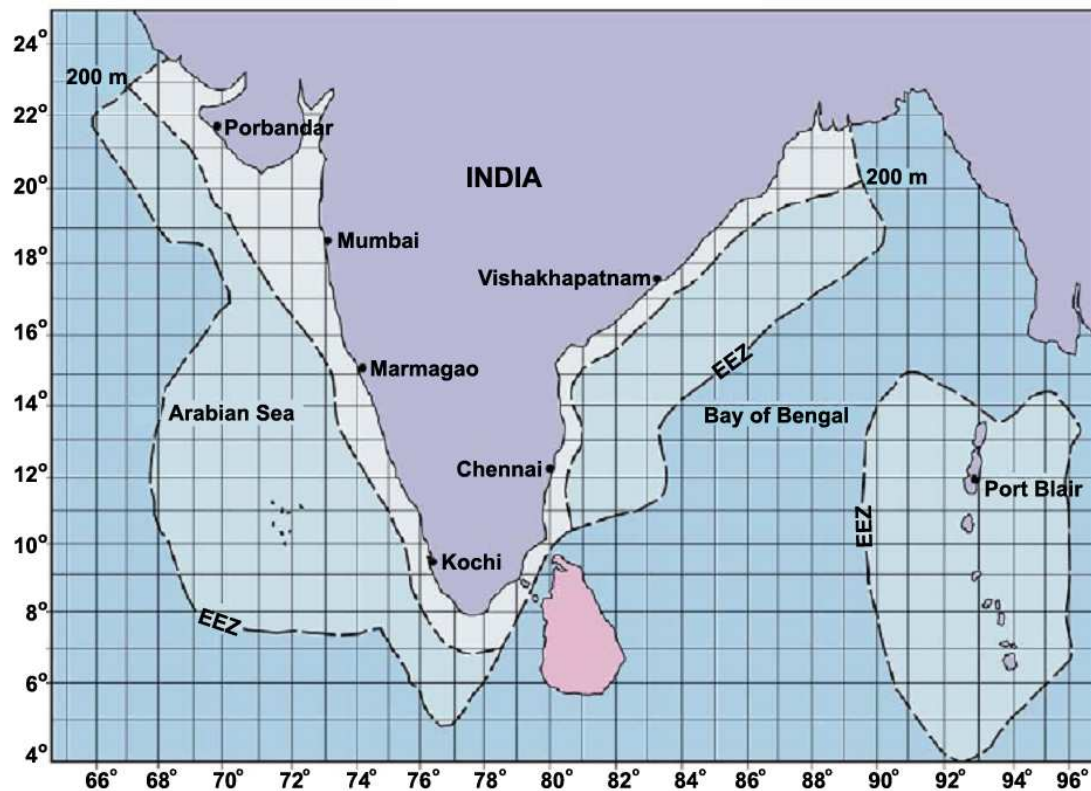


Figure 3. Exclusive Economic Zone of India²⁵

India claims a number of maritime zones in accordance with the provisions of UNCLOS, which provides the basic legal framework for oceans management and sets out the principles and norms that apply to State parties. The outer limits of all these zones are measured from the territorial sea baseline, located at the low-water line along the coast.

Territorial waters: The sovereignty of India extends and has always extended to the territorial waters of India and to the seabed and subsoil underlying, and the airspace over, such waters. The limit of the territorial waters is the line every point of which is at distance of twelve nautical miles from the nearest point of the appropriate baseline. The Central Government may, whenever it considers necessary so to do having regard to international law and State practice, alter, by notification in the Official Gazette, the limit of the territorial waters. No notification shall be issued unless resolutions approving the issue of such notification are passed by both

²⁵ www.nio.org

Houses of Parliament. Without prejudice to the provisions of any other law for the time being in force, all foreign ships (other than warships including submarines and other underwater vehicles) shall enjoy the right of innocent passage through the territorial waters. Foreign warships including submarines and other underwater vehicles may enter or pass through the territorial waters after giving notice to the Central Government: Provided that submarines and other underwater vehicles shall navigate on the surface and show their flag while passing through such waters. The Central Government may, if satisfied that it is necessary so to do in the interests of the peace, good order or security of India or any part thereof, suspend, by notification in the Official Gazette, whether absolutely or subject to such exceptions and qualifications as may be specified in the notification, the entry of all or any class of foreign ships into such area of the territorial waters as may be specified in the notification.

Contiguous zone: The contiguous zone of India is an area beyond and adjacent to the territorial waters, and the limit of the contiguous zone is the every point of which is at a distance of twenty-four nautical miles from the nearest point of the baseline. The Central Government may, whenever it considers necessary so to do having regard to international law and State practice, alter, by notification in the Official Gazette, the limit of the contiguous zone. No notification shall be issued unless resolutions approving the issue of such notification are passed by both Houses of Parliament. The Central Government may exercise such powers and take such measures in or in relation to the contiguous zone as it may consider necessary with respect to: The security of India, and immigration, sanitation, customs and other fiscal matters. The Central Government may, by notification in the Official Gazette: extend with such restrictions and modifications as it thinks fit, any enactment, relating to any matter referred for the time being in force in India or any part thereof, to the contiguous zone, and make such provisions as it may consider necessary in such notification for facilitating the enforcement of such enactment, and any enactment so extended shall have effect as if the contiguous zone is part to the territory of India.

Continental shelf: The continental shelf of India comprises the seabed and subsoil of the submarine areas that extend beyond the limit of its territorial waters throughout the natural prolongation of its land territory to the outer edge of the continental margin or to a distance of two hundred nautical miles from the baseline. India has, and always had, full and exclusive sovereign rights in respect to its continental shelf. Without prejudice to the generality of the provisions, the Union has in the continental shelf, sovereign rights for the purposes of exploration, exploitation, conservation and management of all resources; exclusive rights and jurisdiction for the construction, maintenance or operation of artificial islands, off-shore terminals, installations and other structures and device necessary for the exploration and exploitation of the resources of the continental shelf or for the convenience of shipping or for any other purpose; exclusive jurisdiction to authorise, regulate and control scientific research; and exclusive jurisdiction to preserve and protect the marine environment and to prevent and control marine pollution. No person (including a foreign Government) shall, except under, and in accordance with the terms of a licence or a letter of authority granted by the Central Government, explore the continental shelf or exploit its resources or carry out any search or excavation or conduct any research within the continental shelf or drill therein or construct, maintain or operate any artificial island, off-shore terminal, installation or other structure or device therein for any purpose whatsoever. The Central Government may, by notification in the Official Gazette, declare any area of the continental shelf and its superjacent waters to be a designated area; and make such provisions as it may deem necessary with respect to, the exploration, exploitation and protection of the resources of the continental shelf within such designated area; or the safety and protection of artificial islands, off-shore terminals, installations and other structures and devices in such designated area; or the protection of marine environment of such designated area; or customs and other fiscal matters in relation to such designated area.

Exclusive Economic Zone (EEZ): The EEZ of India is an area beyond and adjacent to the territorial waters, and the limit of such zone is two hundred nautical miles from the baseline. The Central Government may whenever it considers necessary so to do having regard to International Law and State practice, alter, by notification in the

Official Gazette, the limit of the EEZ. No notification shall be issued unless resolutions approving the issue of such notification are passed by both Houses of Parliament. In the EEZ, the Union has sovereign rights for the purpose of exploration, exploitation, conservation and management of the natural resources both living and non-living as well as for producing energy from tides, winds and currents; exclusive rights and jurisdiction for the construction, maintenance or operation of artificial islands, off-shore terminals, installations and other structures and devices necessary for the exploration and exploitation of the resources of the zone or for the convenience of shipping or for any other purpose; exclusive jurisdiction to authorize, regulate and control scientific research; exclusive jurisdiction to preserve and protect the marine environment and to prevent and control marine pollution; and such other rights as are recognised by International law. No person (including a foreign Government) shall, except under, and in accordance with, the terms of any agreement with the Central Government or of a licence or a letter of authority granted by the Central Government, explore or exploit any resources of the EEZ or carry out any research or excavation or conduct any research within the EEZ or drill therein or construct, maintain or operate any artificial island, off-shore terminal, installation or other structure or device therein for any purpose whatsoever: Provided that nothing shall apply in relation to fishing by citizen of India. The Central Government may, by notification in the Official Gazette, declare any area of the EEZ to be a designated area; and make such provisions as it may deem necessary with respect to the exploration, exploitation and protection of the resources of such designated area; or other activities for the economic exploitation and exploration of such designated area such as the production of energy from tides, winds and currents;/or the safety and protection of marine environment of such designated area; or customs and other fiscal matters in relation to such designated area.

Maritime boundaries between India and States having coasts opposite or adjacent to those of India: The maritime boundaries between India and any State whose coast is opposite or adjacent to that of India in regard to their respective territorial waters, contiguous zones, continental shelves, EEZ and other maritime

zones shall be as determined by agreement (whether entered into before or after the commencement of this section) between India and such State and pending such agreement between India and any such State, and unless any other provisional arrangements are agreed to between them, the maritime boundaries between India and such State shall not extend beyond the line every point of which is equidistant from the nearest point from which the breadth of the territorial waters of India and of such State are measured. Every agreement referred shall, as soon as may be after it is entered into be, published in the Official Gazette. The provisions shall have effect notwithstanding anything contained in any other provision of this Act.

India is the third largest global producer of fish, preceded by China and Peru, 2nd largest producer of freshwater fish preceded by China, 7th largest producer of capture fish in the world and harbours a large percentage of the world's fishermen, approximately one million in number (FAO Statistics, 2006; Bavinck *et al.*, 2005). India's share in the world production of fish is 4.33% (Hand Book on Fisheries Statistics, 2006).

Fish production increased from 0.75 million tonnes in 1950-51 to 6.57 million tonnes in 2005-06, against a harvestable potential of 8.4 million tonnes, an average growth of 4.11 percent over the same period (Hand Book on Fisheries Statistics, 2006). Fish production in 2005-06 was 6.57 million tonnes, and of this, 3.75 million tonnes from inland and 2.82 million tonnes from marine resources (Hand Book on Fisheries Statistics, 2006). The harvestable potential was of 4.5 million tonnes and 3.9 million tonnes from inland and marine resources respectively. Growth rate in inland sector was higher than the marine sector. The GDP has increased by 68.8% in 2005-06 over the year 2000-01 and it was 32.3% in agriculture and related activities. For fisheries, there was an increase of 62.9% (Hand Book on Fisheries Statistics, 2006).

1.2.1. Commercial fisheries

Soon after independence in 1947, the Government started focussing on the fisheries sector for two reasons: (1) to promote fisheries production in order to ensue food safety (subsequently foreign exchange earning were also added); and (2) capacity building in fisheries through subsidization of various assets. As a result

starting from a purely traditional activity in the fifties, both aquaculture and fisheries have now transformed to commercial enterprises. The sector has been recognised as a powerful income and employment generator as it stimulates the growth of a number of subsidiary industries and is a source of cheap and nutritious food. The fisheries sector contributed Indian Rupees (INR) 347,580 million²⁶ to the GDP (at current prices) during 2005-2006, which is 1.07 per cent of the total GDP and 5.84 per cent of the GDP from agriculture, forestry and fishing. Between 1970 to 2006, the share of the sector in total GDP increased from 0.62 per cent to 1.07 per cent, recording a cumulative annual growth rate (CAGR) of 1.86 per cent. The fisheries sector has also been one of the major contributors of foreign exchange earnings (FEE) through export of marine products (Yadava, 2008).

1.2.2. The fishers in India

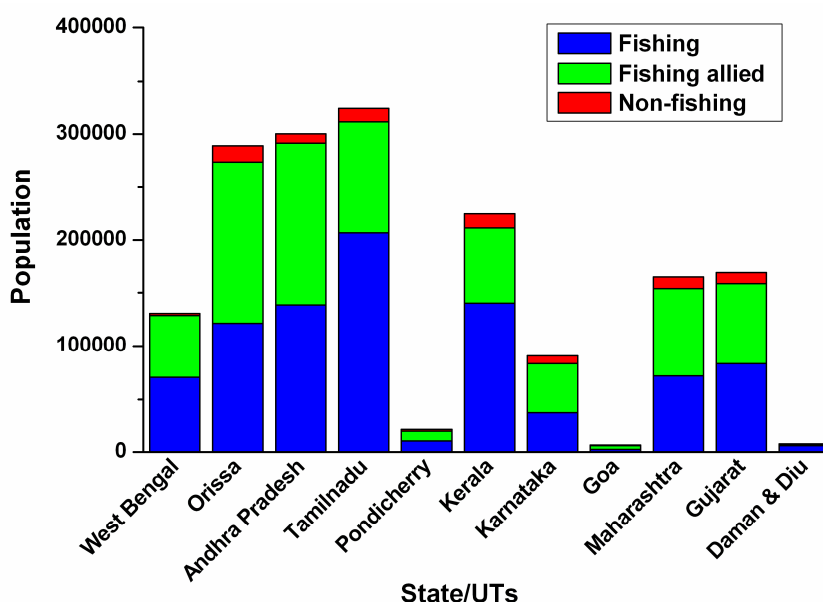
Fishing is a traditional economic activity in India practiced for generations by the fisher communities. The fishers can be broadly classified as: (1) inland fishers; (2) marine fishers; and (3) fish farmers. Among the three, commercial-scale fish farming is a recent development and is also spread outside the domain of traditional fishers' communities. As per the Livestock Census of 2003, 14.49 million people were engaged in various fisheries related activities in India. About 75 per cent of the fishers are engaged in various inland fisheries activities and about 25 per cent in marine fisheries activities. At the national level, about 6.44 per cent of fishers are full-time and about 7.40 per cent engage in part-time fishing. As per the National Marine Fisheries Census (NMFC), 2005 the marine fisheries sector provides employment to about 0.9 million in active fishing and about 0.7 million fishers in various other fishing operations (Table 1 and Figure 4). The number of people involved in marine fisheries related activities include nearly 0.2 million in fish marketing, 0.1 million in repairs of fisheries requisites, around 0.2 million in fish processing and 0.1 million in other ancillary activities. In all, an estimated 3.51 million people depend on marine fisheries for their livelihoods in India.

²⁶ US\$1=49.02 INR

Table 1. National Marine Fisheries Census, 2005

State and Union Territories	Active Fishers	Number of fishers involved in fishing allied activities							Total fisher population
		Marketing	Making/ repair of net	Curing/ processing	Peeling	Labour	Others	Total	
West Bengal	70,750	5,237	15,326	4,705	478	26,151	5,844	57,741	269,565
Orissa	121,282	31,691	40,252	27,849	3,167	37,781	11,794	152,534	450,391
Andhra Pradesh	138,614	34,337	23,926	28,319	2,996	55,372	7,942	152,892	509,991
Tamil Nadu	206,908	36,126	19,051	6,250	2,107	25,657	15,318	104,509	790,408
Puducherry	10,341	6,393	630	364	5	714	1,989	10,095	43,028
Kerala	140,222	17,976	9,560	3,881	8,057	17,242	14,358	71,074	602,234
Karnataka	37,632	14,327	7,876	3,342	581	14,043	5,530	45,699	170,914
Goa	2,515	1,688	479	0	0	515	700	3,382	10,668
Maharashtra	72,074	43,822	9,086	9,209	1,439	11,565	6,659	81,780	319,397
Gujarat	83,322	14,885	13,452	3,212	4,310	31,366	7,857	75,082	323,215
Daman & Diu	5,868	880	80	11	3	256	373	1,603	29,305
TOTAL	889,528	207,362	139,718	87,142	23,143	220,662	78,364	756,391	3,519,116

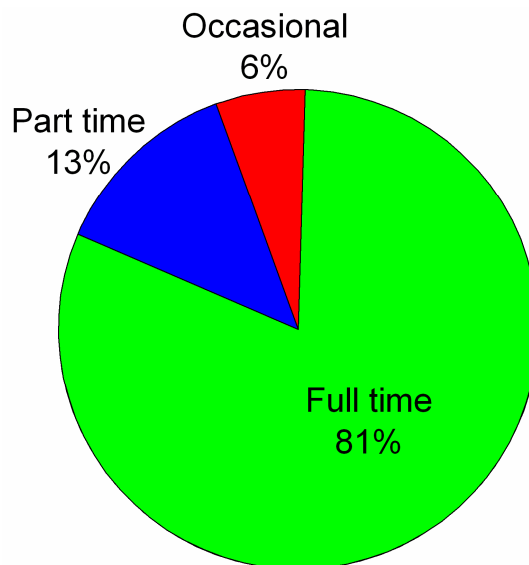
Compared with the previous NMFC undertaken in 1980, it is seen that marine fisher population has nearly doubled from 1.87 million in 1980 to 3.51 million in 2005. Among the marine states, West Bengal has the highest concentration of fishers per kilometre of coastline (1,706) followed by Kerala (1,012) and Orissa (938).



(Source: NMFC, 2005)

Figure 4. State and activity-wise marine fisher population

Among those engaged in active marine fishing, the majority (81 per cent) are engaged in full-time fishing, 13 per cent on part-time basis and the rest in occasional fishing (Figure 5). Fishing as a fulltime profession is relatively popular in the west coast States/UTs (Gujarat, Goa, Daman & Diu, Maharashtra, Karnataka, Lakshadweep and Kerala) where 84 per cent of active fishers are engaged in full time fishing as compared to the east coast (West Bengal, Orissa, Andhra Pradesh, Puducherry, Andaman and Nicobar islands and Tamil Nadu), where 79 per cent fishers engage in full-time fishing. This is also supported by the fact that fishing operations are more capital-intensive in the west coast states than in the east coast states.



(Source: NMFC, 2005)

Figure 5. Engagement profile of active marine fishers in India

1.2.3. Socio-economic status of fishermen

Fishing villages all along the coastal waters in India are almost similar in their underdevelopment. Marine fisheries provide substantial employment to human resources both in the production and post harvest sectors. The labour force employed in marine fishery sector has shown a steady increase over the past two decades. Competition among fisherman for increasing catch continuously promotes structural changes in the coastal economy. Although the total marine fish landings have increased, the catch per unit of operation and per capita production of labour steadily declined over the years. In spite of the decline in per capita production,

different types of fishing units are sustaining due to the increase in price levels of almost all the varieties of marine fish. Intensive mechanization in the marine sector has led to increase in production but in the process marginalized the traditional sector (Yadava, 2004).

1.2.4. Role of women in post-harvest operations

Even though women are not involved in active fishing in marine fisheries, they contribute substantially to the pre- and post-harvest operations. About 25% of the labour force in the pre-harvest activities, 60% in the export marketing and 40% in the internal marketing is women. Altogether, about 0.5 million women are employed in pre and post-harvest operations in the marine fisheries sector (Yadava, 2004).

1.2.5. Trends in fish production and catch composition

Fish production in the country has been showing an increasing trend and reached a record level of 6.57 million tonnes in 2005-06. The marine fisheries sector contributed 2.82 million tonnes and the inland sector (including aquaculture) contributed 3.75 million tonnes in 2005-06 (Table 2). The progress in the inland fisheries sector during the 1990s has been commendable (6.55 per cent per annum), whereas the growth in marine fish production during the same period has been slow (2.19 per cent per annum) (Handbook on Fisheries Statistics, 2006).

The marine waters of India harbour around 1,707 species of fish, of which over hundred species are commercially harvested. Time-series catch composition of marine fishery shows considerable variation through the period 2000-2005 (Table 3). These changes are: (1) increase in the number of species harvested/caught, (2) changes in catch composition and (3) a decline in population of some species. During the 1950s and 1960s, Indian oil sardines, natantian decapods, mackerels and Bombay duck constituted the majority (more than 1/3) of the landings, but since 1970s, share of Bombay duck in catch composition has declined steadily. The share of other dominant species such as clupeids and hair tails also declined considerably during the period 1950-2005. On the other hand a phenomenal rise in landing of prawns, shrimps and other marine crustaceans took place during the same period (Handbook on Fisheries Statistics, 2006).

Table 2. Trends in fish production (1950-2006)

Year	Fish production ('000 tonnes)			Average annual growth rate (per cent)		
	Marine	Inland	Total	Marine	Inland	Total
1950-51	534	218	752	--	--	--
1955-56	596	243	839	2.32	2.29	2.31
1960-61	880	280	1,160	9.53	3.05	7.65
1965-66	824	507	1,331	-1.27	16.21	2.95
1970-71	1,086	670	1,756	6.36	6.43	6.39
1973-74	1,210	748	1,958	3.81	3.88	3.83
1978-79	1,490	816	2,306	4.63	1.82	3.53
1979-80	1,492	848	2,340	0.13	3.92	1.47
1980-81	1,555	887	2,442	4.22	4.6	4.36
1981-82	1,445	999	2,444	-7.07	12.63	0.08
1982-83	1,427	940	2,367	-1.25	-5.91	-3.15
1983-84	1,519	987	2,506	6.45	5	5.87
1984-85	1,698	1,103	2,801	11.78	11.75	11.77
1985-86	1,716	1,160	2,876	1.06	5.17	2.68
1986-87	1,713	1,229	2,942	-0.17	5.95	2.29
1987-88	1,658	1,301	2,959	-3.21	5.86	0.58
1988-89	1,817	1,335	3,152	9.59	2.61	6.52
1989-90	2,275	1,402	3,677	25.21	5.02	16.66
1990-91	2,300	1,536	3,836	1.1	9.56	4.32
1991-92	2,447	1,710	4,157	6.39	11.33	8.37
1992-93	2,576	1,789	4,365	5.27	4.62	5
1993-94	2,649	1,995	4,644	2.83	11.51	6.39
1994-95	2,692	2,097	4,789	1.62	5.11	3.12
1995-96	2,707	2,242	4,949	0.56	6.91	3.34
1996-97	2,967	2,381	5,348	9.6	6.2	8.06
1997-98	2,950	2,438	5,388	-0.57	2.39	0.75
1998-99	2,696	2,602	5,298	-8.61	6.73	-1.67
1999-00	2,852	2,823	5,675	5.79	8.49	7.12
2000-01	2,811	2,845	5,656	-1.44	0.78	-0.33
2001-02	2,830	3,126	5,956	0.68	9.88	5.3
2002-03	2,990	3,210	6,200	5.65	2.69	4.1
2003-04	2,941	3,458	6,399	-1.64	7.73	3.21
2004-05	2,779	3,526	6,305	-5.51	1.97	-1.47
2005-06	2,816	3,756	6,572	1.33	6.52	4.23

(Source: Handbook on Fisheries Statistics, 2006)

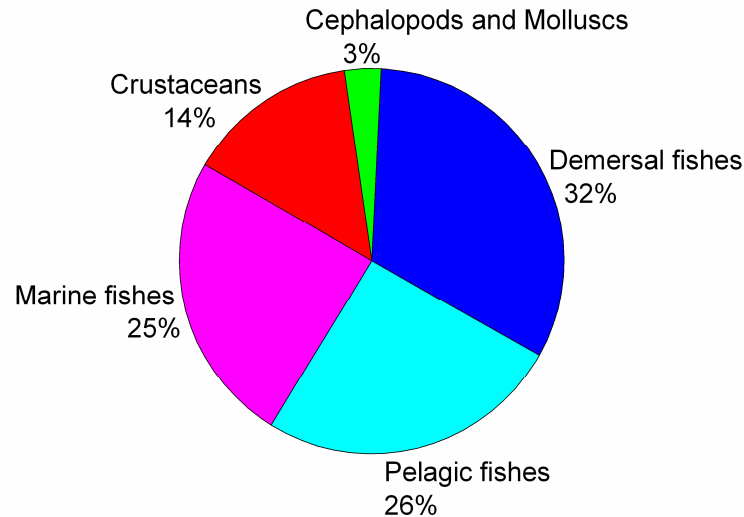
Table 3. Composition of marine catch

Species	2000	2001	2002	2003	2004	2005
Miscellaneous aquatic animals	95	0	0	0	0	0
Others	0	0	8,750	8,750	0	0
Demersal species	951,042	903,119	917,935	860,109	904,988	928,136
Pelagic species	760,534	752,014	722,450	736,835	738,135	732,985
Marine fish	559,676	708,296	845,775	881,386	735,770	705,363
Crustaceans	382,372	378,052	436,028	451,705	411,068	412,755
Cephalopods	96,408	53,271	87,344	89,535	69,292	80,240
Molluscs (excluding cephalopods)	1,796	2,597	1,240	2,358	8,844	7,511

(Source: Handbook on Fisheries Statistics, 2000-2005)

Group-wise (FAOSTAT), demersal fishes constitute 32 per cent of the total landings, pelagic species constitute 26 per cent and marine species (finfishes, etc.) constitute 25 per cent of landings. The other marine varieties (crustaceans, cephalopods and molluscs) constitute about 17 percent of the landings (Figure 6). Overall, during 1950-2005, landing of demersal fishes has recorded a CAGR of 3.07

per cent, pelagic species 2.43 per cent and marine fishes (since mid-1950s) recorded a CAGR of 9.73 per cent.



(Source: Handbook on Fisheries Statistics, 2006)

Figure 6. Composition of marine landing in 2005

Coastal fisheries: Coastal fisheries in India remained in a pre-developed phase until 1962 (pre-mechanization period); with the annual average production during 1950-1962 being <0.8 million tonne), a prolonged growth phase until 1988 (intensive mechanization phase; annual production during 1963-1988 being 0.8 to 1.8 million tonnes); followed by the fully exploited coastal areas and the annual production being 1.8 to 2.8 million tonnes/year. Fishing effort has increased steadily throughout the three phases of development, more so in the fully exploited phase. Marine fishing activity in India is an example of uncontrolled fisheries in the initial phase and inefficiently managed fisheries in the subsequent phases (Yadava, 2008).

Coastal aquaculture: For the past two decades or so, development of brackish water aquaculture has been one of the most outstanding features of the fisheries sector in the country. It has been primarily responsible for almost doubling the shrimp production in recent years, and has also resulted in substantial economic gains in the coastal States of the country. The potential brackish water area available in the coastal regions of the country for shrimp culture is estimated between 1.2 million to 1.4 million hectares (ha). Presently, an area of about 184,115 ha is under farming

with an average production of about 110,000 tonnes of shrimp per year. The average productivity has been estimated at about 1,000 kg per hectare per year. Since the development of this sector, 0.3 million persons have gained direct employment in shrimp farming and 0.6-0.7 million persons are employed in the ancillary units and activities. The area under culture has also increased from 135,582 ha in 1996-97 to 184,115 ha in 2005-06 (Yadava, 2008).

Cultured shrimps (mainly *Penaeus monodon* or popularly known as black tiger) contribute about 50 per cent of the total shrimp exports. About 91 per cent of the shrimp growers in the country have a holding 0 to 2 ha, 6 per cent between 2 to 5 ha, and the remaining 3 per cent have an area of 5 ha and above. The infrastructure facilities established over years include hatcheries both in private and public sector, laboratories for testing of pathogens / diseases and processing units. Until early nineties shrimp culture was completely dependent on the seed collected from the natural resources. With the increase in farming area and increased stocking rates shrimp hatcheries were established in large numbers in the private sector. Presently, there are 237 shrimp hatcheries along the coastline of the country with a production capacity of 11 billion of post larvae (PL) per annum (Yadava, 2008).

Deep sea fisheries: The Indian EEZ is an open access realm for Indian nationals and only possession rights exist. There are no property rights. Deep-sea fishing is viewed in a state of diminishing fleet strength of vessels above 23 m overall length (OAL). There numbers have come down from about 180 in the early nineties to about 60 today. Lack of research and development efforts on fishing vessels best suited to the Indian conditions has also impeded the growth of this sector. Mechanized vessels below 20 m OAL necessitate major inputs in their design not only to increase their voyage but also to facilitate bringing back the catch in as good condition as possible. While new hull material such as fibre-reinforced plastic (FRP) is being used by the industry, standards are still lacking, resulting in poor quality vessels (Yadava, 2008).

Potential yield: The potential fish production in India, as per current estimate, is 8.40 million tonnes per annum. Potential yield from inland fisheries and marine fisheries

are estimated at 4.50 million tonnes per annum and 3.92 million tonnes per annum respectively. At the aggregate level, India is presently exploiting 78 per cent of its potential yield comprising 83 per cent of potential yield in inland fisheries and 72 per cent of potential in marine fisheries. In the coastal fishery, the west coast of India has a potential yield of 2.36 million tonnes comprising demersal fishery resources of 1.25 million tonnes and pelagic fishery resources of 1.11 million tonnes. On the other hand, the east coast of India has a potential yield of 1.09 million tonnes comprising demersal fishery resources of 0.66 million tonnes and pelagic fishery resources of 0.43 million (Table 4). At the aggregate level, the potential yield for demersal fishes is 1.929 million tonnes, for pelagic fishes 1.742 million tonnes, and for oceanic fishes 0.246 million tonnes (Handbook on Fisheries Statistics, 2006).

Table 4. Potential yield from continental shelf of India

Region / Resource	West coast	East coast	Lakshadweep	Andaman and Nicobar	Total
Demersal	1.251	0.656	--	0.022	1.933
Pelagic	1.106	0.434	0.063	0.139	1.742
Oceanic	--	--	--	--	0.246
Total	2.357	1.090	0.063	0.161	3.921

(Source: Handbook on Fisheries Statistics, 2006)

1.2.6. Methods of harvesting

The marine fishing fleet comprises 280,491 fishing craft of which 225,862 are of traditional types (including about 44,578 motorized traditional craft). The mechanized fishing fleet comprises 29,241 trawlers, 983 purse seines, 14,183 gill-nets, 8,862 dol-nets and 1,020 other types of boats (Table 5).

Table 5. Fishing craft operating in the coastal State and Union Territories

Sl. No	State / Union Territory	Traditional crafts	Motorized traditional crafts	Mechanized boats	Total
1	Andhra Pradesh	53,853	4,164	8,642	66,659
2	Goa	1,094	1,100	1,092	3,286
3	Gujarat	9,222	5,391	11,372	25,985
4	Karnataka	19,292	3,452	2,866	25,610
5	Kerala	28,456	17,362	4,206	50,024
6	Maharashtra	10,256	286	8,899	19,441
7	Orissa	10,993	2,640	1,276	15,854
8	Tamil Nadu	33,945	8,592	9,896	52,433
9	West Bengal	4,850	270	3,362	8,482
10	Andaman and Nicobar Islands	1,180	160	230	1,570
11	Daman and Diu	252	350	805	1,407
12	Lakshadweep	594	306	478	1,378
13	Pondicherry	7,297	505	560	8,362
	Total	181,284	44,578	53,684	280,491

(Source: Handbook on Fisheries Statistics, 2006)

As seen by the number of traditional craft and small-mechanized vessels, the major fishing activities are still concentrated in the areas within 0 to 70-80 meter depth zone. As compared to the west coast, concentration of traditional craft (including motorized) is more on the east coast (57 per cent of the total). In the case of mechanized vessels, the trend is reverse. The scale of mechanization is also reflected in the total fish landings of the two coasts. At the national level, the mechanized sector contributes 67 per cent of the landing. In 1969 it was a mere 20 per cent. Motorized sector contributes 25 per cent and the balance 8 to 10 per cent is contributed by the traditional crafts. With the advent of mechanization, use of traditional harvesting gear like bag net, cast net, small meshed gill net has declined and more efficient gear like purse seines have become popular. Table 6 shows the harvesting methods of some commercially important fish species in the country (Yadava, 2008).

Table 6. Harvesting methods for some commercial varieties of fin and shellfish species

Species	Gear
Indian oil sardine	Purse seine, ring seine gill net
Mackerel	Gillnet, ring net, trawl net, purse seine
Bombay duck	Dol net, trawl net
Carangids	Trawl net, gill net, hooks and line
Whitebaits	Ring seine, trawl net
Seer fishes	Gill net, trawl net, hooks and line
Tunas	Gill net, hooks and line
Shad	Gill bet
Anchovy	Trawl net, dol net
Ribbon fishes	Trawl net
Pomfrets	Gill net, trawl net
Sharks	Hooks and line, gill net, trawl net
Rays	Hooks and line, bottom set gill net
Threadfin breams	Trawl net
Catfishes	Purse seine, trawl net, gill net, dol net
Croackers	Trawl net, bottom set gill net, bag net
Silverbellies	Trawl net
Goatfishes	Trawl net
Threadfins	Trawl net
Rock cods	Hooks and line, bag net, trawl net
Flatfishes	Trawl net
Big-jaw jumper	Trawl net
Penaeid shrimps	Trawl net, dol net, trammel net
Non-penaeid prawns	Trawl net, dol net
Crabs	Trawl net, bottom set gill net
Lobster	Trawl net, bottom set gill net, bag net
Cephalopods	Trawl net, hooks and line

(Source: Yadava, 2008)

1.2.7. Status of fisheries policy

India's coastal and marine environments provide numerous opportunities for commercial/economic, social and scientific research. These include, *inter alia*, tourism, fishing, aquaculture, mineral exploration and production, transportation and recreational activities. A summary of the major coastal and ocean uses and issues is contained in Annex 2.

Development of marine fisheries sector is taken up with a focus on sustainability through empowering the traditional sector, enhancement of sea safety, rational exploitation of untapped deep-sea resources etc. for achieving employment generation, social security of fishers, increased food security and augmenting sea food exports. Development of adequate infrastructure for harvest and post-harvest operations with due consideration of the principle of minimizing post-harvest losses and ensuring enhanced food safety has been embarked upon. Under this programme a chain of 6 major and 45 minor fishery harbours and 158 modern Fish Landing Centres (FLCs) have been commissioned and as many as 18 harbours and 46 landing centres are at various stages of construction. In order to improve the domestic marketing of fish in the country, improved fish markets and chilled/refrigerated transport are being provided and low cost technologies for processing are being popularized. With these endeavors the annual per capita consumption of fish has been growing steadily and the national average during 2004 stood at 5 kg, though the consumption pattern along coastal belt stood much high (Yadava, 2008).

1.2.8. Indian state level consideration

Fishery is an Indian State subject and, as such, the primary responsibility for development rests with the Indian State Governments. The major thrust in fisheries development has been focused on optimizing production and productivity, augmenting export of fishery products, generating employment and improving welfare of fishermen and their socio-economic status.²⁷

²⁷ <http://www.dadf.gov.in>

1.2.9. Power and evolution of law

Environmental protection and/or degradation are influenced by power, poverty, political structures, governance arrangements and economic growth and industrialisation (White, 2003; South, 1998; Lynch and Stretsky, 2003; Beirne and South, 2007; Halsey, 1997; Elliot, 2001; Najam, 2004).

Fisheries managers possess a range of potential instruments to regulate capture fisheries, including time zoning (Charles, 2001). The capture fisheries of east and west coasts currently undergo a closed season of minimally 45 days – locally known as ‘monsoon ban’, ‘trawl ban’ or ‘Government strike’ in which trawling and related fishery types are completely shut down. Due to differing environmental conditions, the timings of the closed season along the east and west coasts are dissimilar (Bavinck *et al.*, 2008).

1.2.10. Backgrounds to the annual closed season

Kerala, the state with the most pronounced history of fisher activism, was the first to announce a fisheries ban on mechanized fishing boat, in 1988. One difficulty with this early establishment of closed seasons, however was that the dates did not coincide. Conflicts between the fishing fleets of various states resulted. It was to address the problem of concurrence as well as resource depletion that the Union Government entered the scene in 1996. A committee headed by the Fisheries Commissioner requested the Central Marine Fisheries Research Institute (CMFRI) to provide scientific advice on the timing of ban for east and west coasts on the basis of its knowledge of spawning patterns (Bavinck *et al.*, 2008). The CMFRI report was inconclusive: spawning took place not in single but in multiple periods, depending on the species in question (CMFRI, 2001). The east coast states finally agreed to implement a closed season of 45 days during the period 15 April – 29 May. Andhra Pradesh was the first state in 1999 to put this decision into effect (Bavinck *et al.*, 2008). There was a 60 day uniform ban on all fishing vessels in the Indian EEZ beyond territorial waters on the east coast including Andaman and Nicobar Islands from 15 April to 15 June 2008 and a 47 day ban on the west coast including

Lakshadweep Islands from 15 June 2008 to 31 July 2008 for conservation and effective management of fishery resources and also for maritime safety reasons.²⁸

In the past five decades, State/UT Governments in India have concentrated wholly on the development, rather than on the management of fisheries (Bavinck and Johnson, 2008). The annual closed season for mechanised boat fishing is an indication of new policy taking shape. Not only does the closed period only partially coincide with the spawning seasons of important target species, fishermen argue that whatever increase take place in catches after the ban are short-lived (Bavinck *et al.*, 2008).

1.2.11. Comprehensive Marine Fishing Policy

Relevance of the Marine Fisheries Sector extends beyond the livelihood security of the large coastal population to the food security of Indian countrymen and Indian foreign exchange generation. The potential of the sector for employment generation through ancillary activities and empowerment of coastal womenfolk is significant. However, the global marine fisheries, especially the coastal sector, has been under constant threat in recent years basically due to depleting resources, land and sea based pollution and upheaval in the climatic conditions. Thus, a crisis exists not only in terms of the future fisheries, but also in terms of sustaining the livelihoods of coastal communities around the world (Hauck, 2008). Concerns over this in the international fora have given rise to conventions and procedures that are to be sincerely implemented by the Governments and meticulously practiced by the stakeholders so as to ensure sustainability in fisheries.²⁹

The effort of the Indian Government in this regard has resulted in Comprehensive Marine Fishing Policy document which seeks a focused endeavour from the Indian coastal States and the Central Departments with full appreciation of the international conventions in force for conservation, management and sustainable utilization of Indian invaluable marine wealth, without losing its relevance to the food and livelihood security of the coastal communities which totally depend on this.³⁰

²⁸ www.dadf.gov.in

²⁹ *Ibid.*

³⁰ www.dadf.gov.in

1.2.12. Allocation of funds for fisheries management activities

1.2.12.1. The basis of allocation of funds to fisheries management

The funds allocated to the fisheries sector in India broadly fall under (1) Non-plan expenditure and (2) Plan expenditure. Non-plan expenditure mainly includes the salary component of the organisations. On the other hand, fisheries management falls under Plan expenditure. The Plan component includes allocation to various schemes implemented by the Central and the State Governments during the Five-Year Plan Periods. The Plan size in India depends not only on economic, but also on political considerations. The actual allocation of funds to fisheries management primarily depends on how much in funds is allocated to each Five-Year Plan. Procedurally, in the beginning of each Plan, the National Development Council sets the target and priorities of the plan and formulates guidelines on the importance of various sectors for the Planning Commission of India. Simultaneously the Ministry of Finance works out the amount of resources that can be allocated to the plan. Following this, the Planning Commission forms Working Groups to review various sectors. In respect of the fisheries sector, prior to each Plan, the Planning Commission constitutes a “Working Group on Fishery” to assess the development of the sector and to identify areas of focus/priority to be addressed in the ensuing Plan. The Working Group on Fisheries for the Eleventh Five-Year Plan (2007-2012) was constituted with the following Terms of Reference (ToR):³¹

- a) “To undertake a critical review of the progress of the on-going Central and Centrally Sponsored Schemes/programmes in fisheries sector with reference to their objectives and targets during the Tenth Plan and to recommend their continuation / discontinuation / modification / convergence and also fresh initiatives, if any with tentative investments.
- b) To identify the various problems and constraints in the implementation of the on-going development programmes in the fisheries sector, especially in development of deep-sea fishing/distant water fishing, freshwater and coastal aquaculture, infrastructural development including fishing harbours, fish seed hatcheries, processing and marketing network, welfare of fishes, etc.

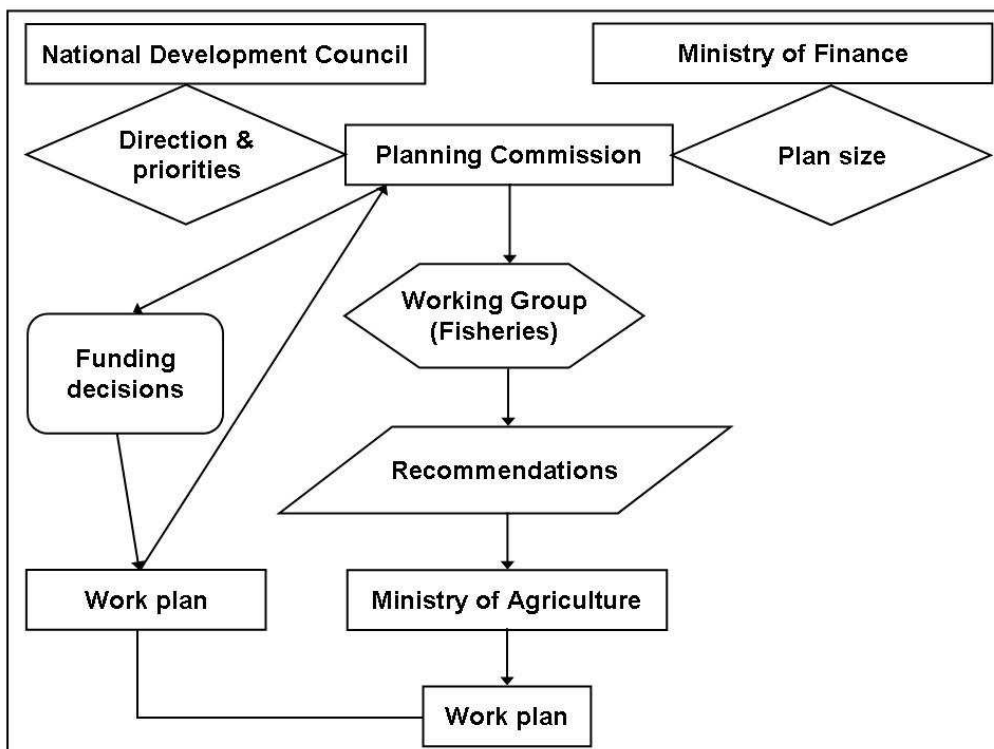
³¹ Report of the Working Group on Fishery, Eleventh Five-Year Plan (2007)

- c) To suggest measures including policy issues for increasing area and productivity in fresh water/coastal aquaculture, reservoir fisheries, cold water fisheries including uniform long-term leasing of suitable water bodies, etc.
- d) To suggest an action plan for production and standardization of adequate quantum of fish seed for freshwater and coastal aquaculture and reservoirs.
- e) To suggest concrete measures for supplementing marine fish catch by sustainable exploitation of deep sea fishery resources, reduction of by-catch, mariculture, resource replenishment programmes like setting up of artificial reefs, etc.
- f) To suggest necessary steps for creation of post-harvest infrastructure for fishing harbours, fish landing centres, processing and marketing network, including inland fisheries.
- g) To suggest measures for development of non-food fisheries for pearl culture, ornamental fisheries, etc. to supplement production and income from fisheries.
- h) To suggest effective fisheries management measures for ban on fishing during monsoon, standardization of mesh sizes in different categories of fishing gear, conservation of aquatic bio-diversity, etc. in accordance with the FAO CCRF adopted etc.
- i) To review the on-going fisheries training, extension, Human Resource Development (HRD) and welfare measures for fishers and suggest effective steps for strengthening HRD in fisheries and for improving socio-economic and livelihood issues, socio-economic development, etc.
- j) To review current availability of extension and information support, institutional credit and suggest measures to augmenting the same.
- k) Working Group may co-opt any other official/non official expert/representative of any organisations members(s), if required.
- l) The Working Group may also examine and address any other issues, which may be considered important, but not specifically spelt out in the ToRs and devise its own procedures for conducting its business including meetings.”

As can be seen from the ToRs of the Working Group, fisheries management in India is mainly concerned with:

- a) increasing production both in capture and culture fisheries,
- b) Research and Development (R&D) support to increase production in a sustainable manner,
- c) Human resource development,
- d) Improving the operational efficiency of various schemes, and
- e) Capacity building in fisheries sector.

The Working Group after reviewing each of these aspects prepares a report for the Planning Commission, which is then circulated to the Ministry of Agriculture. Based on the report of the Working Group, the Ministry of Agriculture prepares a Work Plan and budget for review of the Planning Commission. The Planning Commission, balancing between the priorities of various sectors, decides on the budget allocation for various planned aspects of fisheries management. This process is summarized in Figure 7.



(Source: Yadava, 2008)

Figure 7. Procedure for allocation of funds to fisheries sector

1.2.12.2. Determinant factors in level of expenditure dedicated to fisheries

Expenditure on various aspect of fisheries management comprises two decision situations: 1) allocation funds to various components of management (e.g. research, capacity building and HRD, etc) and 2) allocation of funds to the States/UTs. In each Plan period, based on the report of the Working Group, the Ministry of Agriculture at the Centre and the DoF in the States/UTs sets their own targets and identify the thrust areas to achieve the targets (Table 7).

Table 7. Development thrust during the Five-Year Plan Periods (1951-2007)

Five-year plans	Plan-wise developmental thrust
I	Inland fisheries and collection of spawn and fry from natural sources. Some States passed legislation for bringing neglected water bodies under fish culture.
II	Programmes initiated in the First Plan continued with added thrust on development of marine fisheries
III	Thrust on increased fish production, mechanization of fishing vessels and programmes on improvement in the socio-economic condition of fishermen. Schemes on development of infrastructure for landing and berthing facilities for fishing vessels were introduced.
IV	Development of export potential, including setting up of an autonomous authority for export promotion. Allocation of separate outlay for fisheries research. Setting up of Special Trawler development Fund. Setting up of Fish Farmer's Development Agencies to promote inland aquaculture.
V	Development of brackishwater fisheries, survey of marine fisheries resources, development of infrastructure facilities for coastal fishing villages, etc.
VI	Assistance for acquisition of trawlers for deep sea fishing. Development of inland fisheries statistics. Establishment of prawn hatcheries and prawn farming.
VII	Motorization of traditional fishing craft. National Welfare Fund for development of fishermen villages. Conservation of marine resources through closed season. Initiation of new Deep-Sea Fishing Policy.
VIII	Strengthening of inland fish marketing, resource enhancement through artificial reefs. Fisheries training and extension. Setting up of large number of minor fishing harbours and fish landing centres. Setting up of Aquaculture Authority for regulation of shrimp farming.
IX	Acquisition of survey vessels for strengthening Fishery Survey of India (FSI). Modernization of fishing harbours and fish landing centres.
X	Strengthening of database through the National Marine Census. Manpower building. Establishment of Coastal Aquaculture Authority (CAA) and the National Fisheries Development Board (NFDB).
XI	Under finalization.

(Source: First five-Year Plan to Tenth Five Year Plan, Planning Commission, Government of India)

Until the 1960s, the focus of fisheries development was mainly on increasing inland fish production and improving the socio-economic conditions of the fishers. Hence, major share of funds were allocated to meet these objectives.

Simultaneously, welfare schemes were also introduced. Beginning in the 1970s, the focus of fisheries development shifted to export promotion. To boost production, more funds were allocated for mechanisation of fishing fleet, development of aquaculture and enhancement of infrastructure and food processing industries. During this period, the Government promoted the MPEDA to penetrate new export markets through product diversification. As a part of this effort, the Government through the MPEDA and the DoF also introduced new schemes on coastal aquaculture development (Yadava, 2008).

1.2.12.3. Role played by outside fisheries management agencies in the budget allocation process

In India, primarily three types of outside managerial interventions have taken place in budget allocation for fisheries development: 1) incorporating environmental concerns (international organizations and NGOs), 2) subsidies and other facility to the sector (trade associations), and 3) livelihoods development of fishers (NGOs).

1.2.12.4. Evaluation of expenditure and process for budget adjustments

The accounting year in India runs from 1 April to 31 March of each year. At the beginning of the year, based on the work plan, the Ministry of Agriculture forwards a budget estimate (BE) on possible expenditures to carry out activities for that year to the Ministry of Finance. By 31 October of the same year, the Ministry makes the revised estimate (RE) to record the actual expenditure on the activities. Secondly, if funds remain unspent in a particular year, they go back to the exchequer and such unspent funds have a bearing on the allotments for the corresponding year. In actual field settings, the BE and RE are done for each scheme run by the Ministry of agriculture and depending on utilization, the allocations change.

1.2.13. Expenditures on Fisheries

1.2.13.1. Categorization of expenditure

Categorization of expenditure for fisheries management in India's context can be: a) Central Sector Schemes: the schemes under these categories are fully financed and implemented by the Central Government; b) Centrally Sponsored

Schemes: the financing for these schemes is shared both by the Central and the State Governments; and c) State Schemes: financed and implemented by the States. The allocation of funds and expenditure on various schemes shows different thrust areas under each Five-Year Plan. The allocation and expenditure in fisheries sector has been categorized under five major headings: a) Scientific research; b) Policy development and operational management; c) Enforcement; d) Corporate and administrative support; and e) development and capacity building.

a) Scientific research³²

The current components of fisheries research can be broadly grouped under the following organizations: a) Indian Council of Agricultural Research (ICAR) system; b) Ministry of Agriculture; c) Ministry of Commerce and Industries; d) Ministry of Food Processing Industries (MFPI); e) Ministry of Earth Sciences (MoES) and f) Other bodies such as Council of Scientific and Industrial Research (CSIR) and the State Agricultural Universities (SAU). The ICAR is main organization for conducting fisheries research in the country and the following institutes form part of the ICAR system:

- (i) Central Marine Fisheries Research Institute (CMFRI), Kochi, Kerala.
- (ii) Central Inland Fisheries Research Institute (CIFRI), Barrackpore, West Bengal.
- (iii) Central Institute of Fisheries Technology (CIFT), Kochi, Kerala.
- (iv) Central Institute of Fisheries Education (CIFE), Mumbai, Maharashtra.
- (v) Central Institute of Brackishwater Aquaculture (CIBA), Chennai, Tamil Nadu.
- (vi) Central Institute of Freshwater Aquaculture (CIFA), Bhubaneswar, Orissa.
- (vii) National Bureau of Fish Genetic Resources (NBFGR), Lucknow, Uttar Pradesh.
- (viii) National Research Centre on Cold Water Fisheries (NRCCWF), Bhimtal, Uttar Pradesh.

³² Fisheries and Aquaculture Research Capabilities and Needs in India – World Bank Technical paper 147 (Fisheries series)

b) Policy development and operational management

The use of policy reforms in India has been restricted to rent from the post-harvest sector, i.e. levels on export of marine products; landing and berthing fees collected from mechanized fishing vessels in some of the fishing harbours and fish landing centres (FLCs), and rent through licensing of deep-sea fishing vessels through joint venture, charter and leasing arrangements. While the levy on export continues, the rent through licensing ceased after the Government in 1997 rescinded the 1991 policy on deep-sea fishing. As regards the landing and berthing fee, there is no uniform pattern, and the rent collected from most of the fishing harbours and FLCs is meagre and not commensurate with the expenditure on the maintenance of the facility.

c) Enforcement (monitoring, control and surveillance (MCS))

The open access nature of marine fisheries also takes to the issue of MCS. Implementation of MCS in small-scale fisheries or in coastal areas presents a range of unique problems which relate to large numbers of widely dispersed fishers operating within a fishery, mixed gear/species and landing points. The main objective of implementing MCS in the country is to secure responsible and sustainable management of fisheries resources while allowing an ecologically safe and economically profitable exploitation of the resources, not only for today's population but also for prosperity. The main obstacle in the successful implementation of MCS is lack of coordination among stakeholders.

d) Corporate and administrative support (marine fisheries laws and regulations)

For regulation of fisheries in the territorial waters, all the coastal States and the UT of Lakshadweep have enacted their Marine Fishing Regulation Act (MFRA). These Acts are based on a model bill provided by the Union Government in 1979. The expenditure on corporate and administrative related schemes has shown satisfactory utilization as compared to aspects of fisheries management.

e) Development and capacity building³³

The importance of access to essential infrastructure facilities such as fishing harbours, FLCs, ice plants and cold storages, boat building yards, net making plants, transportation and communications networks, seed production units, has been recognized as important for stimulating the growth of fisheries sector during the various plan periods. In 1964, a Centrally Sponsored Scheme was introduced to provide infrastructure facilities for landing and berthing of mechanized fishing vessels, traditional fishing crafts and deep sea fishing vessels. The initial approach was to provide limited landing and berthing facilities such as jetty, deepening of the entrance channel, provision of a breakwater, market hall, guide lights, etc. Since the inception of the Centrally Sponsored scheme, six major fishing harbours, 53 minor fishing harbours and 188 FLCs have been identified for implementation. Out of which, 6 major fishing harbours, 41 minor fishing harbours and 162 FLCs have been completed and put to use. The remaining 18 minor fishing harbours and 28 FLCs are at various stages of construction (Handbook on Fisheries Statistics, 2006). During the Fifth Plan (1974-1979), the construction of major fishing harbours at Mumbai, Kochi, Chennai, Visakhapatnam and Roychowk was sanctioned. The development of fishing harbours and landing centres has subsequently continued in all the Five-Year Plans, albeit with certain modifications in the implementation of the scheme during the Ninth Five-Year Plan.

Some of the other schemes introduced for development and capacity-building included Techno-Socio-Economic Survey of Fishers, National Welfare Fund of Fishermen, Group Accident Insurance Scheme, Motorization of Traditional Crafts, Introduction of Improved Landing Crafts, Marine Fishing Regulation, Fish Farmer's Development Agency, Incentives for Small Mechanized Fishing Sector, Development of Model Fishermen Villages and Saving-cum-Relief Scheme.³⁴ Implementation of these schemes has had much impact on the living conditions of fishers. The objective of Development of Fishermen Villages is to provide civic amenities like housing, potable water, recreation facilities, etc. The objective of

³³ This mainly includes funds and expenditure on infrastructure, motorization/mechanization, aquaculture development, fisher welfare, etc.

³⁴ www.dadf.gov.in

Saving-cum-Relief for fishermen is to provide financial assistance to the fishermen during the period of ban on fishing (two months during the period April-August, which also coincides with the south-west monsoon in India). The scheme on the Fisheries Training and Extension was introduced in the Eighth Plan to provide training to fishery personnel so as to assist them in undertaking fisheries extension programme effectively. The programmes for the welfare of fisher communities were initiated from the Sixth Five-Year Plan. Prior to that, Government efforts were concentrated on expansion of production and exploitation of fish resources.

The phenomenal increase in fish production in the first three decades after independence could be attributed to the increase in the number of active fishers, introduction of mechanized vessels, motorization of traditional boats, use of synthetic gear material and extension of harbour facilities and expansion of export trade. From the 1980s onwards, the emphasis was on increase in the efficiency of craft and gear, motorization of traditional boats, exploitation of deep-sea fisheries through introduction of new mechanized boats and the use of foreign experience by allowing foreign vessels to fish in the Indian EEZ. Thus mechanizations and motorization has been an important part of the planning process in India.

1.2.13.2. Approaches followed to track expenditure

The Government follows the approach of utilization certificate and expenditure tracking for planned expenditure on fisheries: a) financial indicators, b) physical indicators, and c) utilization certificate. For each scheme, which has been financed through Government sources, the implementing agency has to submit a utilization certificate at regular intervals. The scheme on Fish Farmer Development Agency includes indices like area covered, number of farmers trained, etc. The Auditing of Plan scheme also serves as an instrument for tracking the expenditure. There are two types of audits generally followed for such schemes: 1) financial audit and 2) performance audit. The financial audit also includes a local audit. The Comptroller and Auditor General of India is the prime agency for auditing of all Government expenditure.

1.2.14. Production

The progress in the inland fisheries sector during the 1990s has been commendable (6.55 per cent per annum), where as the growth in marine fish production during the same period has been slow (2.19 per cent per annum) (Table 8 and Table 9).

Table 8. Fish production (compound growth rate, per cent)

4 Year/Period	Marine	Inland	Total
1950s	5.12	2.53	4.43
1960s	2.13	9.12	4.23
1970s	3.65	2.85	3.35
1980s	3.99	5.64	4.62
1990s	2.19	6.55	4.12
2000-7	3.26	9.56	6.66
1950s-07	3.70	5.72	4.54

(Source: Handbook on Fisheries Statistics, 2006)

Table 9. Fish production over Plan periods in India (1951-2004)

Plan Period	Fish Production at end of the period ('000 tonnes)			Growth (per cent) over the plan period			Average annual growth
	Marine	Inland	Total	Marine	Inland	Total	
Pre-Plan Period (1951-56)	534	218	752	--	--	--	--
I Plan (1951-56)	596	243	839	11.61	11.47	11.57	2.31
II Plan (1956-61)	880	280	1,160	47.65	15.23	38.26	7.65
III Plan (1961-66)	824	507	1,331	-6.36	81.07	14.74	2.95
Annual Plans (1966-69)	904	622	1,526	9.71	22.68	14.65	4.88
IV Plan (1969-74)	1,210	748	1,958	33.85	20.26	28.31	5.66
V Plan (1974-79)	1,490	816	2,306	23.14	9.09	17.77	3.55
Annual Plan (1979-80)	1,492	848	2,340	0.13	3.92	1.47	1.47
VI Plan (1980-85)	1,698	1,103	2,801	13.81	30.07	19.70	3.94
VII Plan (1985-90)	2,275	1,402	3,677	33.98	27.11	31.27	6.25
Annual Plan (1990-91)	2,300	1,536	3,836	1.10	9.56	4.32	4.32
Annual Plan (1991-92)	2,447	1,710	4,157	6.39	11.33	8.37	8.37
VIII Plan (1992-97)	2,967	2,381	5,348	30.42	69.83	45.44	6.49
IX Plan (1997-02)	2,830	3,126	5,956	-4.62	31.29	11.37	2.27
X Plan (2002-03)	2,990	3,210	6,200	5.65	2.69	4.10	4.10
X Plan (2003-04)	2,941	3,458	6,399	-1.64	7.73	3.21	3.21

(Source: Handbook on Fisheries Statistics, 2006)

1.2.14.1. Exports of marine products

Fisheries exports from India become an important component of agricultural exports, to the extent of 18 per cent. Over fifty products are exported to as many destinations all over the world, and India has also been making a mark in ornamental fish exports in recent years. Between the Eighth and the Ninth Five-Year Plans, the quantity of fish exports increased by 62 per cent in quantity and over 117 per cent in value (Table 10). It improved the share of exports in total output and

enhanced the integration of the sector with the global market. A trend towards export of high value fish and retention of other fish for domestic market is seen in recent years. Continuous monitoring of overseas markets and compliance of changing standards to remain competitive needs no emphasis. The projected target for exports from the fisheries sector by the end of Eleventh Five-Year Plan is 1.06 million tonnes in quantity and INR 1,500 billion in value. A study conducted by the National Centre for Agriculture Planning, New Delhi, indicated that although fisheries export has performed well and is quite competitive in the global market, the relative competitive advantage has declined in recent years. However, expansion in the world trade is the major determinant of fisheries export from India (Yadava, 2008).

Though shrimps account for about 28% in terms of volume and about 66% in terms of value, there has been diversification also and the country is now exporting frozen squid, cuttle fish/fillets, etc. in large quantities. India now exports marine products to about 70 countries but major buyers are USA, Japan and the European Union (EU). Due to the thrust on export of marine product the post-harvest facilities in this sector have come up at a much faster pace and largely comprise freezing and canning plants (Yadava, 2004).

Table 10. Growth in fisheries exports and integration with international markets

Five-Year Plan	Average annual exports		Average annual production		Per cent exports of production	
	Quantity ('000 t)	Value (Rs. billion)	Quantity ('000 t)	Value (Rs. billion)	Quantity	Value
VIII	287	309.4	4,819	1,235.9	5.95	25.03
IX	379	553.6	5,595	2,455.8	6.78	22.54
X	463	671.6	6,301	3,232.7	7.35	20.78

(Source: Handbook on Fisheries Statistics, 2006)

1.2.14.2. Training, extension and transfer of technology

The training and extension services in the fisheries sector are mainly handled by the Fish Farmers' Development Agency (FFDA) and the Brackishwater Fish Farmers' Development Agency (BFDA). Due to changes in the funding pattern of the two schemes in the Ninth Five-Year Plan, some states disbanded the FFDA/BFDAs and or merged them with their district-level establishments. In the States, the DoF has presence at the lowest revenue division to take care of the fisheries

development, including training and extension. However, with the closure/merger of the FFDA/BFDAs, the availability of extension services to the fish farmers has been adversely affected in these states. The research institutes and the State Agriculture Universities have also been offering training and extension work as part of their routine curriculum. The Department of Rural Development promotes fisheries through its Integrated Rural Development Programme (IRDP) (Yadava, 2008).

1.2.15. Source of funding for India's fisheries

1.2.15.1. Government funding

The sources of Government funding for fisheries sector in India are mainly Central and the State funding. Funding from States to fisheries sector is mainly channelled to welfare funds for fishers. There are two types of schemes which receive funds from State budget viz. Centrally Sponsored Schemes and State Schemes. In the Centrally sponsored schemes, States generally have to contribute about 50 per cent of the outlay, and the remaining 50 per cent is matched by the Central Government.

1.2.15.2. Non-government funding for fisheries management activities

Non-government funding for fisheries in India is mainly related to external funding and has been increasing with participation of India in various regional bodies and with increasing assistance from international and inter-governmental organizations such as the constituents of the United Nations (FAO, United Nations Development Programme (UNDP), International Maritime Organization (IMO), etc.), World Bank, etc. Under institutional finance, the National Bank for Agriculture and Rural Development (NABARD), as a refinance agency for commercial banks, co-operative banks and regional rural banks, has been the major facilitator of credit to the fisheries sector. In view of the focus on deep sea fishing through charter, leasing and joint venture starting from the early eighties, and the brackishwater aqua boom in the early 1990s, many financial institutions like the Industrial Finance Corporation of India (IFCI), Industrial Development Bank of India (IDBI), Shipping Credit and Investment Company of India (SCICI), State Finance Corporations (SFCs) and National Co-operative Development Corporation (NCDC) also entered the sector to

lend credit. Credit support from financial institutes is available for almost all the activities of fisheries and for creation of infrastructure. Nevertheless, the critical role of the middlemen, merchants and occasional money lenders in the chain is still in vogue. The present liberal status of the banking sector does hold a considerable hope for further improvement in the availability of public finance to the fisheries sector.

1.2.15.3. Review of cost recovery mechanisms³⁵

Participation by operators in the fisheries to cost sharing for fisheries management is minimal. License fees are levied in the mechanized sector, but fees are low, as are penalties applied for offences. These sources of revenue do not represent a significant contribution to the overall cost the Government incurs for the management of the resource. Fishermen cooperative societies are exempted from income tax. Arguably, the most important reasons for this exemption are: a) farmers are exempted from income tax, and fishing activities that are considered similar to farming operations are also exempted; b) the costs of collecting taxes in a highly disaggregated sector like the Indian fisheries sector may not justify the revenue that could potentially be collected.

Seafood exporters were exempted from income tax until recently. Exports are charged a fee of 0.3 per cent of the freight on board (FOB) value of seafood exports (a reduction from the initial rate of 0.5 per cent). The collected tax is used for financing the MPEDA, and currently amounts to approximately US\$4 million per annum. Import tariffs on seafood were 60 per cent until recently; but these were reduced to 30-35 per cent in 2002-03. India imports very little fish. At present, the respective coastal State/UT Governments only license the mechanized fishing vessels.

1.2.16. Fisheries management service providers

1.2.16.1. Types and level of services provided by non-government sources

Several international and inter-governmental organizations, including the World Bank, UNDP, Danish International Development Assistance (DANIDA),

³⁵<http://www.fao.org:80/docrep/009/a0477e/a0477e0k.htm>

Norwegian Agency for Development Cooperation (NORAD), Department for International Development/Overseas Development Administration (DFID/ODA) (UK and Japan) provide aid to India for the development of fisheries sector. Under the FAO Bay of Bengal Programme (BOBP), started in 1979, assistance was provided for the development of small-scale fisheries and enhancing the socio-economic conditions of the fishing communities. DFID has provided technical aid for the prevention of post-harvest losses in marine fisheries. Recently, FAO launched a scheme for providing technical assistance to implement Hazard Analysis and Critical Control Points (HACCP) in seafood processing industries. A Shrimp and Fish Culture Project was taken up with the assistance of the World Bank in May 1992 and continued until December 1999.

The role of private players is limited in fisheries management in India. The Tenth Five-Year Plan document emphasizes the importance of private/public partnership in developing fisheries sector as:

increasing public/private investment is needed for strengthening infrastructure for diversifying fisheries and aquaculture activities and for enhancing fish production and productivity. Enhanced public investment is also required in research programmes, strengthening infrastructures for training, post-harvest, marketing, etc. Setting up of minor fishing harbours and creation of common facilities for maintenance and usage of dredgers by the Government should be given priority for improvement of infrastructure facilities in the marine fishery sector.

1.2.16.2. Services by fisheries participants

Trade unions and the Self Help Groups (SHGs) mainly comprise the service provide organizations. The other important participants are boat builders, input (feed, seed, etc.) suppliers, traders and moneylenders. The trade unions in capture fisheries mainly comprise the mechanized/motorized boat owners associations. Such trade unions play a crucial role in local settings in mitigations of conflicts among the artisanal fishers and mechanized boats. They are also quite conscious about de facto demarcation of fishing areas among various fishing centres. Such trade unions have generally evolved into cooperative forms and enter in distribution of fuel for boats, price negotiations, etc.

For artisanal fishers there are hardly any such strong trade unions or cooperatives. Formation of SHGs, especially women SHGs are a recent trend in Indian fisheries and are significantly related to the efforts of NGOs. The SHGs are mostly associated with value addition activities in fisheries. In aquaculture, input suppliers play an influential role in determining farming practices and trade. The fish farmer is usually bound to the input suppliers through credit and advances. As extension activities by the Governmental agencies are inadequate, the input suppliers/traders also act as technical advisers to the farmers.

Boat building is an unregulated activity, both in terms of public interventions as well as market mechanisms. In terms of governmental intervention, there are no rules and guidelines or standard specification for boat building yards. Registration is not compulsory and technical expertise is not scrutinized. In terms of market mechanism, there is no strong association of boat builders that can act as an entry barrier. Virtually anybody with carpentry knowledge can enter the field. Especially in the east coast after the December 2004 tsunami, the number of boat building yards increase many times and produced poor quality fibre-reinforced plastic boats.

One significant determinant of fisheries management is the private money lender, though his place does not find any place in the management policy. The private money lender acts as a cushion for fishers and fish farmers during the peak and lean periods. Since institutional credit is still lacking in terms of timely supply and amount, the fishers mostly depend on these private moneylender to manage their financing. Private moneylenders usually act as input suppliers in aquaculture and wholesale buyers in capture fisheries. There are many fishermen's unions, who assist the Government agencies to implement various laws and regulations and other activities, and the other small groups like the SHGs and co-operative societies have been growing recently in the fisheries sector.

In ocean related programmes, there is need for Governments to continually support and strengthen the existing institutions and initiatives for the effective implementation of marine policies, proper integration of marine issues into national development planning and ensuring the full participation of all levels of Government and other organizations dealing with ocean planning and management (Vallejo,

1994). However, due to the limitations of the traditional institutional arrangements, the country needs to have in place a framework that would address coastal and ocean planning and management issues more effectively. Many national efforts have led to a variety of institutional initiatives and programmes in coastal and marine areas.

In India, two key cross sectoral initiatives, such as Marine Protected Areas (MPAs) and ICZM have been practiced with the purpose of enhancing coastal and ocean management and promoting sustainable use of the associated resources. These two initiatives have yielded significant results and have clearly demonstrated the positive contribution of practical management strategies in the sustainable use and protection of marine ecosystems and resources.

(a) Marine Protected Areas (MPAs):

The world's oceans are facing ever increasing human pressures resulting in the declining health of most marine ecosystems (Pauly *et al.*, 1998; Jackson *et al.*, 2001; Lotze *et al.*, 2006; Worm *et al.*, 2006). It is suggested that these trends can be slowed if not reversed with increased conservation of the marine environment through the development of MPAs (Pauly *et al.*, 2002, 2003; Lotze *et al.*, 2006; Worm *et al.*, 2006). The recognition that MPAs are a key component to the recovery and sustainability of marine ecosystems combined with increasing public pressure to preserve the marine environment has motivated many nations around the world to slowly increase the number of MPAs (Mora *et al.*, 2006; Guarderas, 2007; Wells *et al.*, 2007; Wood *et al.*, 2008).

The International Union for Conservation of Nature (IUCN) defines the term 'Marine Protected Area' as:

Any area of the intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment (Kelleher, 1999).

Some MPAs are designed as marine reserves solely to protect certain commercially important species and to manage these reserves through a species-based focus with the ultimate goal of enhancing fish stocks (Lauck *et al.*, 1998; Hilborn *et al.*, 2004). Other MPAs are developed and managed through an

ecosystem-based approach to preserve important habitats and ecosystems, while integrating other human uses such as tourism, recreation, shipping, and fisheries (Keller and Causey, 2005; Ehler and Douvère, 2007). Mechanisms such as co-management, community-based management, traditional management, or combinations thereof are also employed to plan and administer MPAs through collaborations and/or empowerment of local stakeholders (Fiske, 1992; Heinen and Laranjo, 1996; Russ and Alcala, 1999; McClanahan *et al.*, 2006). Each of these management tools can have varying levels of effectiveness for protection, enforcement, monitoring and evaluation of MPAs (Russ and Alcala, 1999; McClanahan *et al.*, 2006).

While progress is being made toward a global system of MPAs, in many regions a significant number of MPAs exist as 'paper parks' and lack adequate management (Kareiva, 2006; Mora *et al.*, 2006). However, without adopting some essential quality management practices required to produce and demonstrate effective environmental management, the widespread development of MPAs will not meet the intended purposes of resorting and sustaining marine habitats and biodiversity (Thompson *et al.*, 2008).

This spatially explicit approach to managing human impacts has many potential ecological and socio-economic benefits that can alleviate some of the problems fundamental to conventional management practices and can therefore complement, but is unlikely to supplant, the conventional practices (Carr, 2000). MPAs are generally meant to help achieve several objectives which often differ greatly depending on the existing circumstances. Some of the objectives identified by IUCN include (IUCN, 1994):

- Preservation of species and genetic diversity;
- Wilderness protection;
- Scientific research;
- Protection of specific natural and cultural features;
- Tourism and recreation;
- Maintenance of environmental services;
- Education;

- Maintenance of cultural and traditional attributes; and
- Sustainable use of resources from natural ecosystems.

In India's case, the protected areas system is based on total protection of core areas (parks), embedded in buffer zones where limited human interaction and exploitation is allowed (reserves). Thus, the marine parks are embedded in larger reserves, where 'traditional' exploitation of resources is permitted especially with regard to fisheries resources, albeit with restrictions on the type of fishing gear applicable. In marine parks, research and recreation activities (tourism) are allowed at a fee while in reserves, although the same activities are allowed, collection of corals and mollusks is however not allowed. There are four marine parks and three marine reserves in India all established between 1980 and 1996 (Table 11).

Table 11. Marine Parks and reserves in India³⁶

Name of MPA	Size of MPA (km ²)	Legal Establishment	Resources
Gulf of Kachchh Marine National Park, Gujarat	162.89	1980	Coral reefs, sponges, mangrove forests, Dugong, finless porpoise, sea turtles, migratory birds.
Gulf of Mannar Marine National Park and Reserve, Tamil Nadu	6.23 10500	1980 1989	Coral reefs, estuaries, mudflats, beaches, forests, seaweeds, seagrasses, salt marshes, mangroves, Dugong, sea turtles, Cetaceans (Indo Pacific bottlenose dolphin, finless porpoise, spinner dolphin, common dolphin)
Mahatma Gandhi Marine National Park, Andaman and Nicobar Islands	281.50	1983	Coral reefs, mangrove vegetation, sand covered beaches, sea turtles
Rani Jhansi Marine National Park, Andaman and Nicobar Islands	256.14	1996	Coral reefs, mangroves, terrestrial moist forests, crocodile, Dugong, nesting birds, fruit eating bat species.
Sundarbans Biosphere Reserve, West Bengal	9630	1989	Tidal waterways, mudflats, small islands of salt-tolerant mangrove forests, eponymous Royal Bengal tiger, birds, spotted deer, crocodiles, snakes.
Great Nicobar Biosphere Reserve	885	1989	Nicobar scrubfowl (a megapode bird), the edible-nest swiftlet, saltwater crocodile, giant leatherback sea turtle, Malayan box turtle, the giant robber crab (or coconut crab).

³⁶ <http://www.nationalparks-worldwide.info/india.htm>

(b) Integrated Coastal Management (ICM)

Olsen *et al.* (1997) argues that the ongoing problem in the implementation of ICM is not the lack of scientific knowledge but issues relating to governance. Although the key issue in coastal management is managing people, coastal management without sufficient interaction with scientists will fail to create sustainable marine environment. Smith (2002) stresses the importance of combining natural and social science insights when managing marine environments. Natural science plays a critical role in describing the ecological and geological conditions of the sea while social sciences explain human behavior. McFadden (2007) opines that marine policy informed by scientific knowledge is essential to governing the coastal zone effectively.

ICM has been defined as 'a continuous and dynamic process by which decisions are made for the sustainable use development and protection of coastal and marine areas and resources (Cicin-Sain and Knecht, 1998). All ICM initiatives must be designed to meet the following three requirements (Olsen, 2002): First, they must be sustainable over long periods of time (Hanson, 2003); Second, ICM initiatives must be adaptable to conditions that often change rapidly (Olsen, 2003) and Third, they must provide mechanisms that encourage or require particular forms of resource use and collaborative behaviour among institutions and user groups. The evidence provided by many laws and regulations, policies, and plans that exist only on paper leads to a focus on incentive mechanisms that arise from two alternative contexts in which actions are taken: the Top-Down (TD) context vs. the Community-Based (CB) context. Stojanovic *et al.*, (2004) provide a detailed discussion about these and other factors required for successful ICM. It is apparent that there is a continuum between the TD and CB contexts, with a corresponding range of possible Government involvement in coastal management (Ellsworth *et al.*, 1997).

In the TD context, decisions are made by Government agencies, with little or no information provided to the public. In the CB context, coastal management is controlled by the local stakeholders, with Government delegates defining limits and guidelines; alternative expressions used in the literature for this context are

coordinated or bottom-up. For any level of coastal quality, an integrated approach is always better than a non-integrated approach. Thus, coastal management must consider all sectors involved by focusing, at local rather than at national scales, on users rather than on uses. When there is a low degree of interest in maintaining the coastal use over time, only integrated CB coastal management will increase the coastal quality. Even when the interest in maintaining the coastal use over time is high, an integrated CB approach is preferred if the willingness to pay for coastal improvements is great and the marginal efficiency of investments in coastal improvement is low, because the coastal quality improves to a greater extent; if not, only an integrated TD approach to coastal management will increase the coastal quality (Zagonari, 2008).

India is home to some of the most magnificent ecosystems of the world and of utmost importance for the conservation of biodiversity, such as mangrove forests of the Sunderbans in West Bengal, coral reefs in Gujarat and Tamil Nadu. Environmentally sound management of such ecosystems is essential to ensure the preservation of the highly interdependent and complex natural resource base of coastal productive activities. The establishment of reserves may provide benefits in terms of alternative sources of income (i.e. eco-tourism). However, the long term conservation of ecosystem structures and development potentialities represent the main challenge for coastal area management. The collection of wood and minor forestry products has an important role for sustaining coastal populations of the region. Mangrove forests provide biomass for fuel wood and fodder, maintain the productivity of coastal areas and shelter the coastline. However, population pressure and unsustainable exploitation may inflict serious environmental degradation and fragmentation to coastal forests.

Coastal erosion problems are well known along the east coast of India. A broader management framework is necessary to deal with coastal erosion: the definition of the planning boundaries of the coastal zone would often require the inclusion of river catchments. Such a wider demarcation of the coastal zone could allow a more efficient formulation of integrated land-use and water-use plans for coastal ecosystems and habitat management (Olsen *et al.*, 1992).

The capacity of coastal waters to act as a waste sink is considered often impaired and environmental degradation due to dumping of industrial and domestic wastes and biocides is widespread in the coastal waters of India. Most industrial wastes produced are not treated before their disposal into water bodies. Treatment facilities for domestic waste water are also rarely available. Hot spots of marine pollution are reported around all major coastal industrial centers, such as high concentrations of heavy metals in the waters of the Thane Creek of the Mumbai coast (Ministry of Environment and Forests, India, 1993). The problem of industrial pollution control is compounded by the small average size of industrial units, firms' technical constraints and lack of institutional resources to monitor and enforce compliance with standards. Additional factors affecting the control of industrial sources of pollution are the pace of industrial expansion, which may counter the development of control capabilities; and the social and employment implications of enforcing strict discipline of compliance, such as through the closing of facilities (Haq *et al.*, 1997).

India's coastline is characterized by three different types of biophysical features. The western coast of the Indian subcontinent consists of a narrow coastal strip with rocky cliffs; thus it experiences very little flooding and sedimentation. But a few areas, as in the state of Gujarat on the Gulf of Kutch (Gulf of Kachchh) located in northwestern India, are marked by low and wide intertidal mudflats dominated by mangrove forests. The eastern coast is characterized primarily by low and wide, and flat areas. Thus, urbanization, port development and major coastal economic activities have taken place more rapidly in this coastal zone. Finally, the two tropical island groups between the Bay of Bengal and the Andaman Sea, the Andaman and Nicobar Islands, are clad with dense forests from their shores to their hills. Extensive coral reef communities and coastal vegetation are well developed around these islands (Nayak *et al.*, 1992).

India's huge population and rapid growth have overstrained coastal resources and coastal ecosystems. Coastal urbanization and rapid industrialization along the coastline have given rise to much concerns. In particular, intensive development in the western Ghats coastal area, such as fertilizer plants, nuclear power plants,

refineries and steel manufacturers, have threatened the area's ecology (Murthy, 1996). The Central Water Power Research Station (CWPRS) undertakes research on coastal engineering and related research work in India's coastal zone.

The total area of mangrove forest in India has been estimated at 700,000 hectares (2 million acres), which is about 7 per cent of the world's mangroves. More than 80 per cent of India's mangrove forests exist on the eastern coast, with less than 20 per cent of the mangroves on the western coast (Untawale, 1993). Diverse human economic activities, such as gathering of fuel wood and fodder, have destroyed mangrove communities in the Gulf of Kutch along India's north-western coast and the state of Karnataka.

Karnataka's coastal area has become increasingly industrialized and urbanized because of its favorable conditions for harbours and ports. Expansion of large-scale industries in this region, along with the new port development at Mangalore, inevitably caused destruction of coastal wetland ecosystems. Encroachment of agriculture into vast mangrove communities is also expanding rapidly as mangrove habitats are converted into paddy fields or coconut plantations. In addition, numerous mangrove forests have been cut down by coastal residents for firewood and building materials. One of the major factors leading to the destruction of mangrove forests is the public's attitude towards mangrove trees. Many people consider mangrove habitat as useless areas, and treat them as waste dumping sites or sewage treatment facilities (Elkington, 1996).

Mangrove forests within tidal areas are important to India's coastal fisheries and mariculture. Roughly 60 per cent of the country's coastal fish species depend on mangrove estuarine complexes. In India, mariculture is conducted according to traditional methods, as in brackish water fish farming. This traditional fish farming has developed along estuaries fringed with mangrove trees (Untawale, 1993). Accordingly, maintenance of mangrove areas in India is critical to coastal fisheries production.

1.2.17. Overview of the key issues in marine fisheries

The most important characteristic of marine capture fisheries is that the resources are a common property, the access to which is free and open. The

sustained increase in the demand for seafood and the commensurate rise in prices have increasingly encouraged the induction of more manpower and fishing vessels with improved catching efficiency into the traditional as well as the new fishing grounds over the years. Coastal fisheries in India remained in a pre-developed phase till 1962 (pre-mechanization period; with the annual average production during 1950-1962 being <0.8 mmt), a prolonged growth phase till 1988 (intensive mechanization phase; annual production during 1963-1988 being 0.8-1.8 mmt); followed by the fully exploited coastal areas (annual production being 1.8-2.8 mmt per year). Fishing effort increased steadily throughout the three phases of development, more so in the fully exploited phase. Marine fishing activity in India is an example of uncontrolled fisheries in the initial phase and inefficiently managed fisheries in the subsequent phases (Yadava, 2004, Handbook on Fisheries Statistics, 2006).

1.2.17.1. Increase in fishing intensity

In an open access system, crowding of fishers leads to competition and increased conflicts between them resulting in an overall depletion of the resources. After the progressive mechanization of fishing fleets, the number of smaller mechanized craft of OAL 8 to 10 m are being gradually replaced by larger ones (OAL: 13 to 15 m), thereby considerably increasing the sea endurance, fish hold capacity and fishing efficiency of the vessels. Trawlers have become the main stay of the fishing sector (50% of the total catches are from the trawlers) (Yadava, 2004, Handbook on Fisheries Statistics, 2006).

1.2.17.2. Inappropriate exploitation patterns

Marine fisheries operations remained essentially an inshore activity till about the mid-1980s. Though fishing subsequently extended to the offshore areas only about 20% of the total landing were from the offshore areas. It is estimated that 80% of the total fishing effort is employed in the inshore area, which causes enormous fishing pressure on the coastal fish stocks. Increasing competition between different fishing fleets as to who should have access to coastal fisheries resources and thereby benefit directly from the use of these resources is leading to conflicts and

confrontations. These conflicts are also being increasingly witnessed between fishermen of adjoining coastal States (Yadava, 2004, Handbook on Fisheries Statistics, 2006).

1.2.17.3. Marine fish marketing

The infrastructure for marine fish marketing in India is still principally oriented towards the export market. Inherently disorganized marketing structure, lack of adequate infrastructure, deterioration and waste of such highly perishable commodity during transportation, dominance of middlemen and sufferings of small fish farmer and fishers are the major issues in marine fish marketing (Yadava, 2004, Handbook on Fisheries Statistics, 2006).

The fishermen's share in the consumer Rupee is the best index to measure the efficiency of the fish marketing system. Marketing studies at the all-India level indicate that the fishermen's share in the consumer's Rupee ranges from 30% to 60% for different species/groups of marine fish and marketing cost, including transportation range from 6% to 13% of the consumer's Rupee. The wholesalers receive 5% to 32% and the retailers from 14% to 47% of the consumer's Rupee for different species/groups of marine fish. In certain production-cum-consuming areas, the role of the middlemen traders has put both fishermen and consumers to the greatest disadvantage. A new beginning is now being made by the fishermen to group themselves into associations, which will take up not only fishing, but also selling the catches directly to the consumer so as to benefit themselves and the consumers by gradual elimination of the middlemen traders (Yadava, 2004, Handbook on Fisheries Statistics, 2006).

There is enormous scope for improving the distribution process through enhanced private investment in the preservation, processing and transportation sectors of the domestic marketing system under the liberalized economic policies. The quantity of about 30% of the total landing, which are processed after they become unsuitable for fresh consumption, suggests good scope for market development of value-added products for domestic consumption (Yadava, 2004, Handbook on Fisheries Statistics, 2006).

1.2.17.4. Fisheries infrastructure

Infrastructure has been created for post-harvest facilities such as processing and marketing of fish and fish products. However, major efforts in this direction have been aimed at creation of landing and berthing facilities for fishing vessels in the major ports, minor ports and other places along the coastline (Yadava, 2004, Handbook on Fisheries Statistics, 2006).

1.2.17.5. Fisheries Management Systems

Increase in the marine fish production in India is largely due to (i) the introduction of mechanized fishing vessels and synthetic gear materials, and the development of infrastructure for preservation, processing and storage in the 1950s; (ii) expansion of trawl fleet and indigenous boat construction in the 1960s; (iii) introduction of purseining, diversification of fishing, development of fishing harbours and expansion of export trade in the 1970s; (iv) motorization of traditional fishing craft, introduction of ring seines and increase in the number and efficiency of craft and gear in the 1980s; and (v) substantial growth in the number and efficiency of trawlers and motorized craft, and change in the export trade from resource-based to food-engineering-based industry in the 1990s. Thus, the marine fisheries sector, which began as a subsistence operation by employing exclusively traditional craft during the pre-independence days, has today attained the status of a capital-intensive industry (Yadava, 2004, Handbook on Fisheries Statistics, 2006).

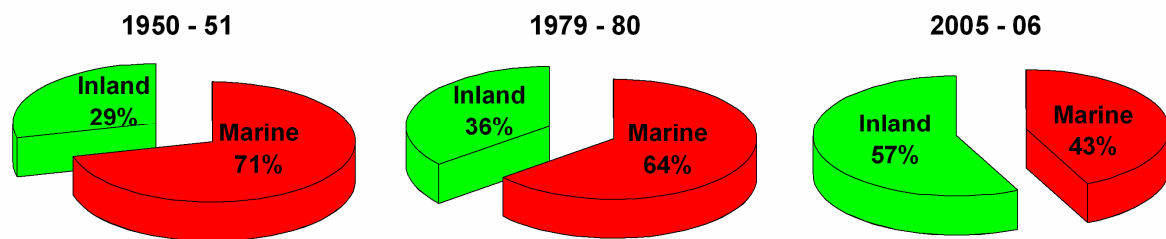
The MFRA enacted by the coastal State Governments and the Maritime Zones of India (Regulation of Foreign Fishing Vessels) Act, 1981 of the Government of India provide for prohibition of fishing vessels (the latter Act restricted to foreign fishing vessels) in the areas earmarked for the traditional and small-motorized fishing crafts. For monitoring the fishing activities to be carried out in different assigned fishing zones by respective fleets, 30 patrol boats are provided to the fisheries department of the maritime States. The Coast Guard undertakes surveillance beyond the territorial waters. The resources monitoring surveys conducted by the Fishery Survey of India (FSI), Mumbai are being linked with the management measures to be evolved and applied for sustainable development of marine fisheries. However, at present there is no law to regulate the Indian owned

fishing vessels operating in waters beyond the territorial limits (Yadava, 2004, Handbook on Fisheries Statistics, 2006).

1.3. Stress factors and problems

1.3.1. Ensuring long-term and balanced conservation of coastal resources and life-support systems

Fish production in the country has been showing an increasing trend. While inshore waters have been almost exploited to the sustainable levels, the contribution from deep sea and marine fisheries has been insignificant. Nearshore fish stocks are generally considered over-exploited in India. However, the considerable information gaps which still surround the assessment of fisheries resources (catch and effort data, biological data and information on migration patterns) represents a major constraint for sectoral planning (FAO, 1993) (Figure 8).



(Source: Handbook on Fisheries Statistics, 2006)

Figure 8. Fish production by source

Gujarat has emerged as the leading producer of marine fish during 2005-06, followed by Kerala, Maharashtra and Tamil Nadu. Penaeid shrimps, which dominate the export front, are at their optimum exploitation levels, where as tuna and cephalopods are the two least exploited fisheries owing to limited operational range of the majority of the present fishing fleets and also the lack of suitable technology. Several other species in the continental shelf are exploited only up to 70-80 m depths (Handbook on Fisheries Statistics, 2006). Nearshore stock depletion is caused by the size of the overall fishing effort, advances in fishing technology, high-efficiency fishing practices as well as the utilization of indiscriminate fishing methods. High efficiency fishing practices bring higher catches, which may cause lower fish populations as well as greater food abundances. Greater food abundance may create lower market prices, which may lead to wasteful usage and lower profits.

Lower profits and lower fish populations induce need for greater efficiency. Need for greater efficiency may create advances in fishing technology and high-efficiency fishing practices (Figure 9).

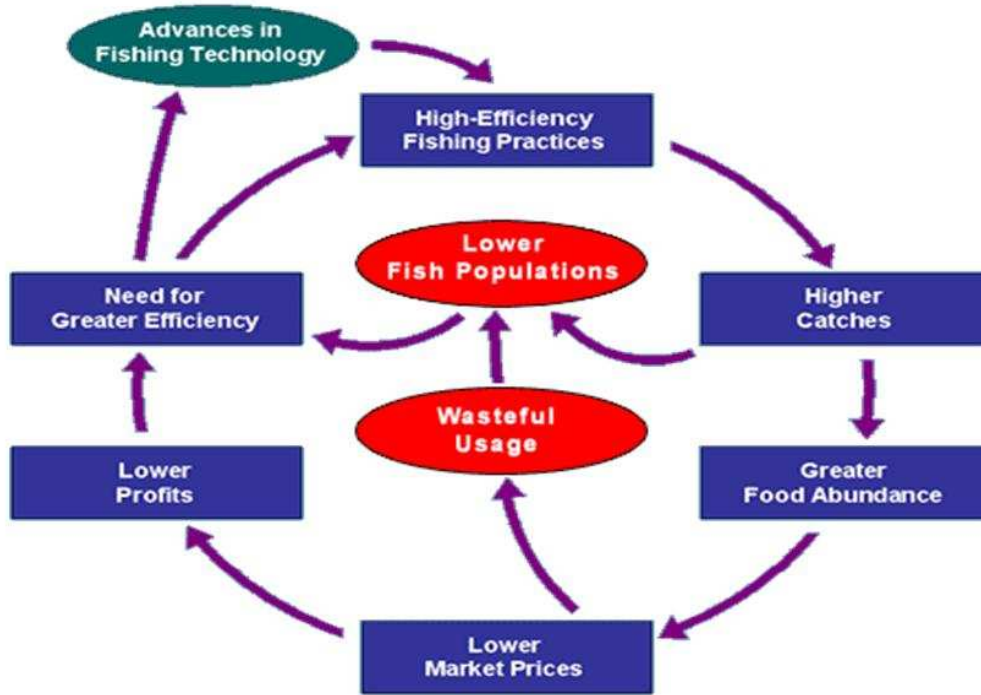
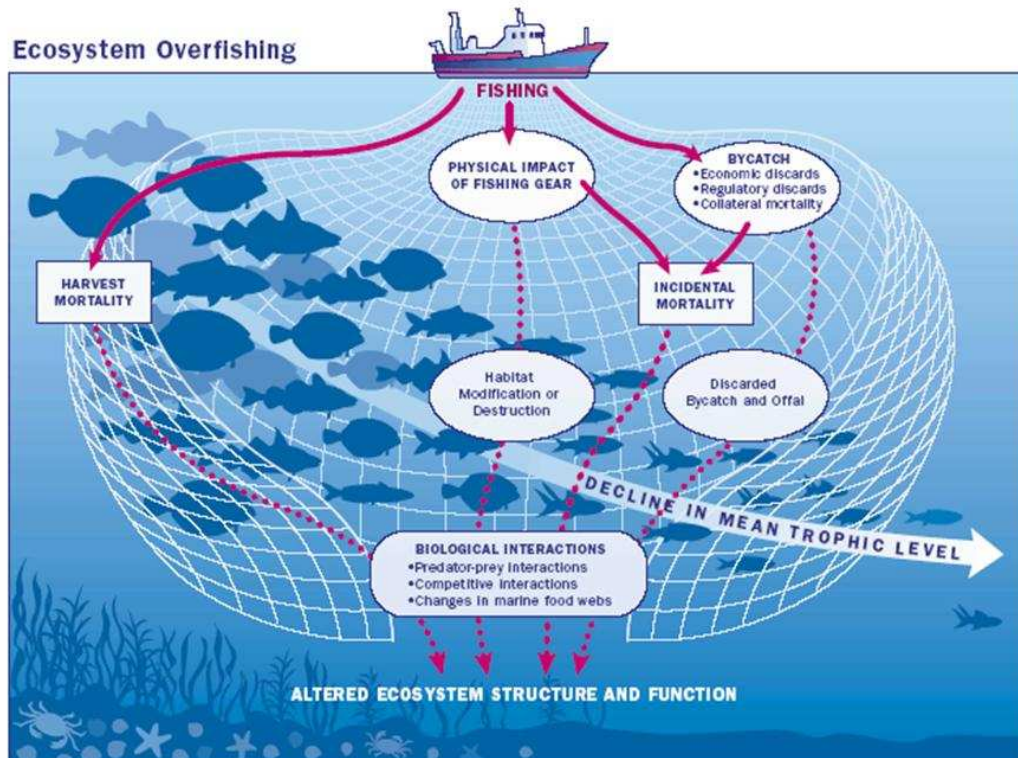


Figure 9. Fish stock depletion due to advances in fishing technology, high-efficiency fishing practices³⁷

The yield of important fisheries, such as penaeid shrimps, is affected by fleet mechanization and the increase in effort of trawl fishery. Nearshore wild shrimp stocks are also threatened by the capture fisheries supporting coastal aquaculture and the destruction of stocks that accompanies push net fishing. Threats to those habitats, such as mangroves, swamps, which are necessary for the life cycle of economically important species, may also aggravate the impacts due to direct exploitation of fish stock (Yadava, 2008). Overfishing may cause harvest mortality, physical impact of fishing gear and bycatch such as economic discards, regulatory discards and collateral mortality. Physical impact of fishing gear and bycatch may cause incidental mortality. Physical impact of fishing gear modifies or destroy habitat. Bycatch may lead to the unfavorable discarded bycatch and offal. Harvest

³⁷ www.grinningplanet.com

mortality, habitat modification or destruction, incidental mortality and discarded bycatch and offal may lead to biological interactions such as predator-prey interactions, competitive interactions, changes to marine food webs. Biological interactions may create altered ecosystem structure and function (Figure 10).



(Source: Adapted from Pauly *et al.*, 1998; Goni, 2000)

Figure 10. Harvest mortality, physical impact of fishing gear, bycatch, incidental mortality, habitat modification or destruction, biological interactions due to ecosystem overfishing

In the inshore zone of India, the growth of the fishing population combined with continuous technical innovation has resulted in an unremitting intensification of fishing effort over a longer period of time (Bavinck *et al.*, 2008).

1.3.2. Management of open access in marine fisheries

The open access nature of marine fisheries is one of the major reasons for depletion, economic waste and conflict among user groups. Without adequate control over access these consequences will become increasingly severe and further impede the sustainable management of fishery and the resource. With an

open access, no catch limits have been set on efforts or the catch (Yadava, 2004, Handbook on Fisheries Statistics, 2006).

1.3.3. Monitoring, control and surveillance (MCS)

The MCS problems in the country include the vast size of the EEZ (2.02 million sq. km), the long coastline (8118 km), larger fishing fleet of different categories, participation of foreign-flagged vessels³⁸ and regional jurisdictional demarcations. Coastal State and UT Governments undertake control of domestic vessels operating largely within the territorial waters. Central Government is responsible for issuing licenses to deep-sea vessels and to foreign-flag vessels. Licenses carry restrictions on fishing methods, types of gear, area, and depth and cod end mesh size. Other regulatory measures include closed seasons and closed areas (Yadava, 2004, Handbook on Fisheries Statistics, 2006).

1.3.4. Fiscal Reforms

The use of fiscal reforms in India has been restricted to rent from the processing sector, i.e. levy on exports of marine products; landing and berthing fee collected from mechanized fishing vessels in some of the fishing harbours and fish landing centres (FLCs) and rent through licensing of deep-sea fishing vessels through joint venture, charter and leasing arrangements (Yadava, 2004, Handbook on Fisheries Statistics, 2006).

As regards the landing and berthing fee, there is no uniform pattern and the rent collected is very meager from most of the harbours and FLCs. Further, the default in payment of rent is very common and there is no mechanism in place to penalize the defaulters as a result very little rent accrues from the users of the landing and berthing facilities. Due to political compulsions, it is also becoming difficult for the management bodies to rationalize the fee to enable its re-use for regular maintenance and upkeep of the harbours and the FLCs (Yadava, 2004, Handbook on Fisheries Statistics, 2006).

³⁸ Presently 15 foreign-flagged vessels are operating used lease arrangements. The charter and joint venture arrangements have been phased out.

1.3.5. Attitude of policy makers

Despite the persistence of social issues, including access to fishing rights, renewal of the industry's social capital and the sustainability of fishing communities, the attitude of policy makers is equivocal. Though prepared to acknowledge the relevance of such concerns, they are strangely unwilling to incorporate explicit social objectives into design of fisheries policy (Symes and Phillipson, 2009).

1.3.6. Issues associated with ability to pay mechanism

Politics (such as politics of fisher unions) and imperfection of labour markets are the major obstacles. The majority of the fishermen are small-scale and poor, which further precludes the implementation of such a mechanism. Further, the non-payment of rent is very common, and there is no mechanism in place to penalize the defaulter. As a result, very little rent accrues from the users of the landing and berthing facilities. Due to political compulsions, it is also becoming difficult for the management bodies to rationalize the fee to enable its re-use for regular maintenance and upkeep of infrastructure facilities such as fishing harbours and the FLCs (Yadava, 2008, Handbook on Fisheries Statistics, 2006).

Water is possibly the most crucial resource at stake in the coastal areas of India. This concern is multifaceted: it involves the management of conflicting claims exerted by competing economic activities in the coastal zones (e.g. fish farming vs rice farming) and the planning of inland water resources, which has very complex implications in the Indian subcontinent (Haq *et al.*, 1997).

1.3.7. Coastal Zone Management issues in India

The socio-economic characteristics of coastal areas present a range of conditions between two extremes: few areas facing noticeable economic development (due to urbanization and industrialization processes); and backward and depressed areas, sparsely populated and lacking resources. Within this range, the economic importance of coastal productive activities cannot be underestimated. In the former case, the coastal economy clearly plays a crucial role in the development of the national economy. In the latter, low-level productive activities

sustain the livelihood of local populations according to traditional practices, highly dependent upon the natural resource base.

Four basic aspects of environmental management of coastal resources can be schematically identified in the environment and development context of India. First, there is a need to manage pressures exerted by population and economic dynamics and to ensure the long term and balanced conservation of the coastal resource base. The protection of the integrity of coastal ecosystems is necessary to secure the preservation of life support systems, with particular regard to those primary productive activities on which large strata of the population base their sustenance. Growing economic demand and unbalanced exploitation patterns often disrupt the complexity of coastal ecosystems, limit development opportunities, give rise to externalities and may impair equity and efficiency in the allocation of resources.

Secondly, due to population growth and poverty that characterize the area, India faces the challenge of identifying and pursuing new and additional development opportunities. India needs to develop coastal resources to meet the basic requirements of coastal populations and the growing demands of the national economy. While the productive potential of traditional sectors such as fisheries may be expanded, additional economic benefits are expected from the exploitation of offshore resources.

The economic growth of marine and coastal areas requires the development of an adequate infrastructure base for tourism, transport, industry and housing. This issue is likely to become of increasing importance for coastal environmental management in India.

A fourth fundamental issue of coastal zone management in India is the need to prevent and mitigate disastrous natural calamities, which frequently occur in coastal areas (Haq *et al.*, 1997).

1.3.8. Development of productive activities

There is a need to expand food production capacities in face of demographic growth and to meet basic needs of local communities by increasing income and generating employment. Rural development remains the central issue of coastal

area management in India. Rural development in coastal zones has to face the challenge of ensuring the preservation of the natural resource base of the livelihood of local population, in a context of multiple use allocation. The expansion of food supply capacities is bound to the identification, testing and promotion of solutions for resource use conflicts among different productive activities (fish farming, rice farming, salt production) over allocation of land, water and resources for development of necessary infrastructures.

Coastal aquaculture production is expanding and the sector has still untapped potential for growth in the eyes of Government of India. The Government support the growth of the industry to boost protein supply in the diet of local population, to generate employment, to ensure welfare of local communities and for export earnings. Due to high capital, investment and operating costs of intensive farms, the sector's growth does not necessarily benefit local populations. The spreading of intensive fish farming plant gives rise to increasing problems. The issue is two fold: on one hand, the tremendous growth of coastal aquaculture can cause extensive impacts and modifications in coastal ecosystems. Fish farmers compete for agricultural land and fresh water supply with other coastal productive activities. Besides these conflicts, the expansion of the profitable shrimp farming industry brings along the associated problems of mangrove forest depletion, salinization (with effect on livelihood of rice farmers), the depletion of natural seed resources, extraction of ground water and disposal of organic effluents, drugs and chemicals. On the other hand, fish farming operations can be disrupted by several natural and man induced phenomena, including river catchments' management, domestic sewage discharge, cyclones, salinity and temperature fluctuations, weed infestation, heavy sedimentation, soil acidity etc. The lack of an adequate regulatory system affects the growth of the industry in India and raises concerns, particularly for the necessary multiple use of coastal resources. The further development of coastal zone planning systems in India will probably face as a major issue the management of coastal aquaculture development.

Opportunities for growth in the fisheries sector and alternative sources of livelihood for coastal fisher folks are expected from development of capacities for

exploitation of offshore fish stocks, based on expansion of capacities of the commercial fishing industry. Therefore, the technological development of the fishing fleet and fish processing facilities, as well as the creation and expansion of adequate credit policies for the sector are fundamental requirements for India. In India, the Government has undertaken a number of programs to assist small scale fishermen toward the extension of their range of operation by upgrading fleet capacities.

The potential for development of offshore resources includes the exploitation of mineral deposits, particularly along the coast of India. India extracts natural gas off the Andaman and Nicobar Islands and the sea basin of Godavari and Kaveri. India's offshore petroleum extraction from the Mumbai High and off the coasts of Mahanadi and Hoogli amounts to about 60% of the country's crude oil production. The Indian Ocean basin is also rich in polymetallic nodules, not yet exploited for lack of technological capabilities (Haq *et al.*, 1997).

1.3.9. Development of infrastructure

A number of large urban centers are located along the coast of Mumbai, Kolkata, Kochi, Chennai, Visakhapatnam in India. Major industrial and maritime transport infrastructures are often located in proximity to or within coastal urban centers. Demographic growth and needs for economic development confirm that the trend of expansion of the coastal centers is bound to stay. Although the largest part of Indian population still lives in rural settlements, the growth of urban centers is expected to play a fundamental role in uplifting of economic and social conditions in India. Thus, the process of urbanization, which is facilitated in coastal areas, will be an issue of increasing importance in the coastal zone management in India. Population in coastal cities (in million) such as Mumbai, Kolkata, Chennai, Kochi, Visakhapatnam, Thiruvananthapuram, Kozhikode are 22.30, 16.00, 8.05, 1.69, 1.65, 1.11 and 1.00 respectively (Brinkhoff, 2008).

Urban infrastructures, such as sewerage and water supply are limited. A considerable proportion of urban population throughout India is squatters. The lack of urban infrastructures causes tremendous environmental problems in the major centers. The unavailability of services also affects coastal rural areas, where the lack of proper housing is often a major problem for local communities, compounded by

problems of encroachment on agricultural and forest lands and near brackish water bodies.

The development of industrial and transport infrastructures in coastal areas is first consideration for India, along with the establishment of special development and economic zones, increasingly seen as incentive to private investment. The tourism sector is expected to grow considerably in India over the next few years. This growth will be at a different pace in different areas, controlled by uncertainties introduced by local political climate, lack of adequate infrastructures and services.

1.3.10. Response to natural calamities and their prevention

The east coast of India, particularly in the State of Andhra Pradesh is regularly hit by storm surges associated with tropical cyclones. The risks associated with such natural calamities call for adequate physical planning of coastal areas, development of necessary forecasting and emergency relief capabilities and the construction of shelters for local population. However, coastal resources of affected areas remain exposed to the possibility of colossal damages, bringing destruction and destitution to hundred of thousands of poor coastal dwellers.

An additional threat to coastal zones is due to the vulnerability of low-lying coastal areas to accelerated sea-level rise induced by global warming. Although the risks associated with global warming induced phenomena are still surrounded by considerable uncertainties (Topping *et al.*, 1993; Asthana, 1993), a sound long term planning of coastal areas may be based on the assessment of potential implications caused by accelerated sea level rise, in terms of vulnerability to flooding and impacts of extreme events. Increasing awareness on the issue has prompted a number of studies on vulnerability assessment of coastal areas (Topping *et al.*, 1993; Asthana, 1993). Such studies advocate improving monitoring of climate and environmental trends in India through cooperative programs and formulating long term coastal zone strategies on sound vulnerability assessment. Proper ICZM can be used to reduce the exposure of coastal populations and the land. Crucial issues to be addressed include phenomena of land subsidence, trends of river sediment supply, impairment of natural defenses (i.e. mangrove forests), location of key infrastructures and coast appraisal for potential response measures. A particular concern is raised on the

possible increase in frequency and intensity of cyclones induced by climate change. This concern needs to be addressed through further research and upgrading of forecasting capabilities (Haq *et al.*, 1997). Proper ICZM to reduce the exposure of coastal populations and the land also may be needed.

In populated coastal areas, two sets of factors give rise to policy problems:³⁹ the conditions of uncertainty, complexity and scale of ecosystems, on the one hand and the social aspirations of the local population on the other. Hisschemoller and Gupta (1999) hold the view that policy problems are socio-political constructs, and are not objectively given. The typology they use involves analysing policy problems according to the fact-value distinction inherent in them. The four types of policy problems they suggest that can be identified are:

1. *The structured, well-defined problem*, where there is consensus about the goals and the means to achieve them. Such problems have a clear and strong role for experts in their resolution as there is little need for stakeholder participation.
2. *The unstructured, ill-defined problem*, where the boundaries are unclear, there is dissensus about ends and means, facts and values. Such a problem needs multi-stakeholder involvement and an open dialogue with a view to structure the problem clearly.
3. *The moderately structured problem (ends)*, where there is consensus about ends, but not about the means to achieve them. Since the goal is common, but interests conflict, there is scope for trade-off. Such problems need participation for resolution, as experts are advocates of one view or the other.
4. *The moderately structured problem (means)*, where there is consensus about means, but not ends. Such a policy process allows for low participation and high involvement of experts who get the task of transforming the political issue into a technical one.

³⁹ A policy problem is defined as a gap between a set of values or goals and an undesirable situation that can be bridged by Government action (Hisschemoller and Gupta, 1999).

Type I problems refer to conflicts within the economy itself between users for the limited coastal ocean resources available within the same sector. Stakeholders in this policy domain are agreed on the development, but are unclear as to the differing interests that should be supported in achieving this. These are then moderately structured problems (ends), which require participation by stakeholders for a solution. Experts are not in a position to define the best trade-offs. They can provide all the back up information on the various contending positions, but the actual trade-off is only possible through a political solution. This type of problem requires for its resolution some form of bargaining among actors.

Type II problems involve conflicts between the natural and the socio-economic systems operating, or in other words between environment and human activity. Such problems involve a dissensus on ends but a consensus on means. Value conflict is evident between those who wish to develop the coast and those who wish to preserve the coast and various combinations of this. The problem is compounded by the fact that local communities have different perceptions of the value of the environment according to whether they are using their community hats or their personal hats.

Type III also involve conflicts between the natural and the socio-economic systems operating, or in other words between environment and human activity. However, there is consensus here both about ends and means. There is agreement on development, and there is also agreement on avoiding or minimising pollution. The only issue is one of pollution prevention or mitigation at lowest cost to the actors. In such situations the role of the expert and technical people is high as they are able to demonstrate the best means of achieving the desired ends. The unstructured, ill-defined problem relates to the issue of sustainable development itself. It is unclear what is exactly meant by this or how best to achieve it. There is need for participation in order to be clear what this policy problem is about and how much is desired to be done to achieve this state. The four types of policy problems identified above for coastal policy analysis are illustrated in Figure 11. These are mapped along two axes that reflect the underlying ideal type fact value distinction.

		Consensus on relevant norms and values	
		No	Yes
Certainty about relevant knowledge	No	Unstructured problem e.g. Issue of sustainable development	Moderately structured problem (ends) e.g. Resource Use Conflicts (Type I)
	Yes	Moderately structured problem (means) e.g. Resource Depletion (Type II)	Structured problem e.g. Pollution problems (Type III)

(Source: Adapted from Hisschemoller and Gupta, 1999)

Figure 11. Types of policy problems relating to coastal development

In India there is issue of sustainable development, resource depletion, resource use conflicts and pollution problems. The depletion of resources in the coastal sector, which is either species specific or location-specific, both resulting from unsustainable fishing pressure. Less exploitation in the deep sea and oceanic waters would be another approach for reducing fishing pressure in the traditional fishing areas. More protection, consideration and encouragement of subsistence level fisher and technology transfer to small scale sector and infrastructure support to industrial sector is needed. Exclusive area in terms of depth and (or) distance may be earmarked for non-mechanised (non-motorised) traditional craft. An area beyond this may be demarcated for mechanised and motorised craft. The principle of CCRF Operations may be incorporated into every component activity. Assessment of existing fishing capacity and plans for regulating or developing one or the other sectors of EEZ may be taken up. Though the Marine Fishing Regulation Acts (MFRA's) of coastal States and UTs have adequate provisions for management of resources and fishing operations, it is often found falling short of effective implementation. Closed seasons may be uniform for neighbouring States unless the geographic or climatic conditions warrant deviations. There may be strict ban on all types of destructive methods of fishing. Mesh sizes in different parts of the fishing gear may be regulated. Catching of juveniles and non-targeted species may be strictly prohibited through legislation. Posting of observers on commercial fishing

vessels and enforcing Monitoring Control and Surveillance (MCS) system may be ensured. A resource enhancement programme will be taken up on priority. Fish aggregating devices may be promoted.⁴⁰

1.3.11. Socio-economic issues

Even when there were attempts to 'develop' fisheries in the developing countries, 'the goals of fisheries development' were generally 'biological' (high catches, utilisation of all resources, etc.), to the near complete neglect of social goals such as employment, community well-being, food security, etc. (Pauly, 2006). As socio-economic issues are affecting the policy development/implementation, social security and economic well being of Indian fishermen may be ensured. Cooperative movement of fishermen may be strengthened and extended to areas where it is non-existent. Greater participation of cooperatives, NGOs and local self Governments may be sought in implementation of welfare schemes for fishermen, thereby reducing the direct role of Central and State Governments in the process. Financing Institutions may be asked to give greater focus to this sector so as to eliminate exploitation of fishermen by middlemen. Programmes to improve safety at sea and also to have an early weather warning system in place may be out lined.⁴¹

A closed fishing season is arguably the most important fisheries regulation measure implemented by the Government of India in the new millennium. Applied mainly to the inshore trawl fishing fleet, the planners' intention was a safe-guarding of capture fisheries. The success of the ban is based on cooperation between the Government and local fisher associations and on broad agreement as to its necessity. Those who are impacted most by the implementation of the closed fishing season are lower-class workers and traders lacking opportunities for alternative employment (Bavinck *et al.*, 2008).

Although some preliminary assessments of the impact of the closed season on the rejuvenation of fish stocks have been carried out (Ammini, 1999; Kurup, 2001 and Srinath *et al.*, 2002), very little attention has yet gone to its human consequences (Bavinck *et al.*, 2008).

⁴⁰ www.dadf.gov.in

⁴¹ *Ibid.*

Due to the Government regulations, mechanized boats nowadays have a maximum length of 50 ft, and inboard engines with a maximum of 110 horse power. During the trawl ban period these vessels are also banned from fishing. The rising of oil prices on the world market, and the declining prices of shrimp are badly pinching the fishermen of this sub-sector. This has resulted in boats being laid up for significant portions of the year and in a general decline of boat- building (Bavinck *et al.*, 2008).

1.3.12. Global climate change

The potential effects of climate change on ocean thermohaline circulation and natural mechanism, sea temperature, marine life distribution, coral reefs and ocean acidity will compound the impacts of other stressors, such as coastal development and pollution, overfishing and unsustainable fishing practices and invasive species. The worst concentration of these cumulative impacts appear to be in 10-15 per cent of the world's oceans, which harbour the most productive fishing grounds, responsible for more than half of global marine landings. Furthermore, changes to ocean thermohaline circulation and natural "flushing and cleaning" mechanisms could impact coastal water quality and nutrient cycling and deep-water production in more than 75 per cent of the world's fishing grounds (Nellemana *et al.*, 2008).

In this Chapter India's physical profile and status of fisheries are explained by illustrating geobiodiversity, marine fisheries resources and status, stress factors and problems. Knowledge of the present status of resources may help the fisheries managers and policy makers to improve the Indian fisheries sector to a better future using fisheries law and policy. The fisheries laws and policies available are described in Chapter 2.

Chapter 2. FISHERIES LAW AND POLICY

Fisheries laws and policies are necessary for the promotion of sustainable and responsible fisheries development and optimizing the benefits from this sector for the present and future generations. The fisheries law and policy are to be focused principally on the promotion of sustainable exploitation in fishing practices, and a degree of responsibility for fishing whilst providing for food, employment, income, and foreign revenue. This Chapter is illustrating the fisheries laws and policies available in international, regional and national levels. In the international framework section, the legal, institutional and political frameworks and their role are described. RFMO/As, environmental organizations and political organizations and their roles are explained in the regional framework section. In the national fisheries management frameworks section mandate and authority, fisheries legislation: legal and policy framework and Institutional structure and their roles are explained.

2.1. The International framework

The use of ocean resources is fundamental to human well being and development. The long term sustainability of oceans is critical as any changes that alter the state of oceans can have immense socio-economic consequences. Therefore, there is an urgent need to address the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction. The threats to biodiversity in areas beyond national jurisdiction range from open access to fisheries, destructive fishing practices like bottom trawling, pollution from ships and other land based activities, and new threats deriving from bio-prospecting and geo-engineering activities. A combination of measures, including monitoring, scientific investigation, and improved governance, are required to prevent or reduce harmful impacts of such activities on biological diversity. Legal, institutional and political framework may provide shape and structure for the management measures to attain the long-term sustainability of oceans.

2.1.1. Legal framework

Overfishing, destructive fishing practices and illegal, unreported and unregulated (IUU) fishing continue to be great threats to the conservation, management and sustainable use of biodiversity. It is important to sustainably manage fish stocks and protect vulnerable marine ecosystems and thus balance sustainable use and conservation. It is essential to give priority to compliance and enforcement measures such as the 1982 UNCLOS and the 1995 United Nations Convention Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks.

2.1.1.1. The 1982 UNCLOS

The UNCLOS lays down a comprehensive regime of law and order in the world's oceans and seas by establishing rules governing all uses of the oceans and their resources.⁴² The UNCLOS embodied in one instrument traditional rules for the uses of the oceans and at the same time introduced new legal concepts and regimes, addressing new concerns, and also provided the framework for further development of specific areas of the law of the sea.⁴³ The UNCLOS contains 320 Articles and 9 Annexes.⁴⁴ The key provisions include the evolutionary features of EEZ, High Sea, Dispute Resolution, and International Tribunal for the Law of the Sea (ITLOS). Coastal States were granted sovereign rights over living and non living resources in their EEZs. With coastal State establishment of EEZs, the most important part of the ocean common was removed from the regime of the high sea and placed under the jurisdiction of the coastal State (Juda, 2002). It is very important matter because more than 95% of all commercial stocks are caught within waters under the jurisdiction of coastal State.⁴⁵ The areas are now controlled by coastal States and fishers from other States desiring to fish in those waters now require State consent (UN, 1993).

The UNCLOS calls on the coastal States and other States in the region, where there are transboundary or straddling stocks and highly migratory species both

⁴² UNCLOS-preamble

⁴³ *Ibid.*

⁴⁴ UNCLOS, Agreement Relating to the Implementation of Part XI of the UNCLOS, *op. cit.* 2001. 294p.

⁴⁵ Agenda 21, 17.69.

within the EEZ and in an area beyond and adjacent to it, to take appropriate measures necessary for the conservation of these stocks.⁴⁶ Transboundary and straddling fish stocks are stocks of fish which migrate between, or occur in both, EEZ of one or more States and high seas.⁴⁷ Highly migratory fish stocks are those that generally roam over large distances and may be found in numerous EEZ jurisdictions and the high seas. Highly migratory species are defined by a listing in Annex 1 of the UNCLOS.⁴⁸ The UNCLOS authorizes coastal States to determine total allowable catch (TAC) of the living resources in the EEZ⁴⁹ and examine its harvesting capacity and give other States access to the surplus of the allowable catch where the coastal State lack the capacity to harvest.⁵⁰ The coastal State is to regulate fishing access through proper conservation and management measures to maintain living resources and to ensure that they are not endangered by over-exploitation.⁵¹ It is also to maintain or restore populations of living resources at level which can produce the Maximum Sustainable Yield (MSY).⁵² The effects on species associated with, or dependent upon, harvesting should be considered by the coastal State, with a view to maintaining or restoring population of such associated or dependent species above levels at which their reproduction may become seriously threatened.⁵³ Management measures shall also be qualified by relevant environment and economic factors that include needs of coastal fishing communities and the particular need of the developing States,⁵⁴ such as making financial contributions, demonstrating value of better management fish stocks, structured assistance programmes that included enhancing the ability of developing States to participate in catch documentation schemes and port States regimes, and to comply with obligations to supply statistical information.

⁴⁶ UNCLOS, art.63 and art. 64.

⁴⁷ United Nations Environment Programme (UNEP), UN Atlas of the Ocean. Straddling Stock, p.1.

⁴⁸ UNCLOS, annex. 1.

⁴⁹ UNCLOS, art. 61, 1.

⁵⁰ UNCLOS, art. 62, 2.

⁵¹ UNCLOS, art. 61, 2.

⁵² UNCLOS, art. 61, 3.

⁵³ UNCLOS, art. 61, 4.

⁵⁴ UNCLOS, art. 61, 3.

Fishers from other States, should comply with the conservation measures and conditions established in the law and regulation of the coastal State which are consistent with the UNCLOS and may include

licensing, determining the species which will be caught, fixing quota, regulating season and area of fishing, type, size and amount of gear and the type, size and number of boat, fixing age and size of fish, specifying information required requiring fisheries research, placing observer or trainee on board, the landing of catch in the port of coastal State, term and condition relating to joint venture or other cooperative arrangement.⁵⁵

For the provision of cooperation, the UNCLOS states that the coastal State and competent international organizations whether regional, sub regional or global shall exchange scientific information, catch and fishing effort statistics, and other data relevant to fishing patterns and conservation of fishing stocks. All States concerned, including States where national are allowed to fish in the EEZ comply with the established regime.⁵⁶

The UNCLOS establishes alternative dispute resolution instruments for settlement of disputes that might occur among the coastal States.⁵⁷ These include the ITLOS, an arbitral tribunal,⁵⁸ and a special arbitral tribunal.⁵⁹ ITLOS is open to States party, and non States party as long as all parties accept the competence of Tribunal.⁶⁰ India has signed and ratified the UNCLOS, thus is a State party.⁶¹ India may implement the provisions of UNCLOS effectively.

2.1.1.2. The 1995 United Nations Convention Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks

The 1995 Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA) was one of the concrete results to UNCED. It was adopted on 4

⁵⁵ UNCLOS, art. 62, 4.

⁵⁶ UNCLOS, art. 61, 2.3.5.

⁵⁷ UNCLOS, art. 287, 1.

⁵⁸ UNCLOS, annex. VII Arbitration.

⁵⁹ UNCLOS, annex. VIII Special arbitration.

⁶⁰ UNCLOS, annex. VI, art. 20.

⁶¹ UNCLOS, art. 287, 1 state that "When signing, ratifying or acceding to this Convention or at any time thereafter, a State shall be free to choose, by means of a written declaration, one or more of the following means for the settlement of dispute concerning the interpretation or application of this Convention.

December 1995 in New York and entered in force on 11 December 2001.⁶² Currently, there are 75 parties to their Convention.⁶³ UNFSA contains 50 articles and 2 annexes,⁶⁴ incorporates the concept of precaution, strengthens the role of regional organization in the management of straddling fish stocks and encourages consideration of fisheries in a wider ecosystem context (Juda, 1997). It also elaborates on the fundamental principle, established in the UNCLOS that States should cooperate to ensure conservation and promote the objective of the optimum utilization of straddling and highly migratory fish stocks both within and beyond the EEZ.⁶⁵ The provision of UNFSA regarding these stocks can be summarized as follows:

- Apply the precautionary approach;⁶⁶
- Adopt, where necessary, measures for the conservation and management of “species belonging to the same ecosystem or associated with or dependent upon the target stock”;⁶⁷
- Minimize catch of non-target species and utilize selective, environmentally safe and cost effective-fishing gear and techniques;⁶⁸
- Protect the biodiversity in the marine environment;⁶⁹
- Utilize regional and subregional organizations and arrangements;⁷⁰
- Taking to account interest of artisanal and subsistence fishermen;⁷¹
- Collect and share complete and accurate data concerning fishing activities including vessel locations and catch of target and non-target species;⁷² and
- Implement and enforce conservation and management efforts through effective monitoring, control and surveillance.⁷³

⁶² United Nations, General Assembly. UNFSA. New York, 1995. A/CONF. 164/37. 1-1 pp.

⁶³ http://www.un.org/depts/los/reference_files/status2008.pdf

⁶⁴ United Nations, UNFSA. New York, 1995. A/CONF. 164/37. 40 p.

⁶⁵ UNCLOS. Art. 63-64.

⁶⁶ UNFSA, Part II, Art. 5 (c) and Art. 6, 1.

⁶⁷ UNFSA, Part II, Art. 5 (e)

⁶⁸ UNFSA, Part II, Art. 5 (f)

⁶⁹ UNFSA, Part II, Art. 5 (g)

⁷⁰ UNFSA, Part III, Art. 1 and 3

⁷¹ UNFSA, Part II, Art. 5 (i)

⁷² UNFSA, Part II, Art. 5 (j)

UNFSA represents a significant attempt to develop a coherent management regime for fish stocks throughout their migratory range. As such it may be seen as an important part of the broader historic trend toward a more managed ocean environment, one in which coastal State interest increasingly predominate with respect to the allocation and conservation of marine living resources and in which the traditional concept of the freedom of the seas is limited (Juda, 1997). On 22-26 May 2006, the UNFSA review conference was held in New York.⁷⁴ The principle outcome of the review conference included:

a) *Conservation and management of fish stocks and highly migratory fish stocks:* The Conference adopted the measures to ensure the long term sustainability of straddling fish stocks and highly migratory fish stocks and addressed overfishing, overcapacity and effects of fishing on marine environment; cooperation to manage fisheries not regulated by a regional fisheries management organization and the collection and sharing of data. The Review Conference recommended that States individually and collectively through RFMOs to: strengthen the commitment to adopt and fully implement, improve cooperation between flag State whose vessel fish on high sea or the areas under national jurisdiction, implement the ecosystem approach to fisheries approach, closed areas to manage fisheries and to protect habitat and biodiversity, conservation and management of discrete stocks.⁷⁵

b) *Mechanism for international cooperation and non members:* The Conference reviewed that even an significant number of States whose vessels fish for stocks regulated by RFMOs have become members and promote non-member adherence to adopted conservation and management measure including data collection and monitoring control and surveillance measures, however problems of non compliance by members and cooperative members and fishing by non-members, continue to undermine the effectiveness of adoption. The Review Conference urged to strengthen the mandates of RFMOs to implement modern approach to fisheries

⁷³ UNFSA, Part II, Art. 5 (I)

⁷⁴ United Nation, General Assembly, Review Conference on the Agreement for the Implementation of the Provisions of the United Nation Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, New York, 22-26 May 2006. A/CONF.210/2006/15.43 p.

⁷⁵ *Ibid.* 31-33 pp.

management, cooperate among existing and developing organizations, encourage non-members to join the RFMOs, improve transparency of RFMOs and criteria for allocating fishing opportunities, develop best practice guide line for RFMOs,⁷⁶ to ensure the opting-out parties is constrained by rule to prevent undermining conservation.⁷⁷

c) *Monitoring, control and surveillance and compliance (MCS) and enforcement:* The Review Conference addressed significant levels of IUU fishing which continue to occur in many fisheries for straddling fish stocks and highly migratory species. The Review Conference underlined the critical important of the effective control by flag States overfishing vessels flying their flag. It needed more effort, particularly the expeditious investigation of suspected violation and follow-up actions as well as further stops to combat and deter IUU. The measures or schemes need to be developed more so as to regulate the landing and transshipment in particular at-sea transshipment to prevent illegally caught fish. A coordinated approach among States and RFMOs is required. The Review Conference recommended that States individually and collectively through RFMOs, adopt necessary port State measures, especially the 2005 FAO Model Scheme on Port States Measures to Combat IUU Fishing, and legally binding instruments with IPOA to prevent Deter and Eliminate IUU fishing, the International MCS, trade measure. In addition, the Review Conference recommended strengthening domestic mechanisms to deter national and beneficial owners from engaging in IUU fishing activities.⁷⁸

d) *The assistance to developing state and non parties:* During the Review Conference, a number of developing States noted that an increase in assistance would encourage further ratification. The Conference recognized the need to provide assistance to developing States in areas such as data collection, scientific research, MCS, HRD and information sharing, as well as technical training and assistance as it

⁷⁶ Chatham House, The Royal Institute of International Affairs. 2007. Recommended Best Practices for Regional Fisheries Management Organization Executive Summary. Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organization. 20 p.

⁷⁷ United Nations, General Assembly, *op. cit.* 36-37 pp.

⁷⁸ *Ibid.* 38-40 pp.

relates to conservation and management of straddling fish stocks and highly migratory fish stock.⁷⁹

The UNFSA is classified as one of hard law implementation instrument of the UNCLOS and established many RFMOs and implementation Agreements.⁸⁰ It aims at completing sustainable fisheries in 2012.⁸¹ India is a State party to the UNFSA, it has accessed on 19 August 2003 and implemented some provisions of UNFSA concerning the conservation and management of stocks by regional fisheries management organizations. However, India may consider without delay the ratification and signing of the UNFSA for complete cooperation in implementation.

2.1.2. Institutional framework

Fisheries management agencies are typically mandated to achieve a broad range of objectives related to resource conservation, sustainable use and the distribution of benefits derived from fisheries. Achieving these objectives involves a number of activities such as scientific research (surveys, data analysis, and stock assessment), operational management (consultation, preparing fishing plans, licensing) and enforcement (surveillance, prosecutions). There are a number of emerging initiatives that have the potential to increase the funding pressures faced by fisheries management agencies including IPOA which contains the 1995 FAO CCRF, IPOA-Seabirds, sharks, capacity, IUU fishing.

India needs to adopt global fishery and related conventions and agreements (e.g. Straddling Stocks Agreement, Compliance Agreement) to which it has been a signatory. In fact, being the largest maritime country in the region, India also needs to set the example. Because of the large marine fisheries resource available to the country, the straddling and migratory nature of many valuable stocks like tuna and emerging issues in sustainable management of the resources, it is also important to take the lead to set up and participate in regional fisheries bodies, which will help to widen the use of the national research and technical expertise in the region.

⁷⁹ *Ibid.* 41-43 pp.

⁸⁰ E. Meltzer, Global Overview of Straddling and Highly Migratory Fish Stocks. Figure C: The figure of International Fisheries and Related Instruments Pertain to Straddling and Highly Migratory. 1-1 pp.

⁸¹ United Nation, General Assembly, *op. cit.* 43 p.

2.1.2.1. The 1995 FAO CCRF

The 1995 CCRF was adopted at the 28 session of the FAO Conference on 31 October 1995⁸² by 170 members.⁸³ Committee on Fisheries (COFI) defined the concept of the responsible fisheries as:

This concept encompasses the sustainable utilization of fisheries resources in harmony with the environment; the use of capture and aquaculture practices which are not harmful to ecosystem resources or their quality; the incorporation of added value to such product through transformation meeting the required sanitary standards; the conduct of commercial practices so as to provide consumers access to good quality products.⁸⁴

The CCRF sets out principles and international standards of behaviours for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for the ecosystem and biodiversity. It recognizes the nutritional, economic, social, environmental and cultural importance of fisheries and the interests of all those concerned within the fishery sector. The CCRF takes into account the biological characteristics of the resources and their environment and the interests of consumers and other users.⁸⁵

The CCRF is voluntary rather than mandatory,⁸⁶ global in scope,⁸⁷ and based on relevant rules of international law, including those reflected in the UNCLOS, the FAO Compliance Agreement, Agenda 21, in particular Chapter 17, and other relevant declarations and international instruments.⁸⁸ The CCRF is comprised of 12 articles and 2 Annexes.⁸⁹ The two annexes provide background to the origin and elaboration of the CCRF, and its adoption.⁹⁰ Article 1 to 4 of the CCRF addresses

⁸² FAO. Code of Conduct for Responsible Fisheries. Rome. 1995. 41 p.

⁸³ FAO, What is the Code of Conduct for Responsible Fisheries? About CCRF. 2003. 1-1 pp.

⁸⁴ FAO, CCRF, annex 1.

⁸⁵ FAO, CCRF, Introduction. 1-1 pp.

⁸⁶ FAO, What is the Code of Conduct for Responsible Fisheries? About CCRF. 2003. 41 p.

⁸⁷ FAO, CCRF, art 1.2.

⁸⁸ FAO, CCRF, Relationship with other International Instruments. 2001. 41 p.

⁸⁹ FAO, CCRF, 41 p.

⁹⁰ *Ibid.* annex 1-2. 35-41 pp.

the nature and scope of the CCRF, the objective, the relationship with other international instruments and implementation,⁹¹ respectively.

The principle objects of the CCRF include fisheries management, fisheries operations, aquaculture development and integration of fisheries into coastal area management.⁹² The CCRF lays on the post-harvest practices and trade that contain responsible fish utilization and international trade, law and regulation relating to fish trade.⁹³ The CCRF recognizes the importance of fisheries research and States that “responsible fisheries require the availability of a sound scientific basis to assist fisheries managers and other interest parties in making decisions.”⁹⁴ The appropriate research is needed in all aspects of fisheries including biology, ecology, technology, environmental science, economics, social science, aquaculture and nutritional science.⁹⁵ The CCRF emphasize the need for assistance to developing States to implement the CCRF, especially in the areas of financial and technical assistance, technology transfer, training and scientific cooperation that would allow developing States to develop their own fisheries and to participate in high seas fisheries.⁹⁶ India may implement the CCRF effectively by financial and technical assistance, technology transfer, training and scientific cooperation, which can be obtained from international and regional organizations. So that India can develop fisheries and build fishing fleets to participate in high seas fisheries.

2.1.2.2. The 1993 FAO Compliance Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas.

The Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (FAO Compliance Agreement) was adopted by the FAO in 1993 and entered in force as from 24 April 2003.⁹⁷ Currently, there are 37 parties to this agreement.⁹⁸ The agreement is

⁹¹ *Ibid.* art 1-4.

⁹² *Ibid.*, objectives.

⁹³ FAO, Code of Conduct, art 11.

⁹⁴ *Ibid.*, art 12.1.

⁹⁵ *Ibid.*

⁹⁶ *Ibid.* art 5.

⁹⁷ FAO, Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas. <http://www.fao.org/Legal/treaties/012s-e.htm>

composed of 16 articles and imposes upon all States party whose fishing vessels operate on the high seas a responsibility in respect of fishing vessels entitled to fly their flags. States are to ensure that flag State vessels are authorized to fish on the high seas and thus they operate in accordance with international conservation and management measures⁹⁹ as well and exchange information on high seas fishing and their activities.¹⁰⁰ It reaffirms the provisions of Agenda 21 that flag States must exercise effective control over their fishing vessels fishing on the high seas.¹⁰¹ It elaborates this obligation by requiring that all such vessels be licensed to conduct such fishing, that the licenses be conditioned on the vessel abiding by internationally agreed conservation and management measures,¹⁰² and establishes the FAO as an archive and clearing house for information on such fishing vessels,¹⁰³ particularly those that have broken applicable rules and have punished for it.¹⁰⁴ The most groundbreaking aspects of the agreement are three new rules regarding high seas fishing operations:

- a) Each flag State must ensure that its vessels do not engage in any activity that undermines the effectiveness of international fishery conservation and management measures, whether or not the flag State is a member of the regional fishery organization that adopted such measures;
- b) No vessel is to be used for fishing in the high seas without specific flag State authorization; and
- c) No flag State shall grant such authority to a vessel unless the flag State is able to control the fishing activities of that vessel (Balton, 2002).

These three rules represent a new vision for high seas fisheries. To abide by these rules, flag States must actively oversee the high seas fishing operations of their vessels. They must decide on a case by case whether to authorize any vessel to fish on high seas. Most importantly, they may permit any vessel to fish on the high seas at all unless they are able to prevent the vessel from undermining agreed high

⁹⁸ *Ibid*

⁹⁹ *Ibid*, Art. III

¹⁰⁰ *Ibid*, Art. VI

¹⁰¹ Agenda 21, 17.52

¹⁰² The FAO Compliance Agreement, Art. III

¹⁰³ *Ibid*, Art. VI

¹⁰⁴ *Ibid*, Art. III, 8

seas conservation rules.¹⁰⁵ The FAO Compliance Agreement is an international convention that responds directly to the recommendation made in Agenda 21¹⁰⁶ for action to ensure effective monitoring and enforcement of high seas fishing activities. It contains both of regulations and punishments. All the States have the duty to take, or to cooperative with other States in taking the measures for their respective nationals as may be necessary for the conservation of the living resources of the high seas.¹⁰⁷ India may cooperate with other States in taking the measures for the conservation of the living resources of the high seas.

2.1.2.3. The 1993 FAO IPOAs addressing specific key issues of the 1995 CCRF

There are four IPOAs which are voluntary instruments within the framework of the CCRF.¹⁰⁸ Three IPOAs were adopted by COFI at its 23 Session in February 1999¹⁰⁹ and include the IPOA on Seabirds which concerns the reduction of incidental catch of seabirds in longline fisheries, the IPOA on Shark which concerns conservation and management of sharks, and IPOA on capacity which concern the management of fishing capacity the subject of management of fishing capacity. The fourth IPOA, addressing IUU fishing was adopted at COFI's the 24 Session 2001.¹¹⁰ The four IPOAs may be summarized as follows:

(a) IPOA-Seabirds

The objective of the IPOA-Seabirds is to reduce incidental catch of seabirds in longline fisheries.¹¹¹ The species of seabirds most frequently victims of such catches are albatrosses and petrels in the Southern Ocean, northern fulmars in the North Atlantic and albatrosses, gulls and fulmars in the North Pacific fisheries. The elaboration of this IPOA was due to an increased awareness about the incidental

¹⁰⁵ The FAO Compliance Agreement, Art. III

¹⁰⁶ *Ibid*

¹⁰⁷ *Ibid*

¹⁰⁸ FAO, International Plan of Action <http://www.fao.org/docrep/006/Y5260e01.htm#fn11>.

¹⁰⁹ FAO, Report of the 23rd Session of the Committee on Fisheries. Rome, 15-19 February 1999 (May 2001); <http://www.fao.org/docrep/meeting/x0911e.htm>.

¹¹⁰ FAO, Report of the 24 Session of the Committee on Fisheries. Rome, 26 February-2 March 2001.; <http://www.fao.org/docrep/meeting/003/y0220e/y0220e00.htm>.

¹¹¹ FAO, International Plan of Action, IPOA-Seabirds (2009); http://www.fao.org/fi.website/FIRetrieveAction.do?dom=org&xml=ipoa_seabirds.xml.

catch of seabirds in longline fisheries and its potential negative impacts on seabird populations.¹¹²

IPOA asked States with longline fisheries to conduct an assessment of these fisheries to determine if a problem exists with respect to incidental catch of seabirds. If a problem exists, States should then adopt accordingly a NPOA for reducing the incidental catch of seabirds in longline fisheries (NPOA-Seabirds). The NPOA-Seabirds is a plan that a State designs, implements and monitors to reduce the incidental catch of seabirds in longline fisheries that should include raising awareness among fishers, fishing associations and other relevant groups.

(b) IPOA-Sharks

The objective of the IPOA-Sharks is to ensure the conservation and management of sharks and their long-term sustainable use.¹¹³ IPOA request States to implement a national program for the conservation and management of shark stocks if their vessels conduct directed or non-directed fisheries for sharks and call upon States to be responsible for developing, implementing and monitoring its Shark-plan. The national shark plan should contain regular assessments of the status of shark stocks, effective measures to ensure that shark fisheries are sustainable and should seek to minimize unutilized incidental catches, minimize waste and discards and encourage full use of dead sharks. And where transboundary, straddling, highly migratory and high seas stocks of sharks are exploited by two or more States, the States concerned should strive to ensure effective conservation and management of the stocks.¹¹⁴

(c) IPOA-Capacity

The IPOA stated that overcapacity and overfishing are really symptoms of the same underlying management problem as well as being biologically unsustainable, among others, contributes substantially to the degradation of marine fisheries resources, the decline of food production potential, and significant economic waste. The level of overcapacity observed in the mid-1990s was also economically

¹¹² *Ibid*

¹¹³ *Ibid*

¹¹⁴ *Ibid*

unsustainable.¹¹⁵ Thus, IPOA seek to address the management of fisheries capacity in the framework of the CCRF,¹¹⁶ States should take measures to prevent or eliminate excess fishing capacity and should ensure that levels of fishing effort are commensurate with sustainable use of fishery resources.¹¹⁷ IPOA-Capacity specifies a number of actions to be urgently taken with regards to the main section of the document including assessment and monitoring of fishing capacity, preparation and implementation of national plans, international consideration, and immediate actions for major international fisheries requiring urgent attention.¹¹⁸ The immediate objective of the IPOA-Capacity is to urge States and RFMOs to achieve a worldwide, efficient, equitable and transparent¹¹⁹ management of fishing capacity.

(d) IPOA-IUU fishing

IUU fishing undermines efforts to conserve and manage fish stocks in all capture fisheries. When confronted with IUU fishing, national and regional fisheries management organisations can fail to achieve management goals. This situation leads to the loss of both short and long-term social and economic opportunities and to negative effects on food security and environmental protection. IUU fishing can lead to the collapse of a fishery or seriously impair efforts to rebuild stocks that have already been depleted. Existing international instruments addressing IUU fishing have not been effective due to a lack of political will, priority, capacity and resources to ratify or accede and to implement them.¹²⁰ The objective of the IPOA-IUU is to prevent, deter and eliminate IUU fishing by providing all States with comprehensive, effective and transparent measures by which to act, including through appropriate

¹¹⁵ FAO, International Plan of Action, IPOA-Capacity (2009);

http://www.fao.org/fi/website/FIRetrieveAction.do?dom=org&xml=ipoa_capacity.xml&xp_nav=1

¹¹⁶ FAO, International Plan of Action, IPOA-Capacity, legal foundation (2009);

http://www.fao.org/fi/website/FIRetrieveAction.do?dom=org&xml=ipoa_capacity.xml&xp_nav=2

¹¹⁷ FAO, International Plan of Action, IPOA-Capacity

http://www.fao.org/fi/website/FIRetrieveAction.do?dom=org&xml=ipoa_capacity.xml&xp_nav=1

¹¹⁸ *Ibid.*

¹¹⁹ FAO, International Plan of Action, IPOA-Capacity, Mission 2009

http://www.fao.org/fi/website/FIRetrieveAction.do?dom=org&xml=ipoa_capacity.xml&xp_nav=2

¹²⁰ FAO, International Plan of Action, IPOA-IUU, 2009

http://www.fao.org/fi/website/FIRetrieveAction.do?dom=org&xml=ipoa_IUU.xml

regional fisheries management organizations established in accordance with international law.¹²¹

The IPOAs focusing on the management of fishing capacity and IUU fishing have implications for most States in both small-scale and industrial fisheries. Assessments are needed to determine the extent and gravity of capacity and IUU fishing problems and the development of NPOAs. Each IPOA sets a target date for States to implement their NPOAs. These dates, plus the severity of the problems associated with fishing capacity and IUU fishing, should facilitate priorities for action in implementing the NPOAs.¹²² In India, fish stock depletion is caused by overfishing, unregulated fishing, high fishing technology, fishing capacity, unselective gear, bycatch and ecosystem destruction by bottom trawling. In order to conserve fisheries resources, India may implement the IPOAs and NPOAs effectively by reducing the fishing capacity, using selective gear and reducing bycatch and bottom trawling. India may cooperate with other States, international and regional organizations to control IUU fishing. India may also encourage longlining to avoid the incidental catches of seabirds due to fishing nets.

2.1.3. Political framework

For those deriving a livelihood in fisheries, the issue is whether international, national and local Governments will have the required capacity and capability of taking full advantage of the opportunities offered by such closer integration while fostering cultural identity, maintaining social balance and political control, and avoid increasing disparities in wealth and well-being. These are the challenges faced by the international community, Governments and civil society and it is too early to make predictions on how well they will face up to them, but much will depend on initiatives taken by fishery dependent communities. The initiatives such as Agenda 21 of UNCED and Johannesburg Summit 2002 – the WSSD are emphasizing the sustainable development of natural resources.

¹²¹ *Ibid.*

¹²² FAO Fisheries Report, Report of the Workshop on the Implementation of the 1995 FAO Code of Conduct for Responsible Fisheries in the Pacific Islands: a Call to Action. Nadi, Fiji, 27-31 October 2003-04. 150 p.

2.1.3.1. Agenda 21 of the 1992 UNCED

The 1992 UNCED also known as the Earth Summit, was held in Rio de Janeiro. The consensus of principles addressing the concept of sustainable development is form in provisions of the comprehensive Agenda 21. This document is a wide-ranging assessment of social and economic sectors with goals for improving environmental and developmental impact (Juda, 2002). Agenda 21 stated that humans confront with a perpetuation of disparities between and within nations, a worsening of poverty, hunger, ill health and illiteracy, and the continuing deterioration of the ecosystems on which humans depend for their well-being. The integration of environment and development concerns as well as an increase in the attention paid to them should lead to the fulfilment of basic needs, improved living standards, protected and managed ecosystems and peace which is a precondition for the global partnership for sustainable development.¹²³

Agenda 21 is comprised of 40 Chapters. Chapter 17 addresses the problems of ocean and coastal areas,¹²⁴ contains provisions for the sustainable utilization and conservation of oceans and their living resources. The implementation of these provisions by States will also require international cooperation and coordination including through the United Nations System, and international development bodies. Furthermore such work should benefit from and regular consideration by the United Nations General Assembly and other UN bodies competent in marine and coastal issues¹²⁵ so as to assist in the development and sharing of analytical and predictive tools, such as stock assessments and bioeconomic models,¹²⁶ effective management and enforcement¹²⁷ and the protection of ecological systems that support fish stocks.¹²⁸

Chapter 17 identifies the problems of the high seas fisheries including overutilization, unregulated fishing, overcapitalization, excessive fleet size, vessel reflagging to escape controls, insufficient selective gear, unreliable databases and

¹²³ Agenda 21, Preamble

¹²⁴ Agenda 21, Basis for action

¹²⁵ Agenda 21, 17.50

¹²⁶ Agenda 21, 17.56 (c) and 17.86 (c)

¹²⁷ Agenda 21, 17.49

¹²⁸ Agenda 21, 17.72 and 17.85

lack of sufficient cooperation between States. Chapter 17 called upon States to take effective action and to cooperate in enforcement of effective conservation measures particularly for highly migratory species and transboundary stock that move between EEZs and straddling stocks that move between EEZs and the high seas.¹²⁹ Such actions include:

- a) Ensure that fishing activities by vessels flying their flags on the high seas take place in a manner so as to minimize incidental catch;¹³⁰
- b) Minor and controlled fishing activities by vessels flying their flags on the high seas to ensure compliance with applicable conservation and management rules;¹³¹
- c) Deter reflagging of vessels by their nationals as a means of avoiding compliance with applicable conservation and management rules;¹³²
- d) Prohibit dynamiting, poisoning and other comparable destructive fishing practices;¹³³
- e) Fully implement General Assembly resolution 46/215 on large-scale pelagic drift-net fishing;¹³⁴ and
- f) Reducing wastage, post-harvest losses and discards.¹³⁵

Chapter 17 also calls on States to cooperate within the regional and global fisheries bodies¹³⁶ and to join regional high seas fisheries organization if they have an interest in a high seas fisheries regulated by that organization.¹³⁷ Also address in Chapter 17 are the problems of fisheries in areas under national jurisdiction including local overfishing, unauthorized incursions by foreign fleets, ecosystem degradation, overcapitalization and excessive fleet sizes, underevaluation of catch, insufficiently selective gear, unreliable databases and increasing competition

¹²⁹ Agenda 21, 17.45

¹³⁰ Agenda 21, 17.50

¹³¹ Agenda 21, 17.52

¹³² Agenda 21, 17.53

¹³³ Agenda 21, 17.54

¹³⁴ Agenda 21, 17.55

¹³⁵ Agenda 21, 17.56

¹³⁶ Agenda 21, 17.57-17.59

¹³⁷ Agenda 21, 17.60

between artisanal and large-scale fishing, and between fishing and other types of activities.¹³⁸ Chapter 17 indicates States should:

- a) Develop and increase the potential of marine living resources to meet human nutritional needs, as well as social, economic and development goals;
- b) Take into account traditional knowledge and interests of local communities, small- scale artisanal fisheries and indigenous people in development and management programmes;
- c) Maintain or restore populations of marine species at levels that can produce the MSY as qualified by relevant environmental and economic factors taking into consideration relationships among species;
- d) Promote the development and use of selective fishing gear and practices that minimize waste in the catch of target species and minimize by-catch of non-target species;
- e) Protect and restore endangered marine species; and
- f) Preserve rare or fragile ecosystems as well as habitats and other ecologically sensitive areas.¹³⁹

Agenda 21 makes recommendations for the future conduct and management of world fisheries. It is supplemented by global fisheries agreements such as the FAO Compliance Agreement and the United Nations Fish Stock Agreement, in the work of international fisheries bodies such as the FAO COFI, and in the efforts of a number of regional fisheries commissions (Juda, 2002).

2.1.3.2. Johannesburg Summit 2002 – the WSSD

The WSSD targets to halve the proportion of people without access to basic sanitation by 2015; to use and produce chemicals by 2020 in ways that do not lead to significant adverse effects on human health and the environment; to maintain or restore depleted fish stocks to levels that can produce the maximum sustainable yield on an urgent basis and where possible by 2015; and to achieve by 2010 a significant reduction in the current rate of loss of biological diversity.

¹³⁸ Agenda 21, 17.71

¹³⁹ Agenda 21, 17.74

India may participate in the initiatives such as Agenda 21 of 1992 UNCED and Johannesburg Summit 2002 - the WSSD, to take effective action and to cooperate in enforcement of effective conservation measures particularly for highly migratory species and transboundary stock that move between EEZs and straddling stocks that move between EEZs and the high seas

2.2. Regional Framework

India is party to a number of regional bodies, programmes and projects dealing with fisheries management and the protection of coastal habitats, communities and resources. India collects data in formalized data collection schemes, and provides regularly feed back to these regional bodies. India also participates in programmes, inter-governmental and regional organizations that also deal with the management and conservation of fisheries resources, or the trade of fisheries products. There is no legal requirement within either State or national fisheries legislation for fisheries management issues that may be adopted by regional fisheries bodies to be incorporated into national legislation.¹⁴⁰

2.2.1. Regional Fisheries Management Organizations/Arrangements (RFMO/As)

RFMO/A is an affiliation of nations which co-ordinates efforts to manage fisheries in a particular region. RFMO/As may focus on certain species of fish or have a wider remit related to living marine resources in general within a region. RFMO/As are responsible for the whole process of fisheries conservation and management from scientific research and provision of advice, adoption of conservation and management measures and other decisions, to the implementation of these decisions. All these tasks are to be performed in interaction with the member states, other interested States and RFMO/As. To carry out all these functions there must exist a certain infrastructure and procedures to ensure that decisions are taken, implemented and revised if necessary. The setting may vary from sub-region to sub-region, requiring different approaches and organizations.

¹⁴⁰ <http://www.fao.org:80/docrep/009/a0477e/a0477e0k.htm>

2.2.1.1. Indian Ocean Tuna Commission (IOTC): The IOTC is an intergovernmental organization mandated to manage tuna and tuna-like species in the Indian Ocean and adjacent seas. Its objective is to promote cooperation among its members with a view to ensuring, through appropriate management, the conservation and optimum utilisation of stocks and encouraging sustainable development of fisheries based on such stocks. India is a member of IOTC from 13 March 1995.

2.2.1.2. Asia-Pacific Fishery Commission (APFIC): The APFIC acts as a Regional Consultative Forum that works in partnership with other regional organizations and arrangements and members. It provides advice, coordinates activities and acts as an information broker to increase knowledge of fisheries and aquaculture in the Asia Pacific region to underpin decision making. The APFIC knowledge base page is intended to provide a guide to the function of APFIC and its work on promoting responsible and sustainable fisheries and aquaculture in the Asia-Pacific region.

2.2.1.3. Bay of Bengal Programme – Inter Governmental Organisation (BOBP-IGO): The BOBP is an Inter-Governmental Organisation mandated to enhance cooperation among member countries, other countries and organisations in the region and provide technical and management advisory services for sustainable coastal fisheries development and management in the Bay of Bengal region. Its Head Quarters is in Chennai, India.

2.2.1.4. Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR): In balancing the conservation of Antarctic marine living resources and their rational use, the Commission has been in the forefront of organisations in the development of an ecosystem approach in managing such resources. It has also assumed prominence in the development of management approaches which apply an element of precaution to take account of uncertainty in the knowledge required for management.

2.2.1.5. INFOFISH: It is an Intergovernmental Organization providing marketing information and technical advisory services to the fishery industry of the Asia-Pacific region. INFOFISH is the leading source of marketing support for fish producers and

exporters in the Asia-Pacific - a region which includes some of the largest fishing nations in the world. Its activities include bringing buyers and sellers together, publication of current and long-term marketing information and operation of technical advisory and specialized services. In addition to organizing exhibitions, conferences, workshops, seminars and training programs, INFOFISH undertakes consultancies on all aspects of fisheries including pre-harvest, harvest and post-harvest.

India may cooperate with RFMO/As to manage tuna and tuna-like species in the Indian Ocean and adjacent seas, increase knowledge of fisheries and aquaculture, develop and manage sustainable coastal fisheries, develop an ecosystem approach and to get marketing information and technical advisory services.

2.2.2. Environmental organizations

An environmental organization is an organization that seeks to protect, analyze or monitor the environment against misuse or degradation. In this sense the environment may refer to the biophysical environment, the natural environment or the built environment. The organization may be a charity, a trust, a non-governmental organization or a government organization. Environmental organizations can be global, national, regional or local. India is party to Bay of Bengal Large marine Ecosystem (BOBLME), South Asia Co-operative Environment Programme (SACEP), Coastal Oceans Research and Development in the Indian Ocean (CORDIO), the World Wildlife Fund (WWF) Projects and Technical Cooperation Group (TCG) of Indian Ocean Marine Affairs Commission (IOMAC) dealing with fisheries management and the protection of coastal habitats, communities and resources.

2.2.2.1. Bay of Bengal Large Marine Ecosystem (BOBLME): The BOBLME Programme provides a comprehensive framework for and identifies the specific actions required to address the priority transboundary problems. Potential national and regional investment, technical assistance and capacity-building interventions will be identified to improve the management of the living marine resources, with an

initial focus on fisheries, and of the health of the BOBLME as a whole for the continued sustainable use of the Bay by future generations.

2.2.2.2. South Asia Co-operative Environment Programme (SACEP): The SACEP promote regional co-operation in South Asia in the field of environment, both natural and human in the context of sustainable development and on issues of economic and social development which also impinge on the environment and vice versa; to support conservation and management of natural resources of the region and to work closely with all national, regional, and international institutions, governmental and non governmental, as well as experts and groups engaged in such co-operation and conservation efforts.

2.2.2.3. Coastal Oceans Research and Development in the Indian Ocean (CORDIO): The CORDIO supports biophysical monitoring and research on coral reefs, participatory monitoring of artisanal fisheries (biological, resource and socio-economic), education and awareness raising, and policy development. Its primary goal is to conserve biodiversity in the context of improved livelihoods and sustainable development, of people directly dependent on coastal and marine resources.

2.2.2.4. The World Wide Fund for Nature (WWF) Projects: The WWF promotes India's ecological security - restoring and sustaining the ecological balance, conservation of biological diversity, ensuring sustainable use of the natural resource base, particularly land and water, minimization of pollution and wasteful consumption, promotes sustainable lifestyles among all segments of the community.

2.2.2.5. Technical Cooperation Group (TCG) of Indian Ocean Marine Affairs Commission (IOMAC): The IOMAC creates an awareness regarding the Indian Ocean, its resources and potential for the development of the States of the region, and furthering cooperation among them, as well as with other States active in the region, bearing in mind the new ocean regime embodied in the 1982 UNCLOS; provides a forum where Indian Ocean States and other interested nations could review the state of the economic uses of the Indian Ocean and its resources and

related activities, including those undertaken within the framework of intergovernmental organizations, and identifying fields in which they would benefit from enhanced international cooperation, coordination, and concerted actions; adopts a strategy for enhancing the national development of the Indian Ocean States through the integration of ocean-related activities in their respective development process, and a policy of integrated ocean management through a regular and continuing dialogue and cooperative international/regional action with particular emphasis on technical cooperation among developing countries.

India may actively participate in BOBLME, SACEP, CORDIO, WWF Projects and IOMAC for the potential national and regional investment, technical assistance and capacity-building to improve the management of the living marine resources, with an initial focus on fisheries. India may cooperate with these regional bodies to get improvement in the field of environment, both natural and human, in the context of sustainable development and on issues of economic and social development which also impinge on the environment and vice versa. In order to conserve biodiversity in the context of improved livelihoods and sustainable development, of people directly dependent on coastal and marine resources, India may seek cooperation from these regional environmental organizations. Indian may also actively participate in the regional environmental organizations to ensure sustainable use of the natural resource base, minimize pollution and wasteful consumption, promote sustainable lifestyles among all segments of the community and to create an awareness regarding the Indian Ocean, its resources and potential for the development.

2.2.3. Political organizations

The Political organizations such as Indian Ocean Rim Association for Regional Cooperation (IOR-ARC), South Asian Association for Regional Cooperation (SAARC), Association of South East Asian Nations (ASEAN) East Asia Summit (EAS) and ASEAN Regional Forum (ARF), Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) and Global Environment Facility (GEF) are established to maximize sustainable biomass yield or MSY, maximize

sustainable economic yield or optimum sustainable yield (OSY), secure and increase employment in certain regions, secure protein production and food supply, increase income from export and biological and economic yield.

2.2.3.1. Indian Ocean Rim Association for Regional Cooperation (IOR-ARC): The Association disseminates information on trade and investment regimes, with a view to helping the region's business community better understand the impediments to trade and investment within the region. These information exchanges have been intended to serve as a base to expand intra-regional trade.

2.2.3.2. South Asian Association for Regional Cooperation (SAARC): The SAARC promotes the welfare of the peoples of South Asia and to improve their quality of life; accelerates economic growth, social progress and cultural development in the region and to provide all individuals the opportunity to live in dignity and to realize their full potential; promotes and strengthen collective self-reliance among the countries of South Asia; contributes to mutual trust, understanding and appreciation of one another's problems; promotes active collaboration and mutual assistance in the economic, social, cultural, technical and scientific fields; strengthen cooperation with other developing countries; strengthen cooperation among themselves in international forums on matters of common interest; and cooperates with international and regional organizations with similar aims and purposes.

2.2.3.3. Association of South East Asian Nations (ASEAN) East Asia Summit (EAS) and ASEAN Regional Forum (ARF): Its aims include the acceleration of economic growth, social progress, cultural development among its members, the protection of the peace and stability of the region, and to provide opportunities for member countries to discuss differences peacefully.

2.2.3.4. Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC): The aims and purposes of BIMSTEC are to create an enabling environment for rapid economic development, accelerate social progress in the sub-region, promote active collaboration and mutual assistance on matters of common interest, provide assistance to each other in the form of training and

research facilities, cooperate more effectively in joint efforts that are supportive of, and complementary to national development plans of member States, maintain close and beneficial cooperation with existing international and regional organizations, and cooperate in projects that can be dealt with most productively on a sub-regional basis and which make best use of available synergies.

2.2.3.5. Global Environment Facility (GEF): The GEF addresses global environmental issues while supporting national sustainable development initiatives. It provides grants for projects related to six focal areas: biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants (POPs).

India may actively participate in the political organizations such as IOR-ARC, SAARC, ASEAN, BIMSTEC and GEF to get information on trade and investment regimes, promote active collaboration and mutual assistance in the economic, social, cultural, technical and scientific fields, accelerate economic growth, social progress, to get assistance in the form of training and research facilities and to address global environmental issues while supporting national sustainable development initiatives.

2.3. National fisheries management frameworks

2.3.1. Mandate and authority

Entry of List I of Seventh Schedule of the Constitution of India specifies Fishing and Fisheries beyond Territorial Waters as Union Subject, whereas Entry 21 of List II speaks of Fisheries as a State Subject. Control and regulation of fishing and fisheries within territorial waters is the exclusive province of the State, whereas beyond the territorial waters, it is the exclusive domain of the Union. The Central Government acts as a facilitator and coordinator responsible for policy formulation, carrying out fishery research and channelling funding support to the States in line with the national priorities and the commitments made to the State/UT Governments. The Ministry of Agriculture (DADF) within the purview of its allocated business helps the coastal States and UTs in development of fisheries within the territorial waters, besides attending to the requirements of the sector in the EEZ. Therefore,

management of fishery exploitation in the EEZ requires close coordination between the Union and the states (Yadava, 2008, Handbook on Fisheries Statistics, 2006).

2.3.2. Fisheries legislation: Legal and policy framework

India's legal and policy framework that relates to the management of the coastal and marine environment has for a long time been developed in response to sectoral needs and in tandem with the actual physical environment and socio-economic dynamics. There are 70 statutes relating to the management and conservation of the environment, most of which apply to the coastal and marine environments (Annex 3). For sustainable development of the marine resources, India amended its Constitution in 1976. The Indian Parliament enacted the Territorial Sea, Continental Shelf, Exclusive Economic Zone (EEZ) and other Maritime Zones Acts in 1976, pursuant to which a 200 nautical mile EEZ was established with effect from 15 January, 1997.¹⁴¹ Since then, India has also enacted a number of other laws and regulations, including: the Marine Products Export Development Authority (MPEDA) Act, 1972; the Indian Coast Guard Act, 1978; the Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, 1981; the related rules of August, 1982; the Environment Protection Act, 1986; the Coastal Aquaculture Authority Act, 2005, etc. The other central legislations, which have important bearing on the fisheries sector, include the Merchant Shipping Act, 1958 and the Wildlife Protection Act, 1973. However, there is still no law to regulate the Indian-owned fishing vessels operating in the EEZ.¹⁴²

The Marine Fishing Regulation Act (MFRA) of the maritime State/UT Governments and the deep sea fishing schemes as provided under the Maritime Zone of India (Regulation of Foreign Fishing Vessels) Act, 1981 of the Government of India provide for prohibition of fishing by mechanized fishing vessels in the areas earmarked for the traditional and small-motorized crafts. For monitoring the fishing activities to be carried out in different assigned fishing zones by respective fleets, patrol boats are provided under a Central Scheme to the DoF of the maritime states. The resources monitoring surveys conducted by the Fishery Survey of India (FSI),

¹⁴¹ http://en.wikipedia.org/wiki/List_of_Indian_Federal_Legislation

¹⁴² *Ibid.*

Mumbai are being linked with the management measures to be evolved and applied for sustainable development of fisheries in the country (Yadava, 2008). A summary of statutes related to the coastal and marine environments and when they were either enacted or revised is contained in Table 12. Statutes relating to coastal zone and enforcement agencies is contained in Annex 4.

Table 12. Statutes that relate to the fisheries

Title of Law/Decree	Decree / Law No.	Year Enacted / Revised
The Constitution		1950
The Territorial Sea, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Acts	80	1976/1997
The Marine Products Export Development Authority (MPEDA) Act	13	1972/1978
The Coast Guard Act	44	1978/2002
The Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act	42	1981/1982/ 1990/1991
The Environment (Protection) Act	29	1986/1991
The Coastal Aquaculture Authority Act	24	2005
The Merchant Shipping Act	44	1958/1970/ 2002/2003
The Wild Life (Protection) Act	39	1972/2002/2006

(Yadava, 2008)

2.3.3. Institutional structure

At the Central-level, the Department of Animal Husbandry, Dairying and Fisheries (DADF) in the Ministry of Agriculture is the focal point, in the State/UT Governments, it is the Department of Fisheries (DoF). Other Ministries/Departments such as the Ministry of Environment and Forests (MoEF) play important role in various aspect of management. At the national level, the Ministry of Defence through the Indian Coast Guard is also associated with the management of fisheries in the EEZ. Government institutions and other agencies participating in coastal and marine resources management is contained in Annex 1.

2.3.3.1. Role of Central Government: The Fisheries Division in the DADF, Ministry of Agriculture acts as the focal point for fisheries development and management in the country. It formulates the strategy for the development plans for the sector and issues policy guidelines for fisheries development and management. It also provides technical and financial assistance for fisheries development and management to

various States/UTs. The financial assistance is over and above the budgetary support provided to the states by the Planning Commission.

To promote export of fish and fish products, the Government of India established the Marine Export Development Authority (MPEDA) under the Ministry of Commerce and Industry in 1972. While the processing aspect fall under the Ministry of Food Processing, the control of marine biodiversity and marine pollution falls under the jurisdiction of Ministry of Environment and Forests and the Ministry of Earth Sciences. Table 13 give the detailed institutional structure for fisheries management in India.

Table 13. Institutional set up for fisheries management in India

Item	Agency / Ministry / Department
Deep Sea Fishing (List I) Survey and assessment of fisheries resources Research Training and extension Aquaculture Development	Ministry of Agriculture/Department of Animal Husbandry, Dairying and Fisheries/Indian Council of Agricultural Research Fishery Survey of India
Monitoring of fishing by foreign vessels (List I) Prevention of marine pollution by ships Protection of endangered species (Wildlife Protection Act, 1972)	Ministry of Defence/Coast Guard
Fish processing Processing Units	Ministry of Food Processing Industries/Ministry of Commerce and Industries Marine Products Export Development Authority (MPEDA) National Fisheries Development Board (NFDB)
Seafood exports (List I) Quality control	Ministry of Commerce and Industry – MPEDA Export Inspection Council
Law of the Sea negotiations (List I)	Ministry of External Affairs
Potential fishing zones Monitoring ocean pollution	Ministry of Earth Sciences
Fishing vessel industry (List I) Major fishing ports (List I) Minor fishing ports (list II)	Ministry of Shipping, Road Transport and Highways / Ministry of Agriculture, State Governments
Aquaculture in inland and territorial waters (List II) Sustainable development of coastal aquaculture (Coastal Aquaculture Authority Act, 2005) Fisheries in territorial waters (List II)	State Governments/Department of Fisheries/NFDB/ Coastal Aquaculture Authority
Protection of marine biodiversity (List III) ¹⁴³ Protection of coastal habitats (List III) Focal point for Ramsar, Convention on International Trade in Endangered Species (CITES), Convention on Migratory Species (CMS) and CBD Conventions (List III)	Ministry of Environment and Forests (MoEF)
Infrastructure	Ministry of Agriculture/Ministry of Commerce and Industries – MPEDA/NFDB

(Source: Yadava, 2008)

¹⁴³ Concurrent List

2.3.3.2. Role of the State Governments: The DoF in the State/UT Governments are responsible for fisheries development and management in their respective jurisdictions. The principal objectives of the DoF are planning and development of infrastructure facilities for landing and berthing of fishing craft, creating suitable marketing facilities, implementation of various fisheries development programmes viz., channelling financial assistance for purchase of fishing implements, implementation of socio-economic programmes and interactions with the Government of India and other agencies for technical and financial assistance.

2.3.3.3. The National Fisheries Development Board (NFDB): In view of optimal utilization of the fisheries resources in the country, the Government of India constituted the NFDB in August 2006. Keeping in view the multifarious requirements of the fisheries sector in the country, the Ministry of Agriculture considered the need of a committed body like NFDB with adequate resources to achieve the desired results. The Ministry also felt that an autonomous agency like NFDB would have the facility to practice effective flexibility in implementation of programmes and schemes, which is a necessity for a diverse country like India.

India may implement IPOAs through the national fisheries management frameworks. The mandate and authority may be transparent to implement the fisheries legislations and policies. Institutional structure may be framed according to the requirements to develop NPOAs to implement IPOAs. Central and State Governments may implement the NPOAs in a time bound manner. The Ministries/Departments in Central and State Governments, NGOs, stakeholders and fishermen may show much emphasis on time bound implementation of NPOAs.

The scope of fisheries laws and policies available to India at the international, regional and national levels as described in this Chapter. The benefits can be obtained through active participation and cooperation in international legal, institutional and political frameworks such as UNCLOS, UNFSA, CCRF, FAO Compliance Agreement, IPOAs, Technical Cooperation Programs, Agenda 21 and WSSD are explained along with the importance of regional frameworks such as RFMO/As, environmental organizations and political organizations. The advantages

may get being an active member of RFMOS/As such as IOTC, APFIC, BOBP-IGO; environmental organizations such as BOBLME, SACEP, CORDIO, WWF, IOMAC; political organizations such as IOR-ARC, SAARC, ASEAN, BIMSTEC and GEF. The role of fisheries management frameworks at the national level such as Central/State Governments and NFDB are also discussed in this chapter. In order to obtain food security in India, fish stock depletion may be reduced through management and conservation measures. Based on the above, conclusion and recommendations for sustainable fisheries management are proposed in Chapter 3.

Chapter 3. CONCLUSION AND RECOMMENDATIONS FOR SUSTAINABLE FISHERIES MANAGEMENT

The fisheries sector in India is set in a highly diversified social, cultural and geographical environment. The diversity is amply evident in the use of technology, making fisheries management a challenging task. Rapid modernization of the sector and emergence of distant-water fishing has led the Government to intensify its involvement in fisheries management, which has also led to increasing transaction costs on activities such as conflict resolution, MCS and safety at sea, especially of small fishers. In terms of achieving management goals, India has been successful in modernising the fishing sector and, to a large extent, especially the aquaculture sector. Fish production has increased manifold, both in inland and marine capture fisheries, and new fishing grounds are now being harvested. Aquaculture has been the main contributor to the increased production in the last one decade. The country has also emerged as an important exporter in international fish trade. Since, increasing production and export earnings were early goals of the fisheries policy makers, it can be inferred that such policies have been quite successful.

However, there is a big question mark on the sustainability of both capture and culture fisheries in India. Marine capture fisheries are riddled with the issues of open access and over fishing. The fishery managers have also failed to pull out the traditional and small-scale fishers out of the poverty trap, and the threat to livelihoods is gradually increasing in many fishing communities along the coastline. Management is largely top-down, although a participatory approach to management is now being more overtly discussed. The challenge, therefore, lies not only in optimal utilization of the resources but also in adopting co-management approaches which can increase the role of fishers and other stakeholders in the day-to-day management of the fisheries.

The pace of economic development in India's coastal belt is not commensurate with other region and the overall socio-economic status of fishermen is comparatively lower than other backward sectors of Indian economy. Over-capitalization of the small-scale mechanized sector and marginalization of artisanal fishermen, low per capita earning, lack of alternate and supplementary job

opportunities, seasonal migration and absence of mobility of labour to other sectors and high rate of illiteracy and indebtedness are some of the major problems faced by the huge population depending on the fisheries sector. The multi-species, open access marine fishery further aggravates the problem and also creates conflicts among the fishermen over the area of operation of different categories of fishing vessels and in sharing of the benefits. A comprehensive long-term policy for fisheries development in terms of resource exploration and exploitation, conservation and regulation, leasing and application of rent on resource utilization, domestic and export marketing, mariculture and coastal aquaculture activities and human resource utilization and management need to be evolved and implemented in a phased manner for the balanced and sustainable development of marine fishery sector of the country.

The exercise of applying precaution to natural resource management needs to be undertaken against a background of value judgements as to the bounds of ecological acceptability and the socio-economic costs that are justifiably incurred in securing a sustainable level of exploitation. Over-precaution will benefit fish stocks and ecosystems at disproportionate cost to fishers, communities and consumers, whereas under precaution will have an unacceptable ecological cost. Precaution should be applied in fisheries in a way that responds to uncertainties through adaptive management, as suggested by the ecosystem approach. The use of precaution in stock recovery plans should be seen as an initial stage in an iterative approach that involves applying a sequence of measures, monitoring their effectiveness and refining the successive precautionary responses accordingly (Howarth, 2008).

Success strategies may include: (1) encouraging collaborations, (2) utilizing multidisciplinary approaches, and (3) identifying common priorities among constituents (McFadden and Barnes, 2009).

The MZI (Regulation of Fishing by Foreign Vessels) Act, 1981 needs to be amended so as to take into account the CCRF and other legal instruments. India is yet to accede to the 1993 Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas

(Compliance Agreement). Marine fisheries management for fishery resources in the EEZ of India including depleted stocks may be formulated based on legal instruments, CCRF, including a NPOA for fishing capacity, sharks, sea birds and IUU fishing. Fisheries conservation models developed during the study may be useful for implementation of various schemes and policies for sustainable development of marine fisheries in India.

This chapter illustrates the importance of the ratification and implementation of international instruments, implementation of the regional instruments, national fisheries law and regulation reformation and the potential approaches for sustainable management and recommended measures.

3.1. The ratification and implementation of International instruments

International cooperation remains a critical component not only for enhancing maritime security and safety but also the sustainable use of marine resources and rational utilization of the oceans and seas. India may ratify and effectively implement fishery instruments, including the UNCLOS, the 1995 Fish Stocks Agreement, The FAO Compliance Agreements and the 1995 CCRF.

a) The UNCLOS

The UNCLOS is one of the most comprehensive international treaties and often called Constitution of the Ocean. It provides the legal framework and basis for the other international agreements. Access to surplus stock is never based on “free access”, but takes the form of joint venture fisheries or licensed fisheries. It is necessary for sustainable management of fisheries in India. The UNCLOS provides comprehensive framework for marine conservation that coastal States are specifically required to conserve living resources in their EEZs. In addition, the UNCLOS promotes scientific research and protects the right to conduct it. India may effectively implement the UNCLOS provisions.

b) The 1995 the United Nations Convention Agreement on Straddling fish Stocks and Highly Migratory Fish Stocks

The UNCLOS established the general framework for high sea fishing rights, but did not codify specific operational provisions. A more detailed management

regime for straddling fish stocks and highly migratory fish stocks was thus developed to through the UNFSA (Juda, 2002). The UNFSA encourages States to cooperate to ensure: conservation, promote optimum utilization of straddling and highly migratory fish stocks both within and beyond the EEZ and emphasize the importance of regional fishery management bodies. India may be fully involved in regional fishery organizations and implement the 1995 the United Nations Convention Agreement on Straddling fish Stocks and Highly Migratory Fish Stocks.

c) FAO Compliance Agreement

India is yet to accede to the 1993 Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (Compliance Agreement). The FAO Compliance Agreement has both the principle of practices and punishments for States which violate applicable rules, most importantly of all, a State is not allowed to use its flag unless it can effectively control the fishing activities of their vessels. Thus, the FAO Compliance Agreement is classified as one of hard law (Juda, 2002). If India accede and implement the Agreement's provisions, it would be in a stronger position to develop sustainable and profitable high seas fisheries.

d) The 1995 Code of Conduct for Responsible Fisheries (CCRF)

The CCRF provides guidelines for fisheries management that will maintain the sustainability of the resources within a comprehensive and balance system under the concept of responsible fishing which is applicable globally. The implementation of the CCRF with other States in the area of technical assistance, technology transfer, training and scientific research, and data exchange¹⁴⁴ will fulfil and enhance India's ability to implement effectively instruments for fisheries management in India. The CCRF is voluntary which mean it will be effective in long term when accepted and practiced by stakeholders. However the code is a global standard application, it should be adapted to implement in India for the most effective conservation and management measures for fisheries.

¹⁴⁴ FAO, CCRF, art. 5: Special Requirement for Developing Countries

3.2. Implementation of the regional instruments

India can cooperate with the States of the regions as well as through appropriate regional organizations. The nature of cooperation may be scientific research and training, sampling programmes and so on. There are lessons to learn from the experience of outside States in the region that have similar problems. Some of the measures taken by other States might be useful to improve and adapt for implementation in India. The BIMSTEC, BOBP-IGO, BOBLME, CCAMLR, IOR-ARC, IOTC, INFOFISH, SAARC are all regional organizations that play an important role in the implementation of effective guidelines for responsible fisheries by considering regional specificities of fisheries structure, ecosystem, cultural, social, economic factors, as well as other issues of importance in the region. Being a member of IOTC, India can be fully involved in tuna resources management. India can be assisted in term of research and development activities in respect of the tuna stocks and fisheries, and such other activities, including the transfer of technology, training and enhancement.¹⁴⁵ International cooperation fosters closer relationships and reduces disputes between India and other coastal States.

3.3. National fisheries related laws and regulations reformation

The Territorial Sea, Continental Shelf, Exclusive Economic Zone and other Maritime Zone Acts, 1976; the Marine Products Export Development Authority Act, 1972; the Indian Coast Guard Act, 1978; the Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, 1981; the Environment Protection Act, 1986; the Coastal Aquaculture Authority Act, 2005; the Merchant Shipping Act, 1956 and the Wildlife Protection Act, 1973 are the important instruments for the achievement of sustainable management. These laws and regulations may be updated with respect to international principles for responsible fisheries, marine resources management and compatible with international law and agreements address many of the current fisheries concerns. The laws and regulations may introduce participatory and consultative processes for stakeholders into fisheries management. The challenge

¹⁴⁵ IOTC, Agreement for the Establishment of the Indian Ocean Tuna Commission: art V. 2-2 pp.

for India may be implementing and supporting full enforcement of these laws and regulations.

3.4. The potential approaches for sustainable management and recommended measures

Due to the diversity of fisheries in terms of resources, local conditions and the capacity of the local Governments and stakeholders, it is difficult to successfully promote a single approach to fisheries management. The priority for Indian fisheries management reform is thus to strengthen and develop legally enforceable decentralized management coupled with appropriate rights-based incentives to the fishing community. This may be accompanied by the strengthening of collection of data on gear and boats so as to have a clear understanding of the fisheries sector and its capacity. India may promote the participation of local communities and the public in the development of the fisheries. Recommended potential approaches for sustainable management are described below:

3.4.1. Centralized to decentralized management

The management of coastal fisheries in India is a centralized system. DoF is the sole agency with the mandate for the management of coastal fisheries. The Central management authorities delegate only very limited functions and responsibilities to the local level. Thus, DoF has difficulty in obtaining positive results in coastal fishery resources conservation and management and the fishers do not accept or have negative attitudes regarding fisheries measures established by DoF.

The United Nations defined decentralization as

the transfer of authority on a geographic basis whether by de-concentration (i.e. delegation) of administrative authority to field units of the same department or level of Government or by the political devolution of authority to local Government units or special statutory bodies.¹⁴⁶

The decentralization of fisheries management is a generic term that describes the delegation of selected fisheries management responsibilities and functions to local Government, community organizations or institutions (Wongsawang, 2003).

¹⁴⁶ United Nations, *Decentralization for national and local development*. ST/TAO/M/19, United Nations, New York, 1962. 246 p.

The decentralization process can not be effective unless human resources are present at the Central and local levels including stakeholders (Wongsawang, 2003). India may have to prepare and develop human resources capacity, especially the local community and institutions in order to take up additional responsibilities and strengthen their capacity for decentralization. Promotion and training for decentralization may be provided to both the Government and fishers, starting with each level simultaneously and continuing.

3.4.1.1. Licensing of fishing boats

At present, the respective coastal State/UT Government licenses the mechanized fishing vessels alone. The system of licensing needs to be extended to motorized and non-motorized craft as well. Licensing will be helpful to maintain an inventory of all categories of fishing vessels. New vessel may be permitted to be acquired only as a replacement of a vessel of equal size and capacity. The priority of licensing should be shifted from a means of mere revenue earning to a system of regulating the number and type of fishing vessels. Licensing will also enable better implementation of sea safety norms in the small-scale fishing vessels.

Another management option that has been considered for this area is to encourage small trawlers to diversify into fishing activities that can be practiced further offshore, in order to reduce overcrowding in coastal waters and reduce the pressure on the fish stocks. There is a need to provide support to this category as also technical information on the availability of resources or the best fishing methods with which to target them.

3.4.1.2. Enforcement through monitoring, control and surveillance (MCS)

Some of the main controls and instruments that could be used in implementing MCS in marine fisheries in India are as follows:

- a) Review of existing marine fisheries management programmes and analysis of the fisheries in the coastal waters and the EEZ (this will *inter alia* include the registration of fishing vessels, number and category of fishing craft and gear, fishing harbours/fishing landing sites, boat building yards etc.).

- b) Review of the existing fishing vessel licensing and registration procedures and practices, fisheries legislation and other concerned Ministries/Departments (e.g. Mercantile Marine Department (MMD)), which have a bearing on the sustainability of the fisheries resources.
- c) Assessment of the MCS capacity and identification of institutional development requirements within the Ministry of Agriculture and the Department of Fisheries of the coastal States/UTs and if necessary, other concerned sister Departments (e.g. MMD).

It is expected that implementation of the MCS system will not only enhance fisheries conservation and management but will also lead to establishment of multiple channels of communication and improved safety for fishing vessels and crew. To effectively manage the vast fisheries resource and also the fishing fleet, a mechanism for MCS needs to be in place. The MCS should also incorporate the requirements of a Vessel Monitoring System (VMS), especially aimed at the fishing vessels above 20 m OAL.

3.4.1.3. Policy development and operational management

It is seen that policy instruments can be useful management tools to restrain/optimize fishing effort as well as to provide source of revenue to the Government, which can be ploughed back to the fisheries sector to supplement the meagre share it often receives from Plan allocations. To sustain marine fisheries, the Government of India would have to introduce a set of fiscal reforms in the fisheries sector to supplement the meagre share it often receives from Plan allocations. To sustain marine fisheries, the Government of India would have to introduce a set of fiscal reforms in the fisheries sector, which *inter alia* should include a system of limiting access and appropriate fee for the access.

3.4.2. Rights-based fisheries management strategy

Rights based fishery has been defined as “a fisheries in which the right to fish or use fisheries resources is granted to resources user and regulated by the competent authority”. In return, the holder of the fishing rights has the obligation to comply with rules and regulations of the right based management system. Under this

system, fisheries input, such as number of fishing vessel or fishers, the type of fishing gear, the fishing season and fishing grounds, will be effectively controlled as locally agreed in a transparent manner and with full stakeholders participation (Wongsawang, 2003). This participatory approach, with local stakeholder's involvement is the key rights based fisheries. And to effectively define and allocate fishing rights, right-based fishery management regimes must be based on accurate information for each fishery.

To implement rights based fisheries management strategy in India, all fishing boats may be registered where they are intended to operate. All types of fishing gears must also be registered for the fishing ground in which they are intended to be used. Vessel markings may be imposed so that fishing boats are easily identifiable at a distance. Commercial fishing boats may be required to install a tracking device like Vessel Monitoring System (VMS). The coastal radio stations may also be used to monitor and assist fishing boats. This approach may be an effective instrument to replace open access in India. A patrol service to inspect illegal fishing in all areas, participation of stakeholders may be encouraged to reduce the costs for inspections. This may stop the movement of the vessels between fishing grounds thereby contributing to the resolution of conflict between fishers.

3.4.2.1. Threats to coastal communities

Marine policymakers are facing increasing calls to consider the resilience of communities that rely on coastal and marine ecosystem goods and services, and the resilience of natural systems themselves. These calls are in response to increasing threats to coastal communities from external factors such as coastal hazards, possibly associated with climate change, reductions in natural capital often caused by over-fishing and invasive species, and drivers that act to change local and regional economic conditions leading to changes in employment and inequality. There is a lack of consensus-based definitions and performance measures for assessing resilience. These factors, along with other barriers, will need to be overcome before effective resilience-based management can be implemented (Gibbs, 2009). Therefore there may be consensus-based definitions and

performance measures for assessing resilience before implementing resilience-based management.

3.4.2.2. Rights to fisheries and implementation of policy instruments

Some of the important interdisciplinary fixes or solutions to diverse problems observed in fisheries can complement each other. This can be achieved through methodical allocation of the rights pertaining to fisheries and simultaneous implementation of policy instruments to correct for market failures and equity concerns (Brady and Waldo, 2009). So fishermen rights may be protected and policy instruments to correct market failures and equity concerns may be implemented.

3.4.2.3. Social justice with resource management

A combination of measures and prolonged cooperation between Governmental and non-Governmental parties is called for. It is needed to address social justice issues in conjunction with resource management (Bavinck *et al.*, 2008). During the resource management social justice issues are not addressed properly. So participation from fishermen for resource management is lacking. In order to get the participation from fishermen, social justice issues are to be addressed with resource management.

3.4.3. Ecosystem-based management strategy

The Ecosystem-based management has been defined by the FAO: An ecosystem approach to fisheries strives to balance diverse societal objectives, by taking into account the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries (FAO, 2003). Ecosystem based management is concerned with the processes of change within the living system (Olsen *et al.*, 2006). Ecosystem based management therefore is designed and executed as an adaptive, learning based process that applies the principle of the scientific method to the processes of management (Olsen *et al.*, 2006).

The current confusion concerning the definition of the ecosystem approach is creating several problems such as pure misunderstanding, distrust, misperception and human aspects (Morishita, 2008). As controversy is often generated around scientific uncertainties and the validity of the claims such as the magnitude impacts of bycatch, transparency and validity are essential elements of good science for ecosystem management (Morishita, 2008).

Participation of those who will be regulated by the management measures in the processes of identification of issues, the design of measures and their implementation are prerequisites for the successful application of the ecosystem approach in fisheries. The establishment of specific management goals is indispensable for creating common understanding among stakeholders about the targets of ecosystem approach-based management measures, facilitating introduction of the ecosystem approach, assessing the effectiveness of the management measures and when necessary, modifying and improving the management measures (Morishita, 2008). Therefore a participatory ecosystem based fishery management may be implemented in India at the earliest. After implementation, depending on the effectiveness of the system, the management measures may be modified and improved, if required.

3.4.3.1. Management of ocean fishery resources

According to Pontecorvo (2008) attention also needs to be given to (1) the transitory nature of the ocean environment, (2) the natural variation in fish stocks, (3) the role of the fishing industry and market forces in fishery management, and (4) the failure to focus on what it is we most need from the oceans, in what form we need it, and at what price. The fishing industry tends to be competitive both domestically (either as the result of market forces or a government directive to achieve catch quotas) and internationally. As a competitive industry, if it observes fish in the sea, regardless of the actual conditions of the stock, the industry struggles to increase catch quotas to preserve its current income and financial solvency. Today, the situation created by the increase in world income, population, the technology of catching fish and the development of new end uses for the resources produced by

the oceans has created a set of options that require a rethinking of how to manage ocean fishery resources. Here are four possibilities:

- a) Fishery managers can continue on the present course investing, at the margin, in improved fishery science and fishery statistics to reduce the uncertainty surrounding catch quotas, and hoping that such biological and economic devices as sanctuary areas, ecosystems based fishery management and Individual Transferable Quotas (ITQs) will constrain the industry. However, given the structure and behaviour of the industry and the record of 150 years of scientific fisheries management, the complex natural variability in the ocean environment and in fish stocks, one cannot be sanguine that this incremental approach will maintain or restore the *status quo ante* in commercial ocean fishing.
- b) Society can implement a draconian solution by reducing the fishing industry world wide to one third of its present size and continue to reduce it further as the productivity of capital and labour in the industry increases (Pontecorvo and Schrank, 2001). This solution would obviously create social, economic and political problems for the industry, nations, consumers, and coastal societies. It would also result in significant underfishing, i.e., a significant fraction of the fish stock which could be safely caught would be left in the ocean. Given environmental change in ocean ecosystems, it still might not maintain the *status quo*.
- c) Based on human nutrition and existing trends in the fishing industry, the industry could move to engage in more fishing for protein (fish oil and fishmeal) regardless of species. Recent market pressure from the increased demand for fishmeal and the recognition of the importance of fish oil in human nutrition has moved the fishing industry towards this solution.
- d) Ocean policy could come to regard as a huge wheat field or rice paddy and, as has been suggested by Marra (2005), seek to engage in large-scale extensive deep ocean aquaculture.

There may be improved fishery science and fishery statistics to reduce the uncertainty surrounding catch quotas, reduction of fishing industry, movement of fishing industry to engage in more fishing for protein (fish oil and fishmeal) regardless of species and large-scale deep ocean aquaculture for the management of ocean fishery resources.

3.4.3.2. Fisheries management vs. fisheries exploitation

The issues pertaining to marine fisheries in India are not unique to the country, but common to the most tropical developing countries and need to be addressed through proper policy support. Some of them directly aim at food security, environmental sustainability, economy and livelihood of the marginal fisherfolk. The State Governments as well as the Central Government through different Ministries, which unfortunately play varied roles, govern the fisheries sector in India. Therefore, the need for an integrated national policy on marine fisheries becomes immediately obvious, particularly in the present context of over-exploitation in the shallow coastal water, under utilization in the off-shore/oceanic zone, sectoral conflicts, economic waste, under employment and protein food contribution to the nutritional basket of the country.

Recent trends in both artisanal and small-scale fisheries in the country have been disturbing and indicate the need for implementation of sound management programmes. In fact, such management for the coastal marine fisheries is long overdue. The catches and earnings of fisherfolk have been declining. Resource scarcity and the dearth of new income opportunities have combined to make life difficult for small-scale fisherfolk. In the trawl fishery, on the other hand, average sizes of species have been falling and the species composition is changing, indicating the need for a pragmatic approach and good management. To sustain this production and to ensure that the major fisheries do not suffer any irreparable damage, improved management measures, based on community participatory approach are needed without further loss of time.

3.4.3.3. Deep-sea fishing

Despite the tremendous growth in India's marine fisheries during the past 50 years and declaration of the EEZ in 1977, there has never been commercial deep-sea fishing worth mentioning. The Government of India chartered foreign vessels in the early 1980s and entered into joint venture arrangements with large industrial houses in the early 1990s for exploiting the deep-sea fisheries. The schemes were terminated a few years after the commencement as the local fishers stiffly resisted them. The fishable potential in unit area is considerably low in depths beyond 50 m (0.9 t km²) compared to that in the inshore waters (12.2 t km²). The deep-sea fishing requires larger vessels (OAL >17 m) with sophisticated fishing technologies involving high establishment and maintenance costs. It is estimated that 0.5 mmt or about 40% of the unexploited stocks in the deep-sea are the tunas which undertake transoceanic migration. Realizing the nature of distribution of the resources in the EEZ as well as the high cost of exploiting them and the technology capability that is required, regional cooperation appears to be the most viable option for achieving the optimum potential benefits of the deep-sea.

3.4.3.4. Harnessing of offshore resource

Sustainable exploitation of offshore resources in the EEZ will have to be reconsidered in terms of not only the resources available, but also in terms of infrastructure. To avoid over-capitalization and ensure a cautious growth of the infrastructure and investments, a rationalized approach will be essential in determining the number and size of fishing vessels, their resource-specific gear as well as technology to be made available either indigenously or through foreign collaborations. The development of deep-sea fishery industry is of concern to the entire marine fishery sector because it would have considerable impact on the management of near-shore fisheries, shore-based infrastructure utilization and post-harvest activities, both for domestic marketing and export. Similarly, up-gradation of the small-mechanized sector should be given high priority to facilitate their entry into the deep-sea sector.

In the absence of compliance by the fishermen to operate in the areas allotted to them, encroachment by the larger mechanized vessels in the areas demarcated for the artisanal craft continues. The Central Government has now proposed to introduce a vessel monitoring system (VMS), which is expected to resolve the problem. Similarly, the Central Government should also consider providing a fresh model bill to the States/UTs to enable them to revive their Marine Fishing Regulation Act (MFRA) on the basis of their present requirements and also global initiative to which India is a signatory.

3.4.3.5. Responsible fishing

The obvious need for sustaining marine fisheries production is to regularize the fishing effort, particularly in the inshore, traditional fishing grounds. At present, there is no effective licensing system to limit the entry of new or existing fishing vessels into the coastal fisheries of India. There is no licensing of the artisanal craft and consequently, the concept of responsible fishing is totally lacking. Licensing and responsible fishing could be extended to cover the entire fishing industry, including the artisanal sector to help monitor fishing effort and optimization of inputs. Implementation of these measures demands a stakeholder endorsed policy, complimentary rules and regulations and a strong political will.

3.4.3.6. Fisheries exports

The future of fisheries export would be influenced by the adoption of environment-friendly fishing practices, ecolabelling and consistent compliance with food safety measures (HACCP and Sanitary and Phyto-Sanitary (SPS) standards). Cost of implementation of these measures has shown scale bias that has worked against smaller operators (Yadava, 2008). This requires Government policies and support system to be designed to minimize the cost of compliance with international standards to make smaller operators viable and export-competitive. Steps also need to be taken to devise appropriate institutional mechanisms to bring scattered small-producers and processors under a network to enable them to participate in the emerging scenario to reap the benefits of expanding global fish trade.

3.4.3.7. Diversification and composite farm practices

There is scope for diversification and composite farm practices for the overall growth of the agriculture sector (Hand Book on Fisheries Statistics, 2006). Aquaculture with species diversification and farming different niche utilizing fishes together without competing each other for food can enhance fish production.

3.4.3.8. Fiscal reforms and policy trends in environmental management and sustainable development

The complexity of factors involved in the regulation of fisheries, domestic and international, is often underestimated. Fishing is still largely an activity to harvest wild stocks of highly ambulatory animals. These animals cannot be fenced in a limited area or with marked ownership. This makes fisheries of open water a “common property resource” with its related problems. Therefore, regulatory measures need to be blended with other environmental protection and fiscal measures such as, a) limited access, b) leasing and auctioning, including resource rent, c) closed seasons and closed areas, d) licensing of gear, e) gear restrictions, and f) other fiscal reforms.

It is seen that fiscal instruments can be a useful management tool to restrain/optimize fishing effort as well a source of revenue to the Government, which can be ploughed back to the fisheries sector to supplement the meager share it often receives from the Plan allocations. To sustain the marine fisheries, the Government of India would have to introduce a set of fiscal reforms in the fisheries sector, which *inter alia* should include a system of limiting access and charging fee for the access.

3.4.3.9. Ecosystem-based management

To promote sustainability via ecosystem-based management, we need to identify vital relationships in a marine ecosystem, and then determine a range of policy options that protect the infrastructure of relationships so that adaptive capacity is maintained for the future-both of the ecosystem and the economy dependent on it. The first step is to understand that the history of the system and the relationships within it today are inextricable. With information gleaned from historical

reconstruction, we must then employ our best remote sensing tools, which include ensembles of mathematical models that integrate the wealth of observational information arriving from diverse sources. Each model type has a certain set of assumptions – a worldview – which may be more or less representative of the ecosystem interactions important to management allows us to assemble analytical tools which reflect wider range of outcomes important to management. Modelling used to its full potential is one of the best methods for testing a range of policy options against the known patterns and processes, the unknown relationships, and the unknowable future, in a marine ecosystem management context where decision making must be transparent to a diversity of stakeholders, and must happen on an annual, if not daily, basis (Gaichas, 2008). Model developed during this study may be utilised for marine ecosystem management and transparency may be maintained during decision making and it may be on annual basis.

3.4.3.10. Large marine ecosystem (LME) concept and approach

The large marine ecosystem (LME) concept and approach has had a global impact on marine ecosystem based management. The LME approach provides a framework for assessing and monitoring LMEs and is based on five modules: productivity, fish and fisheries, pollution and ecosystem health, socioeconomics and governance. The LME approach is also being used to structure interventions to bring about change. It is more appropriate to approach governance interventions at the LME scale through multi-level governance policy cycles (Mahon, *et al.*, 2009). The LME approach may be utilized in India to assess and monitor productivity, fish and fisheries, pollution and ecosystem health, socioeconomics and governance through multi-level governance policy cycles.

3.4.3.11. Marine Protected Areas (MPAs)

It is of paramount importance to underscore the fact that any protected area may be established to meet objectives which are consistent with the local or national needs and complexities and to promote better understanding and communication among those involved in conservation.

It is proposed that the International Organization for Standardization (ISO)¹⁴⁷ is a global leader in both quality (ISO 9000) and environmental management standards (ISO 14000), the application of the ISO 14001 standard for environmental management systems to MPAs can provide a flexible and adaptive management system which can be integrated with existing practices as a standardized quality management process designed for the continuous improvement of MPAs management. Within the ISO 14000 series of environmental management standards, “ISO 14001: Environmental Management Systems – Specifications and Guidance for Use” (ISO, 2004), is the main specifications document that outlines the standard requirements for the development of an Environmental Management System (EMS). An EMS is a documented process for a continual cycle of planning, implementing, reviewing and improving the procedures and actions that an organization undertakes to meet its environmental goals and objectives (McKinley and White, 1996). Built around a simple “Plan-Do-Check-Act” management cycle, an ISO 14001 EMS is designed to lead to the continual improvement of the environmental management and performance of any organization (Thompson *et al.*, 2008).

Aquaculture and fisheries can also be environmentally destructive and often contentious. Growing consumer demand for environmentally responsible fisheries products has been pushing these industries toward international certification standards for sustainably reared and harvested seafood (Cuthbert, 1999; Frankic and Hershner, 2003; Gardiner and Viswanathan, 2004). Due to the generic nature of

¹⁴⁷ International Organization for Standardization (ISO) is a non-governmental organization based in Switzerland, ISO is arguably the most representative and influential standard-setting organization in the world (Rotherham, 2001) and is considered the leading developer of international product and process standards (ISO, 2007). Composed of a federation of the national standards bodies from 157 countries, ISO's global network identifies what international standards business, government, and society require and develops them through a transparent process of extensive discussion, negotiation and international consensus (ISO, 2006, 2007). To date, ISO has developed over 16,000 product and process standards (ISO, 2007) and has published nearly 85% of all international standards (Rotherham, 2001). Of the most widely known and popular standards, the ISO 9000 series has become the international reference for quality management requirements in business, while ISO 14000 and its family of standards provide guidance for environmental management systems (ISO, 2006). India is one of ISO's member bodies. A *member body* of ISO is the national body "most representative of standardization in its country". Only one such body for each country is accepted for membership of ISO. Member bodies are entitled to participate and exercise full voting rights on any technical committee and policy committee of ISO.

ISO 14001, it has been advocated as an effective means of managing a wide range of maritime activities, including aquaculture, fisheries management and the management of marine ecosystems. Applying the standard to the management of such marine activities can help to avoid conflicts and achieve better stakeholder relationships (Cuthbert, 1999; vonZharen, 1999).

The aquaculture industry has embraced EMSs and ISO 14001 certification as a powerful tool for producers wishing to enhance their environmental performance and demonstrate sound environmental performance and management, while ensuring food safety and quality (Cuthbert, 1999; Frankic and Hershner, 2003). ISO 14001 EMSs have assisted in lowering the potential for environmental impacts in aquaculture operations while improving stakeholder communication, and ensuring compliance with the complex, and rapidly evolving legislation and regulations of the industry (Cuthbert, 1999).

The core principles of ISO 14001 may also have potential for use in fisheries management and for addressing the protection of marine species (vonZharen, 1999). Commercial fisheries have already begun to adopt standards for certifying the sustainable management of a fishery. The Marine Stewardship Council (MSC) is attempting to improve the sustainability of fisheries through the development of eco-labelling standards (Peacey, 2000). Like ISO 14001, the MSC Principles and Criteria are established standards that describe a well-managed and sustainable fishery. Through independent third-party certifiers a fishery is assessed against the MSC Standard and, if certification is achieved, products from the fishery are eligible to use the MSC logo which demonstrates to consumers that the seafood they are buying comes from a sustainably managed fishery (vonZharen, 1999; Peacey, 2000; Gardiner and Viswanathan, 2004).

One of the first steps of the MPA management planning process is to clearly establish the broad goals and objectives of the MPA (Kenchington and Kelleher, 1995; Kelleher, 1999) and having them endorsed by the site manager or person(s) ultimately responsible for meeting these objectives (Salm *et al.*, 2000). Similarly, an ISO 14001 EMS requires that an organization develops an environmental policy which outlines “the overall intensions and direction of an organization related to its

environmental performance as formally expressed by top management”. The policy must also be “relevant to the nature, scale, and environmental impacts of the organization’s activities, products, and services” (ISO, 2004).

In the context of an MPA, the development of the environmental policy should take into account the specific legislation, regulations, and implementing decrees of the MPA, its purpose for being created, and the scope of the activities managed by the EMS. It should be adapted to consider the needs and operations of the managing agency (or agencies) and ideally be developed in collaboration with local stakeholders (Italian National Agency for New Technologies, Energy and Environment (ENEA), 2002). To be in compliance with the ISO 14001 standard, the policy statement must also include commitments to prevention of pollution (may include both physical and biological pollution), to ensure compliance with applicable legislation (including compliance by both MPA users and managers), and to continual improvement of the MPAs environment and its management. It must be endorsed by top management, documented, made operational, kept active, and communicated to the public (ISO, 2004). The support and commitment by top-management is of utmost importance and serves as the basis for developing and improving the EMS (Cascio, *et al.*, 1996). A standardized quality management process, international certification standards such as eco-labelling standards, EMSs and ISO certification may be implemented effectively for sustainably reared and harvested seafood aquaculture, fisheries management and the management of marine ecosystems to avoid conflicts and achieve better stakeholder relationships to enhance their environmental performance and demonstrate sound environmental performance and management, while ensuring food safety and quality.

3.4.3.12. Integrated Coastal Management (ICM)

As ICM is closely linked to policy making and the sources of marine policy in large part derive from marine scientific knowledge, it is inevitable that marine sciences and ICM link. The integration of scientific knowledge with policy decisions is hampered by the divide that exists between scientists and policy makers. Marine scientists are often frustrated that their ideas are difficult to get across to

policymakers. Instead of the position of leadership they seek, these scientists often end up playing a supporting role in the policy process (Rice, 2005).

What is lacking is social science and management knowledge crucial for communication between natural scientists and policymakers that ICM can provide. Linking social and natural scientists and practitioners will contribute to creating a holistic learning environment, setting the tone for how ICM will continue to advance. So far attempts have ended to lean towards either marine science or coastal management with a light treatment of the other. An important next step is to forge a more balanced integration by conducting research on the current practices of marine sciences in coastal management and coastal management in marine sciences. This will uncover the weakness and drawbacks of integration and offer hints at revisions. Conducting similar and innovative studies unique to the marine field is necessary to facilitate integration of marine sciences and coastal management (Cheong, 2008).

The process of ICM brings together environmental, social, economic and political considerations that provide a coordinated management approach in the coastal areas (Kay and Alder, 2005). These four considerations are recognized to form the basis for effective decision making in the area.

This process is essentially designed to overcome the fragmentation inherent in the sectoral management approach and the splits in Government jurisdictions by ensuring that decisions in all sectors and at all levels of Government are harmonized and are consistent with the country's coastal policies. As one of the key elements in the ICM approach is the design of institutional processes to accomplish this harmonization in a more politically acceptable way, this aspect will in turn help to minimize chances of conflicts arising among coastal and marine uses/users and in case they do, it will provide an avenue for addressing them amicably.

ICM recognizes the distinctive character of the coastal area as a valuable resource and the importance of conserving it for current and future generations. The process is generally developed in response to a number of coastal management issues that cannot be addressed fully by single subject plans. ICM aims to achieve sustainable development of coastal and marine areas, to reduce vulnerability of coastal areas and their inhabitants to natural hazards and to maintain essential

ecological processes, life support systems and biological diversity in coastal and marine areas. Other key functions of ICM include the facilitation of proper planning of the uses of the coastal and marine areas, promotion of appropriate uses of coastal and marine areas and to help in ensuring public safety in the coastal and marine area typically susceptible to natural and man made hazards. ICM is also known to be multi purpose oriented as it analyses the implications of development, conflicting uses and interrelationships among physical processes and human activities while promoting linkages and harmonization between sectoral coastal and marine activities.

3.4.3.13. Temporal and spatial fishing restrictions

Given the fisheries situation that exists in India, temporal restrictions i.e. seasonal closure of fishing appears to be an option, which could be effectively implemented. To prevent the conflicts between artisanal and mechanized fishing vessels in sharing the inshore waters, the maritime State Governments have banned the mechanized vessels from operating in the inshore areas (for a distance of 5 to 10 km from the shore). However, the regulations relating to the demarcation of fishing areas have inherent weaknesses. First, there is no surveillance to monitor the areas of different types of craft and hence encroachment by the mechanized vessels in the areas demarcated for the artisanal craft continues for more than a decade after the promulgation of the Acts. Second, demarcation of the fishing areas is meant for protection of the interest of the artisanal fishers. If the Acts were strictly implemented, the fishers of the mechanized craft would be at a disadvantage, as they would be denied the opportunity to exploit the richer fishing grounds in the inshore water. It may, therefore, be necessary to reconsider the present regulations based on the feedback from various sectors so that all the stakeholders are benefited.

3.4.3.14. Research and information sharing

There is an urgent need to promote additional research and information sharing on new and emerging activities that impact the oceans. Deep seabed research is still largely the domain of selected developed countries. It is imperative

that there be an increased flow of scientific data and information and transfer of knowledge to developing countries so as to improve their understanding and knowledge of oceans and deep seas.

3.4.4. Community based fisheries management (CBFM) strategy

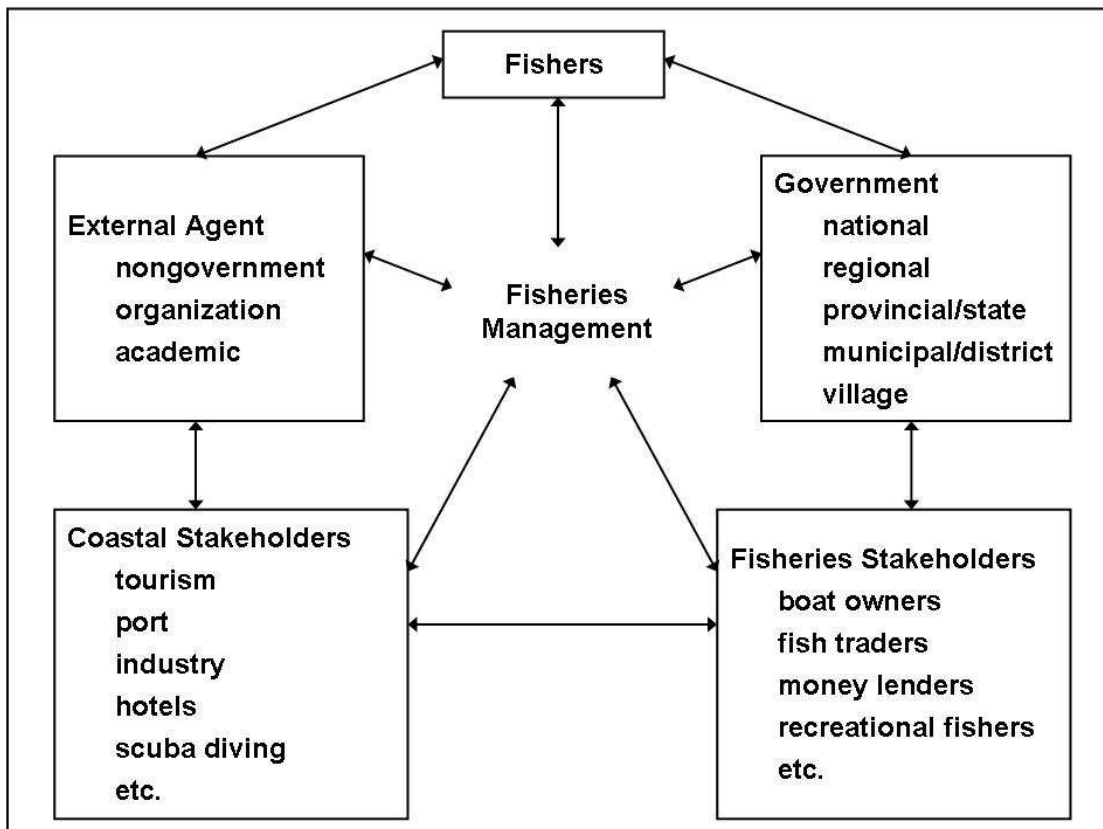
The CBFM is a system in which fishers and their communities exercise primary responsibility for stewardship and management, including taking part in decision making on all aspects of management, such as harvesting, access, compliance, research and marketing. Other features of CBFM include local control, a focus on the ecosystem rather than on specific species, power sharing, and a common interest in and responsibility for common resources (Waber and Ludicello, 2005). The CBFM strategy may be implemented in India to give responsibility to the fishers and their communities on fishery resources.

Participatory fishery research

True participatory fishery research, utilized in support of community-based management, can be a particularly powerful tool. It must deal early in the research process with power imbalances, and it should involve significant political engagement and empowerment through co-learning. This assessment of participatory research in coastal fisheries also has significant implications on social capital and on community-based resource management for a sustainable future (Wiber *et al.*, 2009).

3.4.5. Co-management strategy

Co-management can be defined as a partnership arrangement in which the fishers and Government share the responsibility and authority for the management of fisheries (Figure 12). Through consultation and negotiation the partners develop a formal agreement on their respective roles, responsibilities and management rights (Pomeroy, 2004).



(Source: Pomeroy, 2004).

Figure 12. Fisheries management is a partnership

In order to conserve the fish stock population from depletion for the food security in India, the ratification and implementation of international instruments such as UNCLOS, UNFSA, FAO Compliance Agreement, CCRF; implementation of the regional instruments and national fisheries related laws and regulations reformation are required. The potential approaches for sustainable management and recommended measures are centralized to decentralized management, transparent licensing of fishing boats, enforcement through MCS, policy development and operational management and rights-based fisheries management strategy. Threats to coastal communities are to be reduced by protecting rights to fisheries and implementation of policy instruments, social justice with resource management, ecosystem-based management strategy and management of ocean fishery resources. Sustainable fisheries exploitation in deep-sea, harnessing of offshore resource, high quality fisheries exports can be brought to reality by a better fisheries

management such as responsible fishing, diversification and composite farm practices, fiscal and policy reforms, ecosystem-based management, LME concept and approach, MPAs, ICM, temporal and spatial fishing restrictions, research and information sharing between institutes and international and regional organizations, CBFM strategy, participatory fishery research and co-management strategy.

Alternative approaches may be used as a basis for fisheries in India. The strategies may be adapted, adjusted or mixed together for the most appropriate in each area. For evaluating the integrated management regimes, it may contain the recovery of the fisheries resources either in terms of Catch Per Unit Effort (CPUE) or income of fishers and reduce the conflict among the resources user. It may be balancing between the utilization and economic need for fishing community and recruitment or the production of the sea at the sustainable level. In order to overcome the problems existing in fisheries and ensure sustainable fisheries, effective instruments may be harmoniously implemented all levels: global, regional, national and local. All measures may also respect the capacity of the fisheries resources. The success of sustainable fisheries management in India may be gainful not only for Indians but it also for the security and sustainability of food resources for human kind in the world.

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Annex 1: Indian Government institutions and other agencies participating in coastal and marine resources management

Institution	Main Coastal Management
Ministry of Rural Development	Coastal Planning and coordination of development
Ministry of Urban development	
Ministry of Earth Sciences (MoES) a) Integrated Coastal and Marine Area management (ICMAM)	
Ministry of Rural Development	
Ministry of Urban Development	
Revenue Departments in Indian States	
Ministry of Environment and Forests (MoEF)	Research on marine environment and resources, coordinating the various environmental management activities being undertaken by other lead agencies, conservation of biodiversity (biotopes) flora and fauna in protected areas and critical habitats and species in general, licensing, reforestation and policing use of forest products, coordination of environment policies
Forest and Wildlife Departments in Indian States	
Ministry of Agriculture I) Department of Animal Husbandry, Dairying and Fisheries (DADF) a) Central Institute of Fisheries Nautical and Engineering, Training (CIFNET) b) Central Institute of Coastal Engineering for Fishery (CICEF) c) Fishery Survey of India (FSI) d) National Institute of Fisheries Post Harvest Technology and Training (NIFPHTT) e) Coastal Aquaculture Authority f) National Fisheries development Board (NFDB) II) Department of Agricultural Research and Education (DARE) 1) Indian Council of Agricultural Research (ICAR) a) Central Institute of Fisheries Education (CIFE) b) Central Marine Fisheries Research Institute (CMFRI) c) Central Institute of Brackish water Aquaculture (CIBA) d) Central Inland Fisheries Research Institute (CIFRI) e) Central Institute of Fresh water Aquaculture (CIFA) f) Central Institute of fisheries Technology (CIFT) g) National Bureau of Fish genetic Resources (NBFGR) h) National Research Centre on Cold water Fisheries (NRCCF)	Research on marine environment and resources, fisheries licensing, monitoring and policing

Ministry of Earth Sciences (MoES) a) Centre for Marine Living Resources & Ecology (CMLRE) b) National Institute of Ocean Technology (NIOT) c) Indian National Centre for Ocean Information Services (INCOIS) d) National Centre for Medium Range Water Forecasting (NCFMRF) e) India Meteorological Department (IMD) f) Indian Institute of Tropical Meteorology (IITM)	
Ministry of Science and Technology a) National Institute of Oceanography (NIO)	
Ministry of Commerce and Industry a) Marine Products Export Development Authority (MPEDA)	
Fisheries Departments in Indian States	
Ministry of Defence I) Indian Navy II) Indian Coast Guard III) Indian Naval Hydrographic Department	Surveillance in territorial waters
Ministry of Water Resources a) Central Water and Power research Station (CWPRS)	National planning for both surface and ground water
Water Resources Departments in Indian States	
Ministry of Shipping, Road Transport and Highways	Ports management and administration of maritime traffic
Coastal Shipping and Inland Navigation Departments in Indian States	
Ministry of Culture	Conservation of historical and cultural environments and the identification and protection of archaeological and historical remains
Cultural Affairs Departments in Indian States	
Ministry of Tourism	
Ministry of Home Affairs	
Tourism Departments in Indian States	Security of tourists
Home Departments in Indian States	
Ministry of Tourism	
Tourism Departments in Indian States	Tourism planning and licensing
Ministry of Rural Development	
Ministry of Urban Development	Facilitating self help and generating community groups
Cooperative Department in Indian States	
Local Authorities (Corporations/ Municipalities in cities/towns and Panchayats in Villages)	Approval of structures such as those associated with waste management

(Source: <http://goidirectory.nic.in/exe.htm#min>)

Annex 2: Summary of the major coastal and ocean uses and issues in India

Item	Main uses/issues
Exploitation of living marine resources	<ul style="list-style-type: none"> ▪ Fishing (traditional, artisanal, commercial, industrial) ▪ Aquaculture ▪ Gathering of seaweed and other marine creatures (e.g., sea cucumbers, snails, shells, corals, pearls) ▪ Marine biotechnology applications
Navigation and communications	<ul style="list-style-type: none"> ▪ Shipping ▪ Port and harbour development ▪ Navigational aids ▪ Communication cables
Mineral and energy resources	<ul style="list-style-type: none"> ▪ Hydrocarbon (oil and gas) exploration and production ▪ Offshore drilling, pipeline laying, platforms, installation ▪ Exploitation of sand and gravel aggregates ▪ Exploitation of other minerals (gold, placer deposits, polymetallic sulphides, manganese nodules) ▪ Other forms of ocean energy (e.g., wind, wave energy, tidal power, ocean thermal energy)
Tourism and recreation	<ul style="list-style-type: none"> ▪ Hotels and vacation homes (cottages) ▪ Tourism infrastructure (e.g., transportation, services) ▪ Swimming and diving ▪ Recreational fishing, boating ▪ Non consumptive aesthetic uses
Coastal infrastructure development	<ul style="list-style-type: none"> ▪ Roads, bridges and other forms of transportation infrastructure ▪ Water supply and treatment ▪ Reclamation or alteration of coastal waters (e.g., for building of human settlements, impoundment for aquaculture ponds) ▪ Erosion control programmes ▪ Protection measures (against storms, waves) ▪ Replenishment of beaches ▪ Desalination facilities
Military activities	<ul style="list-style-type: none"> ▪ Transit and manoeuvres by navies ▪ Military special areas (e.g., test ranges and exercise areas) ▪ Enforcement of national maritime zones
Research	<ul style="list-style-type: none"> ▪ Oceanography, marine geology and coastal processes ▪ Fisheries and marine mammal research ▪ Marine biology, biodiversity, biotechnology ▪ Archaeology ▪ Studies of human uses of the oceans
Pollution and waste disposal	<ul style="list-style-type: none"> ▪ Siting of industrial facilities and infrastructure ▪ Sewage disposal and industrial discharges ▪ Disposal of other wastes ▪ Nonpoint sources of marine pollution (agriculture, runoff, river sedimentation) ▪ Operational discharges from shipping ▪ Spills of hazardous materials (oil and toxic substances)

(Source: <http://goidirectory.nic.in/exe.htm#min>)

Annex 3: Indian statutes relating to the environment

Sl. No.	Title of Law/Decree	Decree / Law No.	Year Enacted / Revised
1.	The Constitution		1950
2.	The Coasting Vessels Act	19	1838
3.	The Indian Registration of Ships Act	11	1841/1850
4.	The Shore Nuisances (Bombay and Kolaba) Act	11	1853
5.	The Fatal Accidents Act	13	1855
6.	The Indian Penal Code Act	45	1860
7.	The Criminal Law (Amendment) Act	2	1872/1973/2002/2005
8.	The Northern India Canal and Drainage Act	8	1873
9.	The Sea Customs Act	8	1878
10.	The Transfer of Property (Amendment) Act	3	1882/1929/2002
11.	The Land Improvement Loans Act	19	1883
12.	The Explosives Act	4	1884
13.	The Land Acquisition (Mines) Act	18	1885
14.	The Government Management of Private Estates Act	10	1892
15.	The Indian Fisheries Act	4	1897
16.	The Live-stock Importation (Amendment) Act	28	1898/2001
17.	The Explosive Substances (Amendment) Act	54	1908/2001
18.	The Indian Ports Act	15	1908
19.	The Electricity (Amendment) Act	26	1910/2003/2007
20.	The Indian Museum Act	10	1910
21.	The Wild Birds and Animals Protection Act	8	1912
22.	The Destructive Insects and Pests Act	2	1914
23.	The Inland Vessels Act	1	1917
24.	The Poisons (Amendments) Act	47	1919/1958
25.	The Indian Carriage of Goods by Sea Act	26	1925
26.	The Indian Forest Act	16	1927
27.	The Petroleum Act	30	1934
28.	The Control of Shipping Act	26	1947
29.	The Atomic Energy Act	33	1948/1962
30.	The Oil Fields (Regulation and development) Act	53	1948
31.	The Factories Act	63	1948
32.	The Seaward Artillery Practice Act	8	1949
33.	The Industries (Development and Regulation) Act	65	1951
34.	The Inflammable Substances Act	20	1952
35.	The Coir Industry Act	45	1953
36.	The Companies (Amendment) Act	23	1956/2001/2002/2006
37.	The River Boards Act	49	1956
38.	The Navy (Amendment) Act	23	1957/2005
39.	The Mines and Minerals (Regulation and Development) Act	67	1957/1999
40.	The Merchant Shipping (Amendment) Act	59	1958/2002/2003
41.	The Prevention of Cruelty to Animals Act	59	1960
42.	The Land Acquisition (Amendment) Act	31	1962
43.	The Marine Insurance Act	11	1963
44.	The Major Port Trusts Act	38	1963
45.	The Anti-Corruption Laws (Amendment) Act	16	1967

46.	The Unlawful Activities (Prevention) Amendment Act	29	1967/2004
47.	The Insecticides (Amendment) Act	23	1968/2000
48.	The Marine Products Export Development Authority Act	13	1972
49.	The Antiquities and Art Treasures Act	52	1972
50.	The Wild Life (Protection) Amendment Act	39	1972/2002/2006
51.	Water (Prevention and Control of Pollution) Act	6	1974/1988
52.	The Oil Industry (Development) Act	47	1974
53.	The Urban Land (Ceiling and Regulation) Act	33	1976
54.	The Water (Prevention and Control of Pollution) Cess (Amendment) Act	19	1977/2003
55.	The Coast Guard (Amendment) Act	44	1978/2002
56.	The Forest (Conservation) Act	69	1980/1988
57.	Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act	50	1981
58.	The Inland Waterways Authority of India (Amendment) Act	40	1985/2001
59.	Environment (Protection) Act	29	1986/1991
60.	The National Environment Tribunal Act	27	1995
61.	The National Environment Appellate Authority Act	22	1997
62.	The Protection of Plant Varieties and Farmers' Rights Act	53	2001
63.	The Suppression of Unlawful Acts Against Safety of Maritime Navigation and Fixed Platforms on Continental Shelf Act	69	2002
64.	The Offshore Areas Mineral (Development and Regulation) Act	17	2002
65.	The Biological Diversity Act	18	2002
66.	The Customs and Central Excise Laws (Repeal) Act	25	2004
67.	The Coastal Aquaculture Authority Act	24	2005
68.	The Disaster Management Act	53	2005
69.	The Petroleum and Natural Gas Regulatory Board Act	19	2006
70.	The Code of Criminal Procedure (Amendment) Amending Act	25	2005/2006

(Source: http://en.wikipedia.org/wiki/List_of_Indian_Federal_Legislation)

Annex 4: Indian statutes relating to coastal zone and enforcement agencies

Issue	Framework Legislation	Enforcement/Implementation Agency
Security	The Navy (Amendment) Act	Indian Navy, Ministry of Defence
	The Coast Guard (Amendment) Act	
	Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act	Indian Coast Guard, Ministry of Defence
Land Tenure	The Transfer of Property (Amendment) Act	Ministry of Rural Development, Ministry of Urban development, Revenue Departments in Indian States
	The Land Improvement Loans Act	
	The Land Acquisition (Mines) Act	
	The Government Management of Private Estates Act	
	The Land Acquisition (Amendment) Act	
	The Urban Land (Ceiling and Regulation) Act	
Water use and conservation	The River Boards Act	Ministry of Water Resources, Water Resources Departments in Indian States
	Water (Prevention and Control of Pollution) Act	
	The Water (Prevention and Control of Pollution) Cess (Amendment) Act	
Environment and Forests conservation including pollution	The Northern India Canal and Drainage Act	Ministry of Environment and Forests, Forest and Wildlife Departments in Indian States
	The Explosives Act	
	The Explosive Substances (Amendment) Act	
	The Wild Birds and Animals Protection Act	
	The Poisons (Amendments) Act	
	The Indian Forest Act	
	The Prevention of Cruelty to Animals Act	
	The Wild Life (Protection) Amendment Act	
	The Forest (Conservation) Act	
	Environment (Protection) Act	
	The National Environment Tribunal Act	
	The National Environment Appellate Authority Act	
The Biological Diversity Act		
The Disaster Management Act		
Industrial Development	The Industries (Development and Regulation) Act	Ministry of Commerce and Industry, Ministry of Petroleum and Natural Gas, Ministry of Food Processing Industries, Ministry of Heavy Industries and Public Enterprises, Ministry of Micro, Small and Medium Enterprises, Ministry of Mines, Industries Departments in Indian States
	The Factories Act	
	The Companies (Amendment) Act	
	The Coir Industry Act	
	The Petroleum Act	
	The Oil Fields (Regulation and Development) Act	
	The Oil Industry (Development) Act	

	<p>The Petroleum and Natural Gas Regulatory Board Act</p> <p>The Inflammable Substances Act</p> <p>The Mines and Minerals (Regulation and Development) Act</p> <p>The Offshore Areas Mineral (Development and Regulation) Act</p>	
Shipping	<p>The Coasting Vessels Act</p> <p>The Indian Registration of Ships Act</p> <p>The Sea Customs Act</p> <p>The Indian Ports Act</p> <p>The Inland Vessels Act</p> <p>The Indian Carriage of Goods by Sea Act</p> <p>The Control of Shipping Act</p> <p>The Merchant Shipping (Amendment) Act</p> <p>The Marine Insurance Act</p> <p>The Major Port Trusts Act</p> <p>The Inland Waterways Authority of India (Amendment) Act</p> <p>The Suppression of Unlawful Acts Against Safety of Maritime Navigation and Fixed Platforms on Continental Shelf Act</p> <p>The Customs and Central Excise Laws (Repeal) Act</p>	Ministry of Shipping, Road Transport and Highways, Coastal Shipping and Inland Navigation Departments in Indian States
Agriculture and Fisheries	<p>The Live-stock Importation (Amendment) Act</p> <p>The Destructive Insects and Pests Act</p> <p>The Insecticides (Amendment) Act</p> <p>The Protection of Plant Varieties and Farmers' Rights Act</p> <p>The Indian Fisheries Act</p> <p>The Marine Products Export Development Authority Act</p> <p>The Coastal Aquaculture Authority Act</p>	Ministry of Agriculture, Ministry of Commerce and Industry, Agriculture, Fisheries Departments in Indian States

(Source: http://en.wikipedia.org/wiki/List_of_Indian_Federal_Legislation)