

Integrated Coastal and Ocean Management: A Global Overview

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Abstract: Anthropogenic pressures due to rapid economic development, industrialization and concentration of population in coastal areas are posing considerable challenge for conserving coastal and ocean resources. Climate change, sea level rise, hurricane, coastal flooding, tsunami's, cyclones, irregular precipitations, etc. are causing monumental losses of human life as well as property. These observed as well as inferred catastrophic changes calls for a proactive approach. It is this realization that has prompted nations to evolve and adopt an integrated coastal and ocean management for sustainability of coastal regions as well as conserving marine productivity. This study, provides a global overview of coastal and ocean issues, loss of biodiversity, environmental concerns and impact of climate change. A case study on the integrated coastal zone management planning as pursued in Placentia Bay of Newfoundland and Labrador province of Canada is also presented.

Key words: Coastal zone management, climate change, economic development, ocean resources, estuaries, coastal erosion, sea level rise

INTRODUCTION

Conservation of marine biodiversity is vital considering its significance to human life, i.e., in providing food and essential compounds for drugs and technology; tourism and recreational activities as well as protection from storms and shore erosion. According to marine fish and invertebrates are estimated to provide over 2.6 billion people with at least 20% of their average per capita protein intake. PLI 2 and *Aeromonas hydrophilia* co-infection in pacu, *Piaractus brachydomes* has been explained (Abraham *et al.*, 2017). Marine species such as cone shells, sharks and horseshoe crabs have been found to be useful in the formulation of medicine for treating cancer, muscle diseases, chronic pain, etc.

Approximately 70% of cities with populations over 8 million are located on the coast. It is estimated that 90% of sewage is directly dumped into the sea in developing countries and half the world's coastal wetlands have disappeared. About 75% of global fisheries are fully utilized or over-fished and 60% of coral reefs are threatened. A comparative study of saline and non-saline water in an application of tomato yield by using photonic sensor has been described.

According to approximately, 50% of the world's urban sewage is directly discharged into the sea or nearby water bodies. A Novel Wave Bird Concept for Marine Surveillance (Jacob and Dheepak, 2014). Measurement of the static shift in MT and CSAMT surveys

(Macnae *et al.*, 1998). Removals of herringbone effects from AEM data maps using the Radon transform (Sykes and Das, 1998).

A recently published Census of Marine Life (COML) in which more than 2,700 scientists from 80 countries participated, found approximately 250,000 species in oceans and nearly 6,000 new species (Bruch and Mengerink, 2008). The study took ten years and surveyed 25 regions. The study found that fish stocks and crabs are now only 5-10% of what they use to be (CML, 2010).

According to the 2007 Intergovernmental Panel on climate change report, significant warming, sea level rise, increase in the frequency of storms, changes in precipitation pattern, ocean acidification and wind patterns are affecting each region differently. These trends are projected to increase which will cause greater threats to biodiversity (Smith *et al.*, 1990).

Considering anthropogenic pressures on coastal and ocean resources, Chapter 17 of Agenda 21 of the United Conference on Environment and Development held in Rio de Janeiro in 1992 stressed the need to conserve the coastal and marine environment. The chapter maintains, "The marine environment including the oceans and all seas and adjacent coastal areas forms an integrated whole that is an essential component of the global life-support system and a positive asset that presents opportunities for sustainable development". Following the Rio conference, coastal zone management and conservation of marine resources has gained greater attention. This

study provides a global overview of degradation of coastal and ocean resources, environmental concerns associated with coastal and ocean activities and discusses the impact of climate change. The study also describes the concepts of Integrated Coastal Zone Management (ICZM). A case study on integrated coastal zone planning as pursued in Placentia Bay of Newfoundland and Labrador province of Canada is also presented.

MATERIALS AND METHODS

Degradation of coastal and ocean resources

Tropical coral reefs: The Global Coral Reef Monitoring Network (GCRMN) was established in 1995 as part of the International Coral Reef Initiative (ICRI). According to the GCRMN 2004 assessment which is based on the opinions of the 240 researchers (Sain, 1993):

- Approximately 20% of the world's reefs have been considerably destroyed and there is no hope of their recovery
- Approximately 16% of the world's reefs were severely damaged by coral bleaching in 1998. However, about 40% have either recovered or are recovering well
- Approximately 24% of the remaining reefs are at imminent risk of collapse through human pressures
- Approximately 26% are under a long-term threat of collapse

Mangroves: Globally, about 20% of mangroves forests was lost in 1980. The primary causes of mangrove decline are attributed to aquaculture, agriculture, urban, residential and tourism development.

Mangrove destruction can lead to loss of biodiversity and fisheries productivity. Mangroves are nursery areas for commercially important fisheries. According to an exploitation of coastal zones has accelerated the degradation of mangrove forests. These areas provide ecological benefits such as protection from erosion, flooding, cyclones, typhoons and tidal waves and contribute to carbon sequestration to combat global warming.

It is estimated that 90% of all marine organisms spend some portion of their life cycle within mangrove systems. By the mid-nineties, about a quarter of the world's mangrove forests had been destroyed (CML, 2010; Chivian and Bernstein, 2008).

Seagrass beds: Seagrasses cover about 0.1-0.2% of the global ocean. Studies reveal that seagrass beds are declining regarding numbers as well as health due to anthropogenic pressures in coastal areas.

Some adult and juvenile fish species, sea cows and marine turtles are known to feed in seagrass beds. According to factors contributing to the degradation of seagrass beds include wastewater discharge from different sources such as coastal industries and urban development, shrimp farms as well as other forms of coastal activities and mining. Seagrass beds are also affected by the activities of coastal fishing trawlers. The reduced light caused by excessive sediment loads in water associated with pollution, dredging and construction activities also has an impact on the health of seagrass beds. The loss of seagrass habitat has a direct impact on biodiversity and fisheries productivity. Five of the world's seven endangered species of turtles are living in seagrass beds (Clarke, 1998).

Estuaries: Worldwide, there are about 1,200 major estuaries. The primary cause of estuarine degradation is attributed to human exploitation and accounts for approximately 95% of species depletions and 96% of extinctions, often in combination with habitat destruction.

Coastal erosion: Waves, currents, tides and wind have a direct impact on the costs. Other factors contributing to coastal erosion include changes in relative sea level, geomorphological characteristics of the shore and sand, etc. Anthropogenic pressures due to urbanization and economic activities that cause beach erosion include construction of artificial structures, mining of beach sand, offshore dredging or building of dams or rivers. At present, about 23% of shoreline along the main Indian land is affected by erosion. Coastal erosion threatens property and businesses and causes risks to people living near cliffs and shores.

Marine fisheries: It is estimated that nearly 75% of the world's marine capture fisheries are fully or overexploited.

Environmental concerns associated with coastal and ocean activities

Agricultural activities: Aquaculture and agricultural activities have the considerable contribution in increasing pollution in urban areas due to the use of large quantities of fertilizers. This, together with other biological and organic pollutants contributes in BOD, eutrophication and harmful algal blooms.

Mining and heavy industries: Wastewaters from heavy industries and mining cause damaging pollution from the discharge of toxic substances including heavy metals (lead, mercury, cadmium, etc.), radioactive elements, acids, Polyaromatic Hydrocarbons (PAH's) and several other toxic industrial chemicals such as Polychlorobiphenyls (PCB's).

Shipping, trade and tourism: Shipping activities bring different chemicals and species that alter coastal ecosystems through the use and disposal of ballast water.

Climate and ocean: The oceans play a significant role in regulating the global climate and moderating weather systems around the world. Changes in climate can have a considerable impact on the functioning of ocean, coastal and island ecosystems. Some of the impacts on coastal and oceans include: sea level rise, increases in coastal flooding, storm intensity and potentially changing current patterns. Ocean warming may result in increased stratification and changed circulation patterns of ocean currents, decrease the amount of sea ice, increase coral bleaching and mortality as well as can lead to migrations of species and increased algal blooms. Ocean acidification poses adverse effects on calcifying species such as corals, echinoderms, crustaceans and mollusks as well as individual phytoplankton.

Asia will be particularly vulnerable to the consequences of climate change, especially major population centers at low elevations including Mumbai, India, Shanghai, China, Jakarta, Indonesia, Tokyo, Japan and Dhaka, Bangladesh. The five most vulnerable countries with large populations are China, India, Bangladesh, Vietnam and Indonesia.

Global warming is impacting species distribution and food-webs underlying globally significant fisheries. Also, ocean acidification caused by increased uptake of CO₂ is harming shellfish and coral reefs which are under increasing stress from higher ocean temperatures and sea level rise. Degradation of ecosystem reduces both the productivity and the adaptive capacity of living marine resources which are vital for developing countries for their subsistence and commercial fishing.

Impacts of climate change on different regions and peoples of the world

Observed, confirmed changes: Increasing severe droughts, heat waves, storms, flooding, cyclone activity; shifts in climate zones and seasonality; increased sea level, temperature humidity, precipitation in mid, high latitudes.

Ocean, climate change and security

Inferred (conjectured): Indications of frequent storms, heavy snow, flooding and variability events as El Nino; cropland degradation, agricultural disturbances, decreased food production; deforestation, freshwater decline, soil erosion; increase in mortality and infectious diseases.

Unknown or lack of information: Time scales and extent of changes, quantification at regional, sub-regional level; a scale of disruption in food production, agricultural and fisheries yields.

Concern associated with food security

Observed or confirmed changes: Rising prices due to climate change and other factors use of crops for biofuels; impacts on sea and freshwater fisheries due to overfishing, pollution, habitat losses; ecosystem and biodiversity changes; climate variability (El Nino, other oscillations); severe impacts on the availability of food due to pressures on marine living resources.

Inferred (conjectured): Increasing mortality in emerging countries due to hunger related diseases; shifts in the timing of production, fish migration, ecosystem changes and movements.

Unknown or lack of information: Quantification of loss of nutrition, impacts on human health, change in fisheries and biodiversity; scales of impacts of acidification, possible changes in upwelling systems and ocean circulation.

Concern or issue-coastal areas and habitats, related ecosystems

Observed or confirmed changes: Sea level changes, lack of stable coastline, increased erosion, storm and tidal surges, hurricane impacts; inundations; changes in ecosystems due to temperature changes.

Inferred, conjectured: Possible changes in wind, current, wave pattern and coastal upwelling; possible changes in nutrient supplies.

Global ocean changes and its impact on ecosystem:

National Oceanic and Atmospheric Administration (NOAA) provide evidence of warming in all but three (94%) of the world's 64 Large Marine Ecosystems (LMEs) which significantly exceeds reports of the IPCC.

According to few scientists, a general global warming of ocean waters will increase global ocean productivity. However, they predict that this will also cause considerable changes in species distributions and ecosystems.

Ocean acidification: Fourth IPCC report maintains that the uptake of anthropogenic carbon, since 1750 has contributed in ocean acidification. Increasing atmospheric CO₂ has further accelerated acidification of the sea. Ocean acidification presents a potentially serious future threat to cold water coral reefs and plankton.

Biological production, ecosystems, biodiversity, nutrients

Observed changes or variations: Greater use of nutrient inputs as a fertilizer and wastewater releases contribute in eutrophication.

Inferred or conjectured: Warmer water could lead to higher photosynthetic uptake of CO₂. A warmer climate may decrease inputs of micronutrients such as zinc and iron.

Sea level

Observed changes or variations: Global mean sea level rose 1.8 mm per year for decades before 1990; increased to 3.1 mm in 1990's; decade 1993-2003 generated 1.6 mm per year. Sea level rise is not uniform largest in Western Pacific and the Eastern Indian ocean; dropping sea level in Eastern Pacific and Western Indian ocean.

Effects, impacts, confirmed or possible changes:

Increased coastal erosion, inundations, flooding combined with more frequent and stronger storm events; shifts in wetlands; loss of coastal protections from such ecosystems such as coral reefs, mangroves, etc., costs in retreat, enhanced erosion.

Weather and variability

Observed changes or variations: Increases in extreme storm events, changes in precipitation and the increase in drought conditions recorded globally in 2007.

Effects, impacts, confirmed or possible:

Increasing intensity and frequency of coastal disasters; inland flooding due to precipitation, river overflows, loss of infrastructure; heat waves, humidity with impacts on human health; spreading of diseases, migration of invasive species can be harmful to agriculture, loss of food production; displaced rainy season, changes in timing of primary production; growth in bacteria and virus.

Adequate water temperature is vital for marine ecosystems to sustain various organisms and heat helps in determining species geographic range. Most fish species have a relatively narrow range of temperatures they can tolerate and thrive, therefore, the area they occupy may expand, contract or be relocated with changes in ocean temperature.

Integrated coastal and ocean management: Coastal Zone Management (CZM), Integrated Coastal Management (ICM) and Integrated Coastal Zone Management (ICZM) have interchangeably used. However, Integrated Coastal and Ocean Management (ICOM) is probably more

appropriate for coastal activities have an impact on ocean resources and ocean activities have an impact on coastal areas.

According to, there are no clearly defined and universally accepted boundaries to the coastal zone. Coastal areas include both the area of land subject to marine influences and the area of the sea subject to ground forces. One of the definitions divides the coastal zone into three main components: the sea, the beach and the area behind the beach.

European Commission describes ICZM as “a dynamic, continuous and iterative process designed to promote sustainable management of coastal zones. ICZM seeks, over the long-term to balance the benefits from economic development and human uses of the Coastal zone, the benefits from protecting, preserving and restoring coastal zones, the benefits from minimizing loss of human life and property and the benefits from public access to and enjoyment of the coastal zone, all within the limits set by natural dynamics and carrying capacity”.

According to the term ‘integration’ can have different connotation depending on its application. Integration as it relates to coastal zone management has several levels.

Integration among sectors: This calls for cooperation between different sectors or economic activities such as tourism, fisheries and port companies. This comes from the realization of a common goal focused around sustainability and the appreciation of one another within the area.

Integration among levels of government: Consistency and co-operation are required in planning and policy making at local, regional and national levels.

Integration between nations: This sees ICZM as a valuable tool on a global scale.

Integration among disciplines: ICZM should encompass knowledge from all disciplines, i.e., scientific, cultural, traditional, political and local expertise. By including all these elements a truly holistic approach towards management can be achieved. According to the, ICM has the following characteristics.

ICM moves beyond traditional approaches which tend to be sectorally oriented and fragmented in character and seeks to manage the coastal zone as a whole using an ecosystem approach where possible.

ICM is an analytical process that advises governments priorities, trade-offs, problems and

solutions. ICM is a dynamic and continuous process of administering the use, development and protection of the coastal zone and its resources towards transparently-agreed objectives.

ICM employs a multidisciplinary, holistic systems perspective which recognized the interconnections between coastal systems and uses.

ICM maintains a balance between protection of valuable ecosystems and development of coast dependent economies. It sets priorities for uses, taking account of the need to minimize the impact on the environment to mitigate and restore if necessary and to seek the most appropriate siting of facilities. These are the activities contained in environmental impact assessments.

ICM operates within established geographic limits that usually include all coastal resources as defined by governing bodies. ICM seeks the input of all important stakeholders to develop policies for the equitable allocation of space and resources in the coastal zone. An appropriate governance structure is essential for such decision-making and oversight.

ICM is an evolutionary process, often requiring iterative solutions to complex economic, social, environmental, legal and regulatory issues. ICM integrates sectoral and ecological needs. ICM should be implemented through specific legal and institutional arrangements at appropriate levels of the government and the community.

ICM provides a mechanism to reduce or resolve conflicts that may occur, involving resource allocation or use of specific sites as well as the approval of permits and licenses. ICM promotes awareness at all levels of government and community about the concepts of sustainable development and the significance of environmental protection. It is proactive (incorporating an event planning element) rather than reactive (waiting for development proposals before taking action).

In integrated coastal zone management a vast number of sciences are involved including Law, Oceanography, Sociology, Economy, Regional Planning, Traffic Planning, Geology, Geography, Physics, Biology, Ecology, Chemistry and Coastal Engineering.

Efforts towards conserving coastal and ocean resources:

Globally, several steps have been taken to conserve coastal and marine resources. Some of them are outlined.

Census of marine life: A baseline for marine biodiversity is being established through the Census of Marine Life (CoML), a 10 years program that started in 2000 has published its findings in October, 2010.

Threatened species: International Union for Conservation of Nature (IUCN) has prepared a Red List which is a comprehensive listing of species believed to be at risk of extinction globally. Species are grouped into different categories based on the degree of threat which is assessed in detail by numerous experts from IUCN and Species Survival Commission (SSC).

Marine Protected Areas (MPA): In March, 2008 there were an estimated 4435 MPAs worldwide, covering about 0.65% of the world's ocean surface. Only 12.8% of the total MPA area (or 0.08% of the world's oceans) is no-take or strictly protected. Most MPAs are on the continental shelf and in coastal waters.

High Seas MPAs (HSMPAs): Approximately 64% of the world's oceans are in areas beyond national jurisdiction and include fragile habitats (e.g., cold water coral reefs, seamounts and hydrothermal vents) with high biodiversity that are relatively rare in waters under national jurisdiction.

Global forum on oceans, coasts and Islands strategic oceans planning to 2016:

The global forum on oceans, coasts and islands has initiated a strategic planning for the period 2006-2016 to develop policy and recommend specific steps required to advance the global oceans agenda aimed at governments, UN agencies, NGOs, industry and scientific groups.

About Ecosystem-Based Management (EBM) and ICM, the World Summit on Sustainable Development (WSSD) established goals to: encourage the application of the ecosystem approach by 2010 for the sustainable development of the oceans, particularly the management of fisheries and conservation of biodiversity. Promote integrated coastal and ocean management at the national level.

Ecosystem management and integrated coastal and ocean management by 2010 in the context of climate change:

Ecosystem-Based Management (EBM) has been incorporated widely in national ocean policy statements (e.g., EU Marine strategy, Canadian Oceans Act, Report of the US commission on ocean policy), national legislation (e.g., US Endangered Species Act), international and intergovernmental agreements (e.g., APEC's Bali plan of action, convention for the conservation of antarctic living marine resources, etc.

Over 100 countries have now implemented ICM programs. In addition to UNCED's Agenda 21, ICM is being recommended for ocean and coastal management in

other international guidance such as the climate change convention, The biodiversity convention and the global programme of action for the protection of the marine environment from land-based activities, etc.

Challenges in ICZM: Implementing EBM requires baseline and monitoring data for both ecological and socioeconomic components of the ecosystems. This lack of data and long-term monitoring capacity is a significant impediment to the implementation of the ecosystem approach.

Regulation of activities taking place on the high seas is problematic as not all nations adhere to international treaties regulating this area. At sea, enforcement is particularly challenging due to the vast space, challenging conditions, difficulties in detection, lack of clear enforcement mandate (especially, on the high seas) and expensive equipment needed to conduct enforcement operations.

One of the greatest challenges for international and multilateral approaches to vessel based ocean activities, e.g., commercial shipping and fishing is the issue of flags of convenience. For example, commercial buildings may seek to avoid the costs of compliance by registering with countries that have minimal pollutant discharge regulations or minimal enforcement of existing laws (Bruch and Mengerink, 2008).

RESULTS AND DISCUSSION

Case study; integrated management planning in Placentia Bay of Newfoundland and Labrador Province of Canada

Placentia Bay: Placentia Bay is a large, deep water, ice-free bay which is located on the southeast coast of Newfoundland and Labrador province of Canada. It provides habitat for numerous species of marine plants, fish, marine mammals and migratory birds. The bay is extensively used for shipping and coastal development. Coastal and marine areas of the bay have significant historical, cultural and economic value for communities as well as the province. It has several ports that cater to ocean-going vessels such as oil tankers, ferries, container carriers, bulk carriers, general cargo ships, naval and fishing boats. More than 365 islands and reefs are found in the bay where visibility can be reduced to less than one kilometer from an average of 187 days per year.

Due to economic development and extensive use of Placentia Bay, environmental concerns are growing. These concerns are associated with unique weather conditions such as heavy precipitation, poor visibility due to fog, icing, gale to hurricane force winds, waves, storm

surges and flooding which can contribute to significant loss and destruction to coastal communities in the bay area. Also, oil and gas carrying tankers can also cause considerable harm to marine life in case of an accident. The bay is regarded as the sea area with the highest probability for oil related environment accidents in Canada.

In August 1987, the reopening of an oil refinery in come by chance contributed to a significant increase in marine traffic and consequently has also increased the risk of accidents. The growth of offshore industrial activity on the grand banks as well as off Newfoundland's South Coast is likely to further increase maritime traffic in Placentia Bay. The bay is likely to be a transit passage for more than 35 tons of oil annually, more than any other water body in Canada. It is feared that in the event of a major spill, local fishery and fishing communities could be severely impacted. International Maritime Organization (IMO) is considering to designate the bay as a Particularly Sensitive Sea Area (PSSA), one of only three in the world.

Sustainability of the Bay; issues and concerns: Some of the major concerns in Placentia Bay are related to oil pollution in the form of spills, chronic discharges, onshore and near shore discharges such as domestic sewage and industrial waste. There are also conflicts that exist between the various resource users of the bay.

Pollution: There are several marine activities which have the considerable impact on the resource users of Placentia Bay. Sources of pollution include:

- Tankers delivering crude oil to come by chance refinery and transporting refined oil to various locations
- Shuttle and second-leg tankers, grand bank's crude oil to and from the Newfoundland transshipment terminal
- Marine Atlantic ferries traveling between Argentina and North Sydney and Eimskip RORO Vessels traveling between Argentina and the Eastern Seaboard and European ports
- Fishing boats operating out of the bay, fishing boats based elsewhere visiting or landing fish in the bay and ships associated with aquaculture
- Tour boats and pleasure craft and other vessels visiting or serving Placentia Bay ports

Placentia Bay is prone to pollution from ocean-going vessels that travel near the South Coast of Newfoundland. There is also a risk associated with oil

exploration off Newfoundland's East and South Coasts (including ongoing research in French Waters) for accidental spills and increased shipments of crude in and out of the bay.

Additionally, Voisey's Bay nickel processing facility at Argentia has further improved marine transportation in the bay. This includes boats bringing ore to Argentia from Labrador and other destinations and then the shipment of finished products to markets.

Codfish stocks depletion: The codfish stocks that sustained Newfoundland and Labrador for centuries continue to decline at an alarming rate. The 1992 moratorium on cod fishing which affected the livelihood of around 30,000 people has not contributed to a rebuilding of the cod stocks as expected. According to the Royal Commission, the collapse of the fishery ranks as the number one concern in rural coastal areas. As in other parts of the province, the cod stocks are also declining in the Placentia Bay area.

Impacts of pollution on other resource use: Pollution from marine traffic can severely damage marine and coastal resource use in the bay. For instance, the fishery, aquaculture, fish processing, tourism and recreation are likely to experience considerable impact caused by any major pollution event.

Pelagic seabirds are the most visible victims of oil released into the ocean. It is estimated that mortality on the South Coast of Newfoundland, related to oil release is 100,000-500,000 deaths annually. Ship-source discharge is believed to kill an additional 60,000-100,000 seabirds along the shore of Newfoundland and Labrador.

Onshore and near-shore discharges: Onshore and nearshore discharges and their impact on the marine and coastal environments is also a cause of concern. The main pollution threats under this category include:

- Toxins and disease associated with sewage discharges
- Offal and detritus from fish processing and aquaculture operations
- Toxic chemicals associated with accidental or chronic releases by fish processing, industry, agriculture, mining and minerals processing activity

Argentia naval base cleanup operation: At Argentia, the United States operated a 3,600 ha naval base from 1941-1994. When the Americans finally deserted the base, they left behind barrels of Polychlorinated Biphenyls (PCBs) including heavy metals and asbestos. Landfills

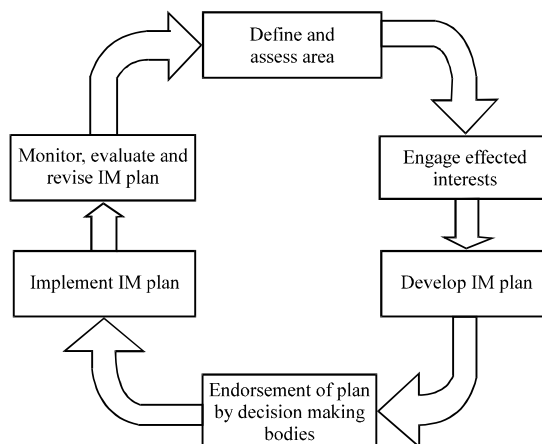


Fig. 1: Integrated Management (IM) process

containing toxic waste engulfed the site and waste fuel has penetrated the water table, contaminating the local water.

Integrated Management (IM): The Placentia Bay integrated management plan has taken into account all the aspects required to maintain sustainability, conservation of marine resources and shared use of ocean spaces as well as social, cultural, economic and environmental dimensions of the area (Fig. 1). Integrated Management Planning in Placentia Bay. Fisheries and Ocean Canada (<http://aczisc.dal.ca/46pbim2.pdf>).

Stakeholders involved:

- Aquaculture industries
- Aboriginal groups
- Non-government organizations
- Municipal, provincial and federal governments
- Coastal communities
- Fishing industries
- Ocean industries

IM at community level:

- Addresses issues at land-water interface (i.e., land-based sources of pollution and habitat degradation)
- Deals primarily with matters of local nature
- Community stewardship initiatives
- Engagement of regional/local governments (i.e., harbour authorities, land-planning authorities, etc.)
- Identify economic diversification opportunities

Role of community stakeholders:

- Setting local goals and objectives
- Strategic planning at a local scale

- Securing partnerships
- Networking among groups
- Education and awareness

Status:

- Federal/provincial working group formed in 2001
- Database of references for Placentia Bay
- Community-based coastal resource inventories completed
- Ecological and socio-economic information has been compiled
- Report entitled 'Integrating Scientific and Local Knowledge to Identify Potential Critical Habitats: A case study in Placentia Bay, Newfoundland
- Comprehensive and current list of groups and organizations in Placentia Bay
- Development of a CD-ROM and visual profile
- Communication strategy
- The broad scoping exercise conducted by the consultant in late 2003/early 2004. Engaged 94 agencies, community groups and individuals
- Workshop held in March 2004 to provide feedback to all participants involved in the scoping exercise
- Focused bilateral consultations with stakeholders (regional economic development boards, regional advisory committee on oil spills, etc.) completed.
- Formation of IM planning committee. First meeting March 21, 2005

Next steps of IM planning:

- Continue to build relationships between regulatory agencies and stakeholders with an interest in Placentia Bay
- Provide direction for adopting a structure and course of action for the interim IM planning committee
- Move to stage three of the operational framework, developing an IM Plan

Placentia Bay information seaway initiative: Initiated by Canadian Centre for Marine Communication (CCMC), the project will be undertaken as part of the Marine and Ocean Industry Technology Roadmap of the National Research Council of Canada. Involves the integration of:

- Ocean mapping and monitoring capabilities (i.e., multi-beam sonar and sea-state surveillance and forecasting)
- Navigation technologies (i.e., electronic charting)
- Vessel management techniques (i.e., AIS)

Placentia Bay information seaway initiative

Benefits:

- Will give local stakeholders access to accurate and up-to-date information
- Assist in providing a safer, more productive marine environment

CONCLUSION

Integrated Coastal Zone Management (ICZM) requires co-operation from various levels of governments local, state, central as well as participation from relevant agencies, departments and ministries who are directly or directly involved in coastal and ocean governance and planning. A truly integrated approach call for engaging stakeholders such as fishing communities, tourism sector, oil and gas, NGOs, industries, etc. Also, involving tribal peoples and coastal communities is utmost important for planning and implementing a coastal zone management plan for sustainability for coastal regions.

By sheer magnitude of ocean space, governance and management of ocean require cooperation among nations which is particularly important for neighboring countries. A holistic approach in ICZM requires participation and knowledge sharing from a different segment, i.e., political, scientific, local, conventional wisdom, cultural, etc. Also, ICZM is a multidisciplinary field which requires involvement from some disciplines such as oceanography, geography, geology, biology, chemistry, sociology, coastal engineering, law and economics, etc.

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