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Linking marine protected areas to integrated coastal and ocean management: A review of theory and practice

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Abstract

If managed in isolation, coastal and marine protected areas (MPAs) are vulnerable to natural resource development and exploitation occurring outside these areas—in particular, overfishing, alteration and destruction of habitats, and water pollution. Thus, protection of coastal and marine areas—of species, habitats, landscapes, and seascapes—should be integrated into spatial development strategies for larger areas, under the umbrella of integrated coastal and ocean management (ICM). This is typically easier said than done, since the actors involved in MPA networks and in ICM programs are often different, reflecting different cultures, networks of relationships, ministries, and goals and motivations.

This article reviews the ecological, social and economic linkages between MPAs and the governance of broader ocean and coastal areas; sets forth nine guiding principles for managing MPAs within an ICM context; reviews work conducted under the Convention on Biological Diversity to operationalize the linkages between ICM and MPAs; and develops strategic guidance for addressing these linkages. The article ends with a call to bring together the diverse communities involved in marine protected areas, coastal and ocean management, and watershed management to collaborate in national-level ocean and coastal planning, including in the designation of networks of marine protected areas.

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1. Background: the imperative of linking marine protected areas (MPAs) to broader ocean and coastal areas

1.1. Background

Theory and practice in marine protected areas (MPAs) have tended to emphasize the dynamics of governance of the protected area itself—e.g., how it is established, governed and funded, its boundaries, management approaches and strategies, and the effectiveness of its management (what one might call the *inside* perspective). Major works on MPAs (both coastal and oceanic) have noted, however, the importance of external factors linking the MPA to surrounding areas (the *outside* perspective). Brandon in *Parks in Peril,* for example, notes that all of the terrestrial parks considered are vulnerable to large-scale threats that have their origins far from park boundaries [1]. In their seminal text on marine and coastal protected areas, Salm et al. [2] note a similar finding:

> Managing a nature reserve or marine park in isolation from surrounding land uses and peoples, and without wide cooperation from agencies, stakeholders, and impacters, may not fully succeed. The reason is that protected areas alienated from a wider programme of coastal resources management exist as ''islands of protection'' surrounded by uncontrolled areas of threat where pollution, habitat destruction and overfishing may exist. CZM [coastal zone management] provides an appropriate framework for incorporation of protected areas into a larger system of protection and a method of consensus building for their support.

Similarly, in the IUCN Guidelines for MPAs, Kelleher [3] holds that MPAs must be placed in their wider context, i.e.:

> Because of the highly connected nature of the sea, which efficiently transmits substances and forcing factors, an MPA will rarely succeed unless it is embedded in, or is so large, that it constitutes an integrated ecosystem management regime.

As emphasized by these authors, MPAs are affected by human activities that lie outside their boundaries, ranging from marine transportation and fishing to land-based sources of marine pollution, e.g., agriculture, urban runoff, and industry. In many, if not most, cases, these exogenous sources have far greater effects on resources of the MPA than activities within the protected area. The management of MPAs takes place within the context of a larger ocean governance system, but often with little or no integration with it. Coastal and ocean governance systems are often designed without consideration of MPAs. On the other hand, MPAs are often designed and implemented without recognition of the larger system within which they are located.

Notwithstanding the widespread recognition of the connection between an MPA and other parts of the ocean and coastal zone, there has been little work in the MPA literature in identifying the ecological and social and economic linkages between the MPAs and external areas nor in examining alternative approaches for linking governance regimes in MPAs to broader coastal zone management in effect in areas outside the MPA(s).

1.2. Purpose of the paper

The purpose of this paper is to begin to redress this important gap by providing an analysis of theory and practice in linking MPA management to integrated coastal management (ICM) in larger parts of the coastal zone and ocean. The paper was originally intended to provide background information and ideas for discussion at the Fifth World Parks Congress in Durban, South Africa, in September 2003. It examines theory and practice in ICM and in MPA management, focusing both on relevant guidelines and on specific cases in which explicit linkages between ICM and MPAs have been made.

In its original version, the paper discussed several case studies to provide some illustrations of approaches followed in linking MPAs to ICM: three from the developed world—Australia, Netherlands, and the United States; and three are from the developing world—Belize, the Philippines, and Tanzania. Most of those case studies have been further developed in this special issue as individual papers.

The paper also presents some practical tools for addressing impacts on MPAs and for developing linkages between MPAs and integrated management of larger ocean and coastal areas. Following the Fifth World Parks Congress, a guidance document aimed at MPA managers was developed to assist these practitioners in making the linkages between MPA management and ICM management [4].

Governance is the process through which diverse elements in a society wield power and authority and, thereby, influence and enact policies and decisions concerning public life and economic and social development. Governance is carried out by the state, as well as the private sector and civil society. With relation to ICM, governance refers to the structures and processes used to govern behavior, both public and private, in coastal and ocean areas under the jurisdiction of a particular country, and the resources and activities they contain. ICM refers to the process through which the use of specific resources or portions of the coastal/ocean area are managed to achieve desired objectives. While in the coastal area, the governance system can apply to the conduct of a single activity (e.g., control of coastal erosion), what distinguishes "integrated coastal management" from "coastal management" or "coastal resource management" is the ability to create a governance system capable of managing multiple uses in an integrated way through the cooperation and coordination of government agencies at different levels of authority, with nongovernmental organizations and among different economic sectors. Graham et al. [5] define governance as:

> The interactions among structures, processes and traditions that determine how power is exercised, how decisions are taken, and how citizens or other stakeholders have their say.

Graham et al. suggest five key principles of sound governance for protected areas, based on the list of the characteristics of good governance defined by the United Nations Development Program (UNDP) (Table 1).

They also detail a number of governance challenges that have to be overcome by protected area managers, namely, the implementation of global conventions, the decentralization of protected area management and the role and independence of protected area management agencies, the collaborative management framework needed to manage individual protected areas, and the integrative governance mechanisms to manage protected areas in a broader ecosystemic context.

Table 1
Principles of sound governance for protected areas

The five principles	UNDP principles
Legitimacy and voice	Participation Consensus orientation
Direction	Strategic vision, including human development, and historical, cultural and social complexities
Performance	Responsiveness of institutions and processes to stakeholders Effectiveness and efficiency
Accountability	Accountability to the public and to institutional stakeholders Transparency
Fairness	Equity Rule of law

Two congruent trends in MPA management and in ICM management reinforce the desirability of carrying out this analysis at the present time:

- In the MPA community, there is significant interest in "scaling up" MPA practice, by creating networks of MPAs with linkages (corridors, etc.) between them. This trend has been given considerable impetus by the World Summit on Sustainable Development [6] that called for nations to establish "representative networks of MPAs" by 2012.
- In the ICM community, there is significant interest in "scaling up" of ICM efforts many of which (particularly in developing countries) have been focused on smaller areas of the coastal zone (typically through pilot or demonstration projects) to ultimately the entire coastal zone of a nation. In some nations, too, there are new efforts to manage the entire 200-mile zone under national jurisdiction, with some attention devoted to determining the extent to which parts of these ocean areas should be designated as MPAs.

The confluence of these trends will demand more strategic and integrative thinking on the part of both the MPA and ICM communities and provide opportunities for better addressing the connection between the two.

1.3. Linking MPAs to broader ocean and coastal areas

MPAs are profoundly affected by the larger ecological, social, economic, and political context of the coastal/ocean areas of which they are a part. Coastal areas are home to more than half of the world's population, and much of the world's economic output is related to the economic activities taking place in coastal and ocean areas (such as shipping, oil and gas development, coastal tourism, etc.). Two-thirds of the world's largest cities are located on coasts and populations of coastal areas are growing faster than inland populations.

The presence of large and growing populations in the world's coastal areas creates major problems. In developed countries, needs are generated for ever larger sewage treatment plants, expanded landfills for the disposal of solid waste, and increased recreational facilities, to name only a few. In developing countries, with less infrastructure, more people in the coastal zone means more pollution of coastal waters, more pressure on nearby natural resources (for example, mangrove forests for firewood and beach sand for construction), and more pressure on fishery resources. Clearly, the tendency for ever

greater numbers of people to migrate to the world's coasts is exerting serious pressure on these areas that could put the value and productivity of many of them at risk, and, in particular, threaten the special ecological or cultural values MPAs aim to protect.

A wide variety of economic and social activities taking place in the coastal zone and ocean affect the functioning of MPAs. In addition to economic and social activities taking place in the coastal zone, activities further inland and upland (and even upwind) can have significant impacts on coastal/ocean areas and MPAs. Coastal and ocean development activities can significantly affect the ecology of the coastal zone and the functioning of coastal and ocean processes and resources, as the following examples indicate:

- Industrial development in the coastal zone can decrease the productivity of wetlands by introducing pollutants, including heavy metals and nutrients, and by changing water circulation and temperature patterns.
- Diking and water withdrawals for agriculture can affect the functioning of wetlands through reduced freshwater inflows and through changes in water circulation.
- Development activities in beach and dune systems can change patterns of sediment transport or alter inshore current systems.
- Marine aquaculture activities in tropical areas which often involve removal of mangrove forests to create aquaculture ponds, can interfere significantly with the many functions mangrove systems perform, such as serving as buffers for coastal storms and nursery habitats for juvenile fishes.
- Port development and dredging can degrade coral reefs and seagrasses through the build up of sediments.
- Inland activities such as logging, agricultural practices (e.g., burning of cane sugar), and animal husbandry practices (e.g., pollution of streams by animal waste) damage estuarine and ocean areas through increased flow of sediment, nutrients, pesticides, and other pollutants into riverine and estuarine systems.

The ocean and coastal activities we have noted above are essential for the economic and social well-being of coastal nations as they typically represent the backbone of the national economy and the major sources of livelihood of coastal communities. This is especially the case in many developing countries where typically the mainstay of local coastal communities relies on the exploitation of the living and nonliving resources of coasts and the ocean. The challenge, therefore, is not to eliminate these activities but instead how to manage them in an appropriate manner while preserving essential ecological processes, life support systems and biological diversity.

In recent years, especially since the 1992 Earth Summit (United Nations Conference on Environment and Development), an international consensus on the imperative of managing multiple ocean and coastal uses through an integrated approach—integrated coastal and ocean management (ICM) has emerged. More recently, too, there has been realization that ICM efforts must also be tied to watershed planning and management efforts and to river basin management.

1.4. Guiding principles for managing MPAs within integrated coastal management

These principles are based on discussions by an international group of experts participating in two workshops on "Integrating Marine Protected Area Management with

Coastal and Ocean Governance: Principles and Practices," held, respectively, at the Coastal Zone 2003 Conference in Baltimore, USA on July 12–14, 2003 and at the Fifth World Parks Congress, Durban, South Africa, on September 10, 2003 [4].

1.4.1. Strengthening linkages between MPAs and the wider coastal/marine area

- *Principle 1*. Connectivity between the terrestrial and marine side of the coastal area and between MPAs and the surrounding coastal and marine area should be recognized and maintained. To this end, a good scientific understanding of the ecological, socio-economic, and cultural linkages and connectivity between ecosystems and humans in the coastal zone has to be developed. This is essential for ensuring that management of MPAs and the wider coastal and marine area is well integrated.
  Understanding ecological, socioeconomic, cultural and institutional connectivity of MPAs and MPA networks to the broader coastal and marine area is essential to the credibility, support and success of MPAs and of ICM. MPAs are often affected by activities carried out outside the established boundaries of the MPA, including discharges of pollutants from coastal watersheds, as well as marine uses in proximity of an MPA. Also, MPAs provide the broader coastal and marine area with a number of goods and services, including conservation of biodiversity; protection of critical habitats; increased productivity of fisheries through stock regeneration; increased knowledge of the marine environment; a refuge for, and protection of, genetic diversity; and protection of cultural heritage and diversity. In other instances, the restrictions of access to resources within MPAs may affect outside users who rely on such resources, such as seasonal fishermen, to the benefit of just a small portion of the population. All these environmental, socioeconomic, and cultural linkages between MPAs and the wider coastal and marine area and users have to be recognized fully and strengthened through appropriate institutional arrangements to ensure an equitable distribution of benefits.
- *Principle 2*. MPA management should be based on the best available knowledge and information, and much of this information is relevant to, and should draw from, the basis of broader coastal and marine area management.
  Research and monitoring are essential tools in MPA management, and MPAs are often spaces where relatively rich information and knowledge exist. This information, however, is often not accessible to, or applied within, ICM programs in the coastal and marine areas in which the MPAs are situated. It is also usually biased towards biophysical information about the MPA, with less emphasis on the socioeconomic and cultural aspects. Furthermore, research and monitoring programs for MPAs often do not focus on linkages between the MPA and adjacent coastal and marine areas, or exploit the opportunities that MPAs can provide as benchmarks of the state of coastal and marine environments.
- *Principle 3*. Successful integration of ICM and MPAs depends on sustained management processes and programs that will produce perceived benefits and tangible outcomes that contribute to improved quality of life:
  Awareness of the interactions between the management of an MPA and its surrounding physical and human environment helps to identify opportunities and constraints for an integrated approach to MPAs and the wider coastal and marine area. Involvement of the public helps build general support for positive institutional, legislative, and

regulatory changes. The creation of political will and an enabling environment to support MPA networks framed in the broader coastal and marine area will allow addressing local concerns in the context of regional and global pressures and the achievement of sustainable management solutions.

1.4.2. Developing governance arrangements to incorporate MPAs into the broader framework of ICM

- *Principle 4*. Strengthened and more effective relationships—vertically and horizontally—are needed to allow appropriate stakeholder participation at every stage of development and implementation of MPAs, and to achieve adequate linkage of MPAs with ICM institutional structures and planning processes.
  Fragmentation of jurisdictional, institutional, and legislative frameworks is one of the primary obstacles to the effective implementation of MPAs and ICM. While not necessarily entailing the integration of different institutions, integrated management of coastal and marine areas, including MPAs, does require coordination and harmonization of policies, strategies, plans, programs, and projects. Therefore, it is essential that MPA managers and planners develop productive relationships with those that have a stake in the conservation and sustainable use of the MPA resources. Equally important, MPA managers need to be represented in ICM institutions and processes that deal with issues that affect them. This may involve participation in meetings, hearings, and decision-making bodies on subjects that may sometimes appear to be remote from specific MPA management responsibilities.
- *Principle 5*. MPA management should be an integral part of ICM governance: in cases where no ICM institutions have been put into place, MPA managers will need to relate to sectoral institutions concerned with watershed management, fisheries, tourism, maritime transportation, etc.
  Marine conservation and biodiversity concerns, as well as environmental goods and services, should be integrated into larger coastal and marine management issues. MPAs can effectively contribute to the sustainable development of coastal and marine areas and their interests should be fully incorporated into the institutional, legal and managerial arrangements for coastal and ocean management. Therefore, MPA management should be linked with ICM and to watershed management, so as to better secure the conservation and sustainable use of coastal and marine biodiversity.
- *Principle 6*. Planning of individual MPAs should be participatory and integrated within broader spatial management and economic and social development frameworks to ensure their sustainability and promote creation of functionally connected networks of MPAs.
  Participatory MPA planning needs to occur within larger spatial and governance contexts to make MPA objectives relevant to a broad stakeholder base and to ensure consistency with broader sustainable development priorities. It must also identify strategic linkages outside the MPA to mitigate negative externalities that threaten MPA effectiveness.

1.4.3. Fostering implementation of MPAs through enhanced policy and management tools

- *Principle 7*. Mobilizing adequate resources and capacity is essential for successful implementation, sustainability, and integration of MPAs in ICM programs.

People, facilities and funds are essential for proper and full implementation and plan and program sustainability. The management of MPAs can be financed through a combination of instruments, including government support, donor funding, and user fees and charges. Tourism fees and charges, and royalties and levies on commercial operators, in particular, can provide a source of revenue. Remittance of revenues at the central level and returning of a proportion to individual MPAs can contribute to ensuring a balance between commercial use and conservation management. Collaborative initiatives on financing between MPA and ICM authorities can help avoid competition and mutually reinforce sustainability.

- *Principle 8*. The effectiveness of MPAs and their incorporation into ICM frameworks has to be assessed through appropriate tools, guidelines, and trained personnel. Evaluation of MPAs should be conducted at the individual site, subnational, national, and regional levels.

  Increasing threats on MPAs make it critical that their management be effective. As MPAs are connected into networks and incorporated into ICM frameworks, it is essential that best practices and results from MPAs collectively accomplish the objectives of the network.
- *Principle 9*. Ecologically coherent networks of MPAs, including geological and oceanographic considerations, provide a spatial management tool to prioritize biodiversity conservation and ensure maintenance and enhancement of environmental goods and services, which are essential objectives of ICM.

  Scaling up of existing MPAs and ICM initiatives can be limited by administrative boundaries, therefore, larger scale ecological coherence is required. To this end, it is important to establish MPAs and no-take areas that contribute to networks of national and international protected areas in accordance with a strategic approach that fills gaps and conserves priority marine conservation areas. The network must strategically link broad-area integrated coastal management with fully protected areas and multiple use/sustainable-use areas.

2. Integrated coastal management: concepts, guidelines, and major development in practice

ICM can be defined as "a continuous and dynamic process by which decisions are taken for the sustainable use, development, and protection of coastal and marine areas and resources" [7]. The goals of ICM are to attain 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.

ICM acknowledges the interrelationships that exist among coastal and ocean uses and the environments they potentially affect, and is designed to overcome the fragmentation inherent in the sectoral management approach. ICM is multi-purpose oriented, it analyzes and addresses implications of development, conflicting uses, and interrelationships between physical processes and human activities, and it promotes linkages and harmonization among sectoral coastal and ocean activities [7]. Ideally, an ICM program should operate within a closely integrated, coherent management framework within a defined geographical limit [8].

2.1. ICM functions

The major functions of ICM are presented in Table 2 (based on Cicin-Sain and Knecht [7]):

2.2. ICM principles

ICM involves the application of a set of principles: *overarching principles, principles related to environment and development, and principles related to the special character of oceans and coasts*. Overarching principles guiding ICM are: (1) sustainable development, and (2) integration (by integration we mean to unify, or to put parts together into a whole). Several dimensions of integration are of special importance in ICM, i.e. [7]:

- *Intersectoral integration* (bringing together agencies and groups from different sectors such as fisheries, tourism, oil and gas development, etc.).
- *Intergovernmental integration* (bringing together the several levels of government: national, provincial, local) which typically have authority in the coastal zone and ocean).
- *Spatial integration* (bringing together management issues concerning the land side of the coastal zone (including up-river issues related to watersheds and river basins) and issues related to the ocean side).
- *Science-management integration* (applying practical knowledge from the natural and social sciences to managerial decisions about the oceans and coasts).
- *International integration* (especially in cases where there are important transboundary issues that cross national boundaries).

ICM is also guided by *the principles on environment and development* which were endorsed by the international community at the 1992 United Nations Conference on Environment and Development, i.e.: the right to develop; inter-generational equity;

Table 2
Main functions of integrated coastal and ocean management (ICM)

Functions	Activities
Area planning	Plan for present and future uses of coastal and marine areas Provide a long-term vision
Promotion of economic development	Promote appropriate uses of coastal and marine areas (e.g., marine aquaculture, ecotourism)
Stewardship of resources	Protect the ecological base of coastal and marine areas Preserve biological diversity Ensure sustainability of uses
Conflict resolution	Harmonize and balance existing/potential uses Address conflicts among coastal and marine uses
Protection of public safety	Protect public safety in coastal and marine areas typically prone to significant natural, as well as human-made, hazards
Proprietorship of public submerged lands and waters	As governments are often outright owners of specific coastal and marine areas, manage government-held areas and resources wisely and with good economic returns to the public

environmental assessment; precautionary principle; polluter-pays principle; and openness and transparency in decisionmaking.

Finally, ICM is also guided by principles related to the special character of oceans and coasts and to the public nature of the oceans and to the use of coastal ocean resources [7]:

Principles related to the special character of oceans and coasts:

- Coastal and ocean systems require special planning and management approaches due to their high productivity, great mobility, and interdependence.
- The significant interactions across land–water boundary require recognizing and managing the whole system.
- Activities well inland can significantly affect coastal resources.
- Land forms fronting the water's edge (e.g., beaches, dunes) that help as buffers against erosion and sea level rise should be conserved.
- Interruptions of the natural longshore drift system should be minimized.
- The biodiversity of rare and fragile ecosystems and endangered/threatened species should be protected.
- Efforts to stabilize the coast should be "designed with nature" using, e.g., special vegetation instead of physical structures.

Principles related to the public nature of the oceans and to the use of coastal ocean resources:

- Since ocean resources are part of the public domain, management must be guided by a stewardship ethic, fairness and equity.
- Historically based claims of indigenous peoples should be recognized.
- While ICM is intended to foster the coexistence of multiple uses in an area, in case of irreconcilable conflicts, protecting renewable living resources and their habitats should have priority over exploitation of nonliving, nonrenewable resources.
- New coastal developments that are marine dependent should have priority over those that are not.

2.3. ICM institutional factors

There is generally a recognition in ICM projects of the need to work from two directions—"bottom up" (involving the local community, as well as provincial authorities) and "top down" (involving the national government) since, in most cases, national, provincial, and local governments share jurisdiction over the coastal zone and ocean.

A key aspect of ICM is the design of institutional processes of integration/harmonization to overcome the fragmentation inherent in the sectoral management approach and in the splits in jurisdiction between levels of government at the land–water interface. This generally entails the creation of a coordination mechanism that brings together coastal and ocean sectors, different levels of government, users, and the public into the ICM process. Attributes of a successful institutional coordination mechanism for ICM include:

- Based on appropriate legal/legislative authority.
- Able to affect the activities of all the agencies and levels of government involved.

- Perceived as a legitimate and appropriate part of the process.
- Capable of making informed decisions (with the assistance of a technical secretariat and scientific advisors).
- Whenever possible, the coastal management entity should be at a higher bureaucratic level than the sectoral agencies to give it the necessary authority to harmonize sectoral actions.
- The effort should be adequately financed and staffed.
- The planning aspects of ICM should be integrated into national development planning.

2.4. International guidelines on ICM

All of the major agreements emanating from the 1992 UN Conference on Environment and Development have endorsed the application of the ICM approach, including: the Framework Convention on Climate Change, the Convention on Biological Diversity, the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities, the Programme of Action for the Sustainable Development of Small Island Developing States, and the International Coral Reef Initiative. In addition, a number of efforts have been made by international entities to further define, interpret, and operationalize the ICM concept. The main international guidelines developed for ICM, listed in Table 3, are important for they set standards of an international model or norm for countries to follow. In some cases, a country's adherence to such international standards, or lack thereof, can be used by international funding agencies as a basis for approving or disapproving program funds.

Table 3
Main guidelines on ICM

Year	Organization	Guidelines
1992	UN	Agenda 21, Chapter 17
1993	OECD	Coastal Zone Management: Integrated Policies
	World Bank	Guidelines for Integrated Coastal Zone Management
	IUCN	Cross-Sectoral, Integrated Coastal Area Planning (CICAP): Guidelines and Principles for Coastal Area Development
1995	UNEP	Guidelines for Integrated Management of Coastal and Marine Areas: With Special Reference to the Mediterranean Basin
1996	UNEP	Guidelines for Integrated Planning and Management of Coastal and Marine Areas in the Wider Caribbean Region
1998	FAO	Integrated Coastal Management and Agriculture, Forestry and Fisheries
1999	UNEP	Conceptual Framework and Planning Guidelines for Integrated Coastal Area and River Basin Management
	EC	Towards a European Integrated Coastal Zone Management (ICZM) Strategy: General Principles and Policy Options
	Council of Europe	European Code of Conduct for Coastal Zones
2000	CBD	Review of Existing Instruments Relevant to Integrated Marine and Coastal Area Management and Their Implementation for the Implementation of the Convention on Biological Diversity
2004	CBD	Integrated Marine and Coastal Area Management (IMCAM) Approaches for Implementing the Convention on Biological Diversity

Table 4
Coastal countries with ICM efforts in 1993 and 2000

Region	Coastal countries	1993	2000
Africa	37	5	13
Asia	17	13	14
Caribbean	13	5	8
Central America	7	4	7
Europe	33	11	30
Near East	16	6	7
North America	3	3	3
Oceania	17	7	8
South America	11	5	8
Totals	154	59	98

While the guidelines in Table 3 emphasize different aspects of ICM, examination of the various guidelines reveals consensus among them as to the scope and purposes of ICM, and on major approaches and principles.

2.5. ICM in practice

There has been a significant increase in the number of countries adopting ICM programs in recent years, especially since the 1992 UNCED conference. As noted in Table 4, while in 1993 there were about 59 countries working on some form of ICM, at national and/or local levels, in 2000, the number of countries working on ICM had reached 98 [9,10]. There are different patterns on ICM dissemination, however, in different regions of the world, with major differences found in the scope of the efforts (involving the whole coastal zone or a small portion of it), the role of national and local governments, the extent and importance of international funding.

3. Biodiversity, marine protected areas and integrated coastal management

Of all the international conventions and agreements referenced earlier, the Convention on Biological Diversity is the most relevant agreement to the use of MPAs to protect and enhance biodiversity, in the broader context of ICM. The Conference of the Parties to the Convention on Biological Diversity (CBD), in its Decision II/10, supported recommendations provided by the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) in its Recommendation I/8 [11], calling governments, communities, and users to adopt integrated management measures to promote conservation and sustainable use of marine and coastal biodiversity [12], including the adoption of tools and measures for ICM noted in Table 5.

Recommendation I/8 advises to adopt a number of tools in support of the above measures, while the same Recommendation I/8 and Annex to Decision II/10 also makes reference to a number of measures to be incorporated into ICM to pursue the goals of the conservation of biological diversity.

Table 5
Tools and measures for ICM useful for biodiversity conservation

Tools for ICM	Measures for ICM
Carry out environmental impact assessment (EIA) of all major marine and coastal development activities with special attention to marine and coastal biological diversity, taking into account cumulative impacts. Undertake systematic monitoring and evaluation of project impacts during implementation.	Measures to prevent physical alteration, destruction and degradation of vital habitats and restore degraded habitats, including spawning areas, nurseries of stocks and living marine resources. The incorporation of coastal and marine protected areas under the umbrella of ICM, the identification of critical habitats for living marine resources as an important criterion for their selection, and conservation measures to protect ecosystem functioning in addition to the protection of specific stocks.
Address socioeconomic needs of coastal communities in the planning and implementation of the marine and coastal area management. Promote rapid appraisal techniques to improve the conservation and management of marine and coastal biological diversity. Address impacts of land-based activities on marine and coastal biological diversity and identify methodologies and research to assess these impacts. Address impacts of desludging and pollution by maritime vessels on marine and coastal biological diversity, in particular in those countries which border international waterways. Adopt measures to mitigate adverse effects.	The incorporation of mariculture into ICM plans, taking into account the vulnerability of areas of high biological value. The management of alien species as part of ICM.

Source: [12].

The review undertaken by the CBD of existing international and regional guidelines for ICM [12] highlights a number of common features of ICM that can serve biological conservation purposes, as noted in Table 6. While the analyses of the guidelines carried out by the CBD show a high degree of consistency in terms of general guidance on ICM, they do not provide specific operational guidance for the management of biological diversity. For example, they do not provide guidance on how to determine the spatial integration needed in ICM to address the protection of migratory species or the transboundary impacts of pollution on biological diversity.

3.1. Incorporating biodiversity elements in ICM projects: analysis by the CZMC/RIKZ

In 2002, the Parties to the Convention on Biological Diversity called for further examination of the contribution of ICM guidelines to the objectives of the convention. The Coastal Zone Management Centre, National Institute for Coastal and Marine Management, Ministry of Transport, Public Works and Water Management in the Netherlands (CZMC/RIKZ) undertook an analysis of the extent to which biodiversity protection elements were included in 25 major works/studies/guidelines and five major case studies of ICM at the national and subnational levels (Albania, Belize, Estonia, Tanzania, and UK)

Table 6
Main characteristics of integrated marine and coastal area management (IMCAM) according to international guidelines

Main variable	Features
Purpose	The aim of IMCAM guidelines is to guide coastal area development in an ecologically sustainable manner.
Principles	IMCAM guidelines are guided by the Rio principles with special emphasis on the principle of intergenerational equity, the precautionary principle and the polluter-pays principles. They are holistic and interdisciplinary in nature, especially with regard to science and policy.
Functions	IMCAM guidelines are intended to strengthen and harmonize sectoral management in the coastal zone. They preserve and protect the productivity and biological diversity of coastal ecosystems, and maintain amenity values. ICM guidelines are designed to promote the rational economic development and sustainable utilization of coastal and ocean resources and facilitate conflict resolution in the coastal zone.
Spatial coverage	An IMCAM programme embraces all of the coastal and upland areas, the uses of which can affect the coastal waters and the resources therein, and extends seaward to include that part of the coastal ocean that can affect the land of the coastal zone. The IMCAM programme may also include the entire ocean area over which national Governments have stewardship responsibilities, both under the United Nations Convention on the Law of the Sea and the United Nations Conference on Environment and Development.
Horizontal and vertical integration	Overcoming the sectoral and intergovernmental fragmentation that exists in today's management efforts is a prime goal of IMCAM guidelines. Institutional mechanisms for effective coordination among various sectors active in the coastal zone are fundamental to the strengthening and rationalization of the coastal management process. From the variety of available options, the coordination and harmonization mechanism must be tailored to fit the unique aspects of each particular national government setting.
Use of science	Given the complexities and uncertainties that exist in the coastal zone, IMCAM must be built upon the best natural and social science available. Techniques such as risk assessment, economic valuation, vulnerability assessments, resource accounting, benefit-cost analysis, and outcome-based monitoring should be built into the IMCAM process, as appropriate.

Source: [11].

[13]. The analysis revealed that the following elements were sufficiently covered by the various documents:

- Marine and coastal protected areas and buffer zones.
- Monitoring and regulation of activities that cause significant adverse impacts on biological diversity.
- Policy integration.
- Economic incentives and disincentives.
- Promotion of public awareness and education.
- EIA procedures.

Elements that were *not* sufficiently considered included:

- Restoration and rehabilitation of degraded ecosystems and promotion and recovery of threatened species.

- Protection and encouragement of customary use of biological resources in accordance with traditional cultural practices.
- Support of local populations to develop and implement remedial action in degraded areas.
- Fair and equitable sharing of the benefits arising out of the utilization of genetic resources.
- Respect, preservation and maintenance of knowledge, innovations and practices of indigenous and local communities and encouragement of the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices.
- Promotion of emergency response measures for activities and events, whether caused naturally or otherwise, that present a grave and imminent danger to biological diversity.
- The precautionary principle.
- The ecosystem approach.

Regarding ICM studies and guidelines, the CZMC/RIKZ study found that only two ICM handbooks [7,14] and one guideline [15] provide specific guidance on MPAs, while other guidelines only concur in general terms with CBD/MPAs objectives [16–20].

The CZMC analysis examined five case studies of ICM to ascertain the extent to which they incorporated MPA aspects:

- Tanga Island in Tanzania.
- Albania Coastal Area Management Programme (CAMP).
- Dorset, United Kingdom IMCAM project.
- Belize CZM program.
- Käina Bay in Estonia.

The analysis of the case studies shows that most of them incorporated the following elements:

(a) establishment and management of protected areas;
(b) promotion of environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas;
(c) integration of consideration of the conservation and sustainable use of biological resources into relevant sectoral or cross-sectoral plans, programs and policies and national decision-making;
(d) encouragement of cooperation between governmental authorities and the private sector in developing methods for sustainable use of biological resources.

The CZMC/RIKZ analysis, notes, however, that the implementation of these elements, however, was rather limited in scope and deficiencies in the monitoring and evaluation processes made it difficult to ascertain the impacts of the projects in terms of biodiversity. Both in the African and European cases, biodiversity conservation and ICM appear to be driven by two independent processes: different government authorities are in charge of the policies concerning biodiversity conservation and management of the coastal environment. In the European Union (EU) this is compounded by overlapping biodiversity policies at the EU (Nature and Bird directives) and national levels. In Africa (Tanzania), the problem is complicated by the absence of linkages between ICM and biodiversity projects at the

local level and sectoral initiatives led by line agencies at the national level. In Belize, however, the CZM authority is directly involved in the formulation of the national biodiversity policy, which makes ICM and CBD objectives more integrated.

4. Some strategies for addressing ecological, social, and economic linkages between MPAs and larger coastal and ocean areas

4.1. General guidance

As we have discussed, the control of external influences is vital to the proper functioning of coastal and MPAs. As Salm et al. [2] have noted:

1. all areas linked to the protected area should be assessed and monitored regularly (e.g., with regard to deforestation, sedimentation, pollution from land-based activities);
2. buffer zones with controlled multiple use can help control activities impacting the protected areas;
3. coordinating mechanisms such as coordinating committees between the protected area management body and other authorities managing activities outside the protected area should be established;
4. conflicting uses between the protected area and the surrounding area can be managed if the protected area is part of a broader ICM plan.

As we have discussed, economic and social benefits derived from coastal and ocean activities are essential for the well-being of the national economies of coastal nations and the livelihoods of coastal communities. Policies for the conservation of natural and cultural heritage must thus be balanced with developmental policies, so as not to limit socioeconomic benefits and modernization opportunities. In this perspective, conservation policies and measures must be put in place taking into account their links with spatial development and, in particular, land use. Therefore, coastal and MPAs will be most effective when connected into networks or systems of protected areas through ecological corridors and incorporated into the integrated approach offered by ICM.

If managed in isolation, individual coastal and MPAs will remain vulnerable to natural resource development and exploitation occurring outside—in particular overfishing, alteration and destruction of habitats, and water pollution. Therefore, protection of coastal and marine areas—species, habitats, landscapes, and seascapes—needs to be integrated into spatial development strategies for larger areas, under the umbrella of ICM, that should incorporate a specific strategy for nature conservation coordinated with other actions for intergovernmental and intersectoral coordination. The ICM framework itself should be conceived as part of a national strategy for sustainable development.

Coastal and MPAs could be connected through links and ecological corridors to allow for migration and the genetic exchange of plants and wild animals. These, in turn, should be incorporated in broader land use policies, including the use of buffer zones. ICM encompasses the consideration of social, economic and ecological aspects in order to improve the coordination of planning and management activities that could influence the quality of the environment, economic and social opportunities and cultural heritage in coastal areas. Protection measures should be balanced with economic development opportunities and should not negatively influence the living conditions of coastal

communities or communities living inside protected areas. Buffer zones could also provide a source of revenues to help cover the costs of protection (such as, for example, from tourism fees) [21].

The Convention on Biological Diversity [11] and the Plan of Implementation for the World Summit on Sustainable Development [22] have suggested a number or approaches and tools for MPAs and their incorporation into a broader ICM framework, including:

- Application of the ecosystem approach.
- Elimination of destructing fishing practices.
- Marine and coastal protected areas.
- Incorporation of coastal and MPAs into ICM.
- ICM as the approach to address land-based activities.

4.2. Approaches for integrating MPAs into an ICM framework

The process for integrating MPAs into a broader ICM framework, as called for by the CBD, can be based on the combination of a number of approaches and tools. In the next section, we review a number of ways that can contribute to establishing linkages between MPAs and the range of uses and governance frameworks of the coastal area and adjacent watershed and ocean area.

Integrating MPA management into a broader strategy for the coastal area: MPA planning and management has to be incorporated into a comprehensive strategy for the coastal area, taking into account the ecological, biological, socioeconomic, and governance linkages between different portions of the coastal area, encompassing adjacent watersheds and offshore ocean areas. Various strategies can be suggested to attain such integration based on a strategic outlook at the regional level:

- integrated coastal area management strategies;
- watershed management strategies;
- sea-use and EEZ management strategies.

Integrating MPA management into existing planning processes: Different planning processes take place in the coastal area and it is important to promote the incorporation of MPA planning in such processes. Strategic environmental assessment (SEA) can provide a means to strategically assess the environmental impacts of plans and programs on MPAs:

- coastal use planning;
- watershed planning;
- sea use planning.

Expanding land- and sea-use planning as a system of managing human activities: Land and sea use planning rely on a number of approaches and tools that can be useful for the management of human uses both outside and inside MPAs and reduce their impacts on biological resources:

- ecosystem approach;
- precautionary approach;

- land/habitat use analysis;
- environment/development scenarios;
- environmental impact assessment;
- strategic environmental assessment;
- rapid appraisal techniques;
- zoning;
- sustainable tourism planning and management.

Integrating MPA management into existing institutional arrangements for coastal and marine management: The interests of MPAs should be represented in existing institutional arrangements for coastal and marine management. As a way to pursue such representation, MPA managers should be able to participate in governing bodies, commissions or working groups established at the local, regional, and national level to coordinate coastal and marine management:

- coordinating arrangements at the local, regional, and national level.

Mainstreaming coastal and marine biodiversity conservation and use into other sectors: The goals and objectives of the conservation of coastal and marine biodiversity have to be "mainstreamed" into other sectors, so as to reduce the pursuit of inconsistent objectives at the sectoral level and unwanted impacts on MPAs. Funds made available to specific sectors such as agriculture, transportation, tourism, etc., in particular, should be subject to assessment of their direct and indirect impacts on coastal and marine biodiversity and to measures to mitigate such impacts:

- conditionality of sectoral funds and instruments in response to biodiversity conservation needs.

Promoting the coordination of sectoral policies affecting MPAs: In addition, the promotion of better coordination among sectoral activities likely to affect measures taken to conserve coastal and marine biodiversity should entail the availability of mechanisms to resolve, and whenever possible to anticipate, conflicts:

- conflict resolution mechanisms.

Implementing MPA management activities through existing administrative, institutional, research and other frameworks: A variety of instruments are already available to MPA managers to implement daily activities. The use of such instruments should be streamlined and, whenever possible, operated in collaboration with and the support of stakeholders both inside and outside MPAs:

- regulatory instruments;
- economic instruments;
- capacity building;
- public awareness;
- scientific research.

Establishing monitoring and evaluation and management effectiveness assessment procedures: The quality and effectiveness of the implementation of MPAs can be enhanced through the use of general and more specific instruments:

- monitoring and evaluation systems;
- rapid assessment techniques;
- management effectiveness assessment;
- environmental standards and controls;
- reporting on the state of the environment.

Ensuring coordination at the regional level: On a regional level, MPAs could be conceived as a network or system rather than isolated efforts. A bio-regional approach can prove useful in the assessment and selection of candidate sites to be part of a regional system of representative MPAs and to optimize benefits arising from the conservation of biodiversity:

- representative systems of MPAs based on a bio-regional approach.

Ensuring coordination of donor efforts: In many countries of the world, MPAs have been established through the support of donor funding. Since often MPAs in the same region are supported by different donors, it is important that such efforts be implemented not merely on a project basis but rather, when needed and possible, in a coordinated way:

- programmatic approach to MPA initiatives funded by different donors.

4.3. Developing governance linkages between MPAs, ICM regimes, and watershed planning efforts

Approaches for linking the governance of MPAs with the governance of larger ocean and coastal areas are suggested by work undertaken under the Convention on Biological Diversity. The Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) to the CBD has defined the elements that comprise a national system of marine and coastal protected areas incorporated into a broader framework for the sustainable use and management of marine and coastal areas [22], namely:

(a) a primary network of highly protected marine and coastal areas;
(b) an ancillary network of multiple-use marine and coastal protected areas; and
(c) a framework of sustainable management practices over the wider marine and coastal environment.

Such a system, represented in Fig. 1, integrates biodiversity conservation goals with the need to allow sustainable uses and socioeconomic development in coastal and marine areas under the planning and management framework provided by integrated ocean and coastal management:

(a) in the primary network of highly protected marine and coastal areas extractive uses are prohibited and other significant human pressures are removed or minimized in order to

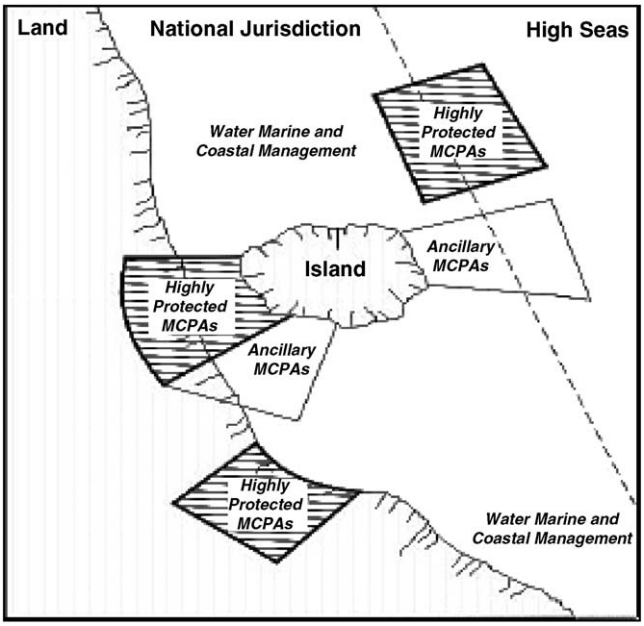

Fig. 1. Elements of a coastal and marine biodiversity management framework [22].

ensure that the integrity, structure and functioning of the ecosystem is maintained or restored;

(b) in the ancillary network of multiple-use marine and coastal protected areas human uses are managed for the joint purposes of biodiversity conservation and sustainable use and certain extractive use may be allowed;

(c) a broader framework for integrated ocean and coastal management provides the planning and management context for coastal and sea uses, recognizing the linkages between coastal areas, the adjacent watersheds, and offshore zones.

The system: (a) relies on an area-based approach to the management of marine and coastal resources, (b) makes use of approaches, tools and techniques such as the ecosystem approach, zoning of coastal and marine uses, conflict resolution mechanisms and strategic environmental assessment, and (c) implies the existence of institutional and legal arrangements adequate to represent and reconcile different and often conflicting interests in the perspective of sustainable development.

The institutional and legal arrangements for an integrated ocean and coastal management framework [23] require that:

(a) ocean and coastal affairs are elevated in the public policy agenda so as to allow for the formulation of national coastal and ocean policy goals and priorities;

(b) such goals and priorities are integrated into the national development planning framework;

(c) all levels of governments as well as private and nongovernmental interests are represented in the formulation and implementation of a national ocean policy.

For the pursuance of the above, the following types of institutional arrangements are typically needed:

(a) an inter-ministerial, inter-agency board or council, at the highest political level, presided over by the minister in charge of the lead marine-oriented agency of the country;
(b) a national planning office charged with the formulation and implementation of the national ocean policy, possibly assisted by a technical advisory body;
(c) parallel structures at the regional or local level, depending on the degree of decentralization of the administrative system;
(d) existing government offices charged with the implementation of plans, eventually with an extended mandate and supported by technical forums or executive committees to address specific issues and ensure broad representation.

4.4. The next agenda: bringing together practitioners in MPAs, ICM, and watershed management to achieve nested governance

While it is clear that many practitioners of ICM and MPA recognize the need for linkages between the two governance regimes, it will be difficult to put this goal into practice. The actors involved in MPA networks and in ICM programs are often different, and reflect different cultures, different networks of relationships, different ministries, and different goals and motivations. ICM practitioners will need to come together with MPA practitioners, as well as with watershed planners, to engage in national-level ocean and coastal planning, including designation of networks of MPAs. Similarly, they will need to engage in regional-level ocean and coastal planning to examine in detail ecological issues in an area, multiple-use interactions, and to determine areas that need to be protected, and procedures for avoiding adverse impacts in MPAs.

Such coming together for joint planning and, ultimately, joint governance will need to be facilitated by third parties knowledgeable about both ICM and MPA processes. There will be a need for capacity building to achieve collaborative nested governance of oceans and coasts, incorporating large ocean/coastal areas under ICM, networks of MPAs, and appropriate linkages to watershed and river basin issues.

4.5. Seizing the political opportunity

The World Summit on Sustainable Development enshrined, at the highest political levels of decisionmaking, very tangible targets on ocean and coastal management, and in a number of cases, also stringent timetables. Most applicable to our discussion are the targets noted below:

- establishment of MPAs consistent with international law and based on scientific information, including representative networks, by 2012;
- application of the ecosystem approach (by 2010);
- promote integrated, multidisciplinary and multisectoral coastal and ocean management at the national level, and encourage and assist coastal States in developing ocean policies and mechanisms on integrated coastal management.

These targets are a challenge to link MPA and coastal management and provide both with legitimacy and political support.

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