Integrated Ocean Management and the Fisheries Sector: Interactions, Economic Tools and Governance Structures

Anthony Charles

Saint Mary's University, Halifax Canada

tony.charles@smu.ca

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Integrated ocean management (IOM) is rapidly expanding in policy and practice across much of the world. As the word 'integrated' suggests, IOM is a systems-oriented approach to governance, one that seeks to deal effectively with the complex interactions in marine systems. The move to IOM is in many ways parallel to the similar shift to systems approaches in fisheries management (e.g., Garcia and Charles, 2007, 2008) – notably the move to ecosystem-based management that deals fully with both human and non-human components of the overall system, drawing on a diverse tool-kit of approaches to govern human activities at sea.

A key goal of IOM, as for fisheries management, lies in achieving the balance that is inherent in the idea of sustainable development – producing present-day socioeconomic benefits to humans (and as part of that, resolving conflicts among users of resources and ocean space) while simultaneously maintaining, and if necessary restoring, the ecosystem health and ecosystem services that will be needed by future generations to produce their own socioeconomic benefits. Thus IOM (and fisheries management) as forms of marine governance can contribute to concrete approaches to sustainable development. For example, they may support the emerging 'green growth' strategy, referred to by the Organisation for Economic Co-operation and Development (2011) as "providing an actionable policy framework to generate new and greener sources of growth" through "an economic development path that is consistent with long-run environmental protection, using natural resources within their carrying capacity, whilst providing acceptable living standards and poverty reduction in both developed and developing countries".

This paper explores the various concepts and approaches of IOM, together with the economic implications of these integrated governance approaches, and particularly the relationship between IOM and fisheries management. With regard to the latter, the paper addresses both the potential for synergies and the issues of overlap between multi-sectoral and single-sector planning and decision making.

The paper begins in section 1 with an overview of the rationale, conceptual basis, key ingredients and implementation approaches for integrated ocean management. In particular, that section also examines the relevance of two defining attributes in IOM – its multi-sectoral nature (with associated aspects of spatial allocation and conflict resolution) and its incorporation of ecosystem-based management – as well as a component of IOM, marine (maritime) spatial planning, that has recently gained prominence in marine discussions. Section 2 of the paper turns to the practice of integrated ocean management, examining three main topics: (a) the need to deal with issues of boundaries, scope and scale, (b) instruments and institutions for IOM, including ocean zoning, rights-based approaches, and governance institutions, and (c) the role of economics in design and implementation of integrated ocean management, including matters of values, valuation, incentives and institutional economics. The 3rd section of the paper focuses on the links (current or potential) between the fishery sector and fishery management/governance,

on the one hand, and integrated ocean management on the other. Linkages are explored that arise through the objectives being pursued, the common element of spatial management, the unifying framework of the ecosystem approach to fisheries (EAF), and policy/governance principles. A comprehensive process for linking IOM and fisheries management is suggested, based on the objectives and initial realities of each, and interactions of IOM with fisheries management are examined, based on a comparison of the 'toolkits' or portfolios of approaches and methods used in each. Finally, the paper closes with a set of conclusions consolidating the paper's main insights.

1. The Idea of Integrated Ocean Management

> "Integrated Ocean Management is not only the most appropriate framework for achieving long term goals for oceans and seas development, but also a necessary one to assure a proper sustainable development of the oceans and seas within the normative structure established by UNCLOS… Integrated management complements sectoral management, particularly by providing decision-makers and regulators with access to the information and advice required to develop sectoral measures which support ecosystem-based management."
>
> - Statement of the European Union, delivered by H.E. Mr. José Antonio De Yturriaga Barberán, Ambassador at Large for the Law of the Sea (April 11, 2002).

The above quotation is one of many descriptions of the rationale and the nature of integrated ocean management put forward by policymakers and analysts. Another is that of Chua et al. (2006) who note that:

"The [integrated management] framework (institutional arrangements, coastal strategy, action plans, scientific investigations, indicators, etc.) and processes (planning, adoption, implementation, monitoring, refinement) allow environmental concerns to be addressed in a systematic manner in accordance with the priorities, human and financial resources and the political and administrative realities of the area concerned."

In referring to integrated management as "an internationally accepted approach for achieving sustainable development of the coasts and oceans", Chua et al. (2006) further note that "The integrated approach of managing the coasts and oceans has been emphasized in Chapter 17 of Agenda 21". Indeed, Agenda 21 requires us to take into account the full range of human activities and natural ecosystems on both the land and water sides of the coast. This leads us to focus on the concept of 'integrated coastal and ocean management' (ICOM).

The idea of integrated management has been described in more detail as follows (de Young et al., 2008):

"Integrated Management (whether of oceans, coasts, watersheds, *etc.*) is an approach, or mechanism, to manage multiple (competing) uses of a certain designated area – uses such as fisheries, aquaculture, forestry, oil and gas, mining, agriculture, shipping and tourism. This involves managing multiple stakeholders (*e.g.*, local communities, industries) as well as interactions among people and ecosystems, and among multiple levels of government. The Integrated Management approach is typically characterized by attention paid to a multiplicity of

resources (*e.g.*, soil, water, fish stocks, *etc.*) and of habitats (*e.g.*, open ocean, estuaries, wetlands, beaches, lakes, rivers, *etc.*), as well as a range of environmental factors (*e.g.*, changes in water temperature, turbidity and acidity, chemical pollutants and water flows)."

As noted by de Young et al. (2008), IOM requires:

- processes for participatory decision making and conflict resolution
- a range of ecological and human information on characteristics of the designated area
- an institutional framework suitable to manage the "mix of components and interactions within the relevant system… within a wider context of human-environment interactions, institutional linkages, multi-use conflict, multi-stakeholder governance systems and the like".

Barberán (2002) reinforces this latter point in noting:

"The implementation of effective ocean and coastal integrated management involves establishing the necessary network (policy, legal, financial, and technical), and requires the involvement of governmental organizations, local communities and of the private sector. Moreover, these efforts should also concentrate in establishing a regular interagency coordination process and sustainable management of coastal areas and marine resources at all levels."

These aspects of integrated management are highlighted by Cicin-Sain and Knecht (1998), in their description of what 'integrated' means in the term 'integrated management'. They focus on five forms of integration:

1. Inter-sectoral integration
2. Intergovernmental integration
3. Spatial integration
4. Science-management integration
5. International integration.

Of these, certainly inter-sectoral integration lies at the heart of IOM. Cicin-Sain and Knecht consider that this includes not only the creation of fora to bring together the various ocean use sectors, but also mechanisms to bring together agencies covering different sectors within government. Then, intergovernmental integration is focused on linkages between levels of government, i.e. national, sub-national and local. Similarly, international integration deals with linkages across nations. Both of these complement the intra-governmental (or inter-departmental) integration noted above. With respect to spatial integration, the authors focus on linkages between 'the land and ocean sides of the coastal zone', a crucial factor in coastal management. In addition, however, integration implies a more holistic perspective on the ocean space itself, in terms of interactions among users across the area.

Two additional aspects of integration are not clearly indicated from this list but are crucial elements of IM:

6. Multi-stakeholder integration

7. Ecosystem-based integration

While multi-stakeholder integration is captured to some extent in 'multi-sectoral integration', the idea of IM bringing all relevant players to the table – not only economic sectors, but municipal and/or community bodies, nongovernmental conservation organizations, and others as well – is so fundamental to IM that it is worth highlighting separately and more inclusively.

Why one might wish to specifically highlight ecosystem-based integration will be the focus of discussion below. The key point is that ecosystem-based management is acknowledged as an inherent part of integrated management, with 'integration' providing a perspective on decision-making and problem-solving that involves 'seeing the whole picture', which in turn reflects an ecosystem point of view.

Components of Integrated Ocean Management

Ehler and Douvere (2009) describe the core elements and activities of IOM (which they refer to as 'sea use management') as follows:

"(1) *works toward sustainable development*, rather than only conservation or environmental protection, and in doing so contributes to more general social and economic objectives: (2) provides a *strategic, integrated and forward-looking framework* for all uses of the sea to help achieve sustainable development, taking account of environmental as well as social and economic goals and objectives; (3) applies an *ecosystem-based approach* to the planning and management of development and activities in the marine environment…; (4) identifies, safeguards, or where necessary and appropriate, recovers or restores *important components of marine ecosystems* including natural heritage and nature conservation resources; and (5) through *marine spatial planning* (MSP), analyzes and allocates space in a way that minimizes conflicts among human activities, as well as conflicts between human activities and nature, and, where possible, maximizes compatibilities among sectors."

This section has focused primarily on what is meant by IOM, but it is worth also highlighting the rationale for this integrated approach, which naturally relates to overcoming the problems of a fragmented single-sector approach. Thus, Douvere (2008) lists some of those problems arising from the lack of a suitable integrated framework: "(1) A spatial and temporal overlap of human activities and their objectives, causing conflicts (user–user and user–environment conflicts) in the coastal and marine environment. (2) A lack of connection between the various authorities responsible for individual activities or the protection and management of the environment as a whole. (3) A lack of connection between offshore activities and resource use and onshore communities that are dependent on them. (4) A lack of conservation of biologically and ecologically sensitive marine areas. (5) A lack of investment certainty for marine developers and users of ocean resources…".

The remainder of this section examines two defining attributes of integrated ocean management – its multi-sectoral nature (along with a conflict resolution focus), and its incorporation of ecosystem-based management approaches – as well as a major new thrust of IOM, namely marine spatial planning.

1.1 Multi-sectoral management: Spatial and resource allocation and conflict resolution

One of the two crucial aspects of integrated management is its multi-sectoral nature. Not only are there typically many uses of ocean space (including extractive and non-extractive uses), but there are also conflicting values across the sectors – including the above uses, as well as 'non-use' values, i.e. the value placed on the ocean and its resources among those who are not extracting or even seeing them – such as those who value specific marine species or the diversity of life in the oceans.

From a fishery perspective, fishers and fishery managers know well that fishing is not the only activity taking place at sea. While in many cases, competition arises between fishermen themselves, with different kinds of vessels or targeting different species, the entire fishery may well face competition for space in the ocean from a range of other marine-related uses, including shipping, tourism and nature-based activities, offshore oil and gas exploration, aquaculture and various harbour uses (Charles, 1992). In addition, impacts of land-based economic activities can create negative externalities for fisheries – for example, agriculture can lead to siltation and pesticide-based pollution, forestry can affect fish habitat, coastal factories can cause localized ocean temperature change and pollution, etc.

These interactions have led to the implementation of regulations on various industries to limit the externalities imposed on fisheries and other sectors. Environmental legislation to this end has been in existence in many jurisdictions for decades. However, these measures have typically arisen on a somewhat ad hoc basis, rather than in the context of a more integrated and comprehensive approach to dealing with the many competing uses of coastal and ocean areas.

The Intergovernmental Oceanographic Commission (IOC, 2011) has provided a checklist of questions for governments and others to ask, positive answers to which indicate that integrated ocean management (or more specifically, marine spatial planning, discussed below) would be useful in a given marine context. Note that most of the questions below focus on multi-sectoral management to deal with spatial allocation and conflict resolution (IOC, 2011):

- "Do you have (or expect) human activities that adversely affect important natural areas of your marine area?
- Do you have (or expect) incompatible human activities that conflict with one another in your marine area?
- Do you need to streamline policies and licensing procedures affecting the marine environment?
- Do you need to decide on what space is most suitable for the development of new human activities such as renewable energy facilities or offshore aquaculture?
- Do you need a vision of what your marine area could or should look like in another 10, 20, 30 years from now?"

1.2 Ecosystem-based management

Integrated ocean management, and marine spatial planning, represent broader, more holistic, approaches to managing ocean uses, including fisheries. This in turn reflects the fundamental goal of sustainable development, in keeping with World Summit on Sustainable Development (WSSD) objectives. While integrated management is becoming well accepted as a governance approach internationally, ecosystem-based management (EBM) is similarly widely accepted as a mechanism for understanding and managing a wide range of natural resource uses and environmentally-related activities. Indeed, EBM is often being implemented as a result of specific legislative or policy thrusts, often related to ocean management.

For example, Smith et al. (2007, p.633) note that EBM has developed "in Australian fisheries during the past decade, driven by a number of policy directions and initiatives". These include broad policies, such as "a national, government-wide approach to ecologically sustainable development, released in 1991" and "Australia's Oceans Policy, which adopts an explicit ecosystem-based approach to management, with explicit requirements for regional ocean planning for all uses and users of the marine environment…", as well as more fishery-specific elements – "development of fisheries legislation that incorporates explicit reference to wider ecological impacts of fishing (e.g. the Fisheries Management Act 1991)" and "new environmental legislation that assesses fisheries against environmental standards (e.g. the Environmental Protection and Biodiversity Conservation Act 1999)".

IOM and EBM are closely related, with both focusing on specific well-defined spatial areas of the ocean, both seeking an 'integrated' and holistic approach to the management of human uses in the given area, and both paying attention to the ecosystem impacts of those human uses – obviously inherent in EBM but typically incorporated in all IOM initiatives as well.

Generally, there is a high degree of complementarity and constructive overlap between EBM and IOM, but there are some differences. IOM, like any form of integrated management, explicitly deals more with multi-sectoral conflict and conflict resolution, and focuses on the governance structures needed to accomplish this. It could be argued that EBM originates in an ecological perspective while IOM comes from an administrative/governance perspective. Alternatively, it might be said that IOM reflects an organizational approach, focusing on processes and institutions, while EBM is a 'systems' approach that is focused on interactions among ecological and social (human) components.

Another popular perspective, the Livelihoods Approach (Ellis, 2000; Allison and Ellis, 2001), takes a third, also complementary route, focusing on people and communities, and how they use and rely on coastal and marine resources (Figure 1). Just as the ecosystem approach developed from a need to manage resource use in the broader context of the ecosystem, similarly the livelihoods approach grew from a recognition of the need to place natural resource sectors in a larger context of households, communities and socio-economic environments. A livelihoods approach can inform spatial and resource management in terms of demographic, socio-cultural, economic, institutional, infrastructure and non-fishing aspects (e.g., boatbuilding, agriculture, tourism).

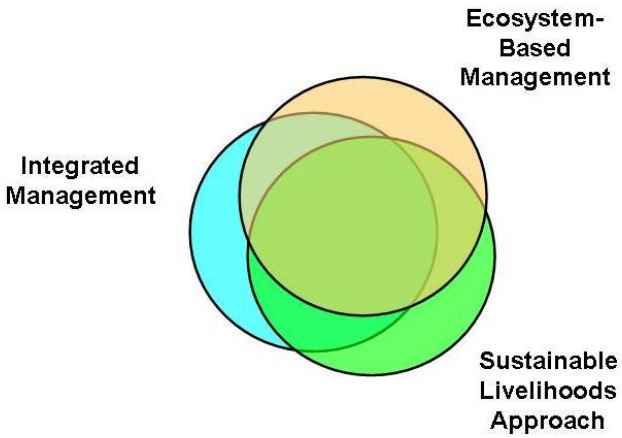

Figure 1. Relationships among integrated governance perspectives.

Just as in the late 1980s and the 1990s, the term ‘sustainable development’ became not only widely adopted but essentially compulsory to use in governmental and international circles, so too have the terms ‘ecosystem-based management’ and ‘ecosystem approach’ (EBM, EA) become similarly utilized today. Matching the lengthy debates over what should constitute sustainable development, we now see governments around the world, as well as multilateral and nongovernmental bodies of various sorts, discussing internally how to implement EBM, and debating internationally how EBM should apply to each economic sector and each type of ecosystem. These discussions are accompanied by a vast and growing academic literature on the subject.

An early version of EBM, within the realm of fishery science and management, broadened the conventional single-species view to one in which interactions of target fish stocks with other species and the surrounding ecosystem are taken into account. The Commission for the Conservation of Antarctic Marine Living Resources is considered a pioneer in implementing this form of EBM, and its convention notes such principles as “maintenance of the ecological relationships between harvested, dependent and related populations of Antarctic marine living resources” (Commission for the Conservation of Antarctic Marine Living Resources, 1982).

Today, with governments obliged to adopt an ecosystem approach of some form, there are many variations on the approach, with some focused more on the natural science ecosystem components, while others stressing a holistic and integrated (interdisciplinary) interpretation. The former emphasizes scientific analysis of: (1) fishing effects on the ecosystem, (2) ecosystem influences on fisheries, and (3) ecosystem-related influences of other sectors on fisheries. This broadens from conventional single-species fisheries thinking but keeps attention on scientific matters relating to ecosystems, and any direct management implications, while avoiding ‘human dimensions’ such as governance issues and use conflicts (which may be left to integrated management fora). There may be some recognition of the need to consider human dimensions, but only in the context of determining how to create an acceptance of ecosystem thinking among the various stakeholders, i.e. determining what is needed to induce people to implement EBM.

A full version of EBM requires extending the focus on ecosystems to comprehensive marine 'systems' that incorporate human and ecological goals, as well as human and ecological components. Thus the key to modern ocean (and fishery) governance is to focus on the 'bigger picture' around fish stocks and fishers, combining ecosystem centred and people centred thinking. This is reflected in the FAO's (2003) definition of the Ecosystem Approach to Fisheries (EAF) as one that:

"strives to balance diverse societal objectives, taking account of the knowledge and uncertainties of biotic, abiotic and human components of eco-systems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries."

This EAF reflects the point of Smith et al. (2007) that "The past decade has seen a gradual evolution in fisheries management from a primary focus on sustainability of target species and resources to a much wider focus on ecosystems, and the impacts of fisheries on them. This new approach has come to be called ecosystem-based fisheries management (EBFM), or alternatively the ecosystem approach to fisheries…".

Indeed, EAF is a particularly comprehensive approach, tending toward a sector-specific version of full integrated management. As De Young et al. (2008) note, it focuses on "aspects within the ability of fisheries management bodies to implement, even while recognizing the fisheries sector's responsibility in collaborating in a broader multi-sectoral [EBM]". Indeed, while EAF operates solely within the fishery sector (albeit recognizing linkages externally), integrated ocean management involves institutional frameworks and management of multiple uses in a multi-sectoral context (*i.e.* fisheries together with other marine, coastal and/or watershed uses, such as shipping, mining, *etc.*). Thus, EAF and IOM are very much complementary, needing to operate in synchrony even while their scope differs with respect to what is being managed.

Ecosystem-based management

(Ehler and Douvere, 2009)

An integrated approach to management that considers the entire ecosystem, including humans. The goal of ecosystem-based management is to maintain an ecosystem in a healthy, productive and resilient condition so that it can provide the goods and services humans want and need. Ecosystem-based management differs from current approaches that usually focus on a single species, sector, activity or concern; it considers the cumulative impacts of different sectors. Specifically, ecosystem-based management:

- Emphasizes the protection of ecosystem structure, functioning, and key processes;
- Explicitly accounts for the interconnectedness within systems, recognizing the importance of interactions between many target species or key services and other non-target species;
- Acknowledges interconnectedness among systems, such as among air, land and sea;
- Integrates ecological, social, economic, and institutional perspectives, recognizing their strong interdependences; and
- Is place-based in focusing on a specific ecosystem and the human activities affecting it.

1.3 Marine Spatial Planning

It has been emphasized that integrated ocean management inherently focuses on (1) multi-sectoral governance, and (2) ecosystem-based management. Much of the theory and practice of IOM deals with institutions and processes for governance. Over the past decade or so, increasing attention has been paid to a component of integrated ocean management known as *marine spatial planning* (MSP). As Ehler and Douvere (2009) note:

"Marine spatial planning is a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that are usually specified through a political process."

Marine (or maritime) spatial planning has been the subject of growing attention in various regions. In Europe, for example, a recognition that "all sectoral policies have a territorial (or spatial) impact and that a spatial plan is the most appropriate means of ensuring coherence and resolving conflicts between sectoral interests and policies…" (Douvere, 2008, p.767) has led to a point where now the EU "sees MSP as a key tool for the management of a growing and increasingly competing maritime economy, while at the same time safeguarding marine biodiversity". This point is reiterated by De Santo (2011): "With regard to Europe in particular, the Commission envisions MSP as a means for balancing sectoral interests and achieving the sustainable use of marine resources in line with the EU Sustainable Development Strategy…"

Some confusion has developed over the similarities and differences between MSP and IOM. Consider first the similarities. Ehler and Douvere (2009) note that both MSP and integrated management (of coastal areas) "are integrated, strategic, and participatory—and both aim to maximize compatibilities among human activities among human activities and reduce conflicts both among human uses and between human uses and nature". Their discussion of the interaction between single-sector management and MSP could equally apply to integrated ocean management (Ehler and Douvere, 2009):

"Comprehensive MSP provides an integrated framework for management that provides a guide for, but does not replace, single-sector planning. For example, MSP can provide important contextual information for marine protected area management or for fisheries management, but does not intent to replace them."

Finally, their list of the characteristics of effective MSP could apply equally to IOM (Ehler and Douvere, 2009):

"Ecosystem-based, balancing ecological, economic, and social goals and objectives toward sustainable development; Integrated, across sectors and agencies, and among levels of government; Place-based or area-based; Adaptive, capable of learning from experience; Strategic and anticipatory, focused on the long-term; Participatory, stakeholders actively involved in the process".

On the other hand, while MSP is described as having all the key attributes of integrated management. it is generally accepted that MSP is but one component of IOM, or, as Ehler and Douvere (2009) note, "an element of sea use management". IOC (2011) reinforces this key point, stating that MSP "is only one element of the marine spatial management process. This process

includes additional elements of implementation, enforcement, monitoring, evaluation, research, public participation, and financing—all of which must be present to carry out effective management over time." Marine spatial planning is thus an activity *within* IOM that is specifically connected with planning the spatial distribution of human uses of the oceans, producing a plan that "is usually implemented through a zoning map(s) and/or a permit system". In this way, "[we] can allocate human activities to specific marine areas by objective, e.g., development or preservation areas, or by specific uses, e.g., wind farms, offshore aquaculture, or sand and gravel mining" (Ehler and Douvere, 2009).

Thus integrated ocean management is typically seen as more encompassing than MSP – as a spatially-oriented approach to managing the multi-sectoral reality of ocean use, including possible conflicts among the uses, within an ecosystem-based and spatially-defined ocean space. While determining suitable locations for each ocean use, as well as for marine conservation efforts (e.g., through ocean zoning) is an intrinsic part of MSP, IOM can incorporate other options as well, potentially proceeding in different ways – for example, seeking to resolve conflicts among uses not by separating them in discrete spatial zones, but through stakeholder processes of conflict resolution.

Ultimately, with MSP having gained traction in national and international for a, the confusion that has developed between it and IOM needs to be overcome. In particular, we need to be careful in recognizing the value of marine spatial planning while not losing sight of the reality that other aspects of integrated ocean (and coastal) management need to be incorporated as well in the overall portfolio of ocean governance mechanisms.

2. The Practice of Integrated Ocean Management

"While most coastal countries have adopted sector-specific policies to manage ocean use, such as for fishing and oil development, it has only been since the early 1990s that some countries have started introducing an integrated approach to managing ocean and coastal areas in their jurisdictions" (Boyd et al., 2005).

Practical examples of IOM implementation may be found worldwide, with varying degrees of success. A well-known success story is that of Australia's Great Barrier Reef Marine Park Authority (GBRMP). As Day (2008: p.823) reports, "…over the last 30 years, the GBRMP has successfully established a multiple-use spatial management approach that allows both high levels of environmental protection and a wide range of human activities".

2.1 Boundaries, Scope and Scale

A key starting point for IOM, as in fisheries management, lies in setting the right boundaries, as well as deciding on the appropriate scale and scope within which to manage. Even if these matters were long ago resolved in fisheries, they need to be re-opened to develop an effective IOM framework, since dealing with multiple sectors, and marine social-ecological systems, within a context of ecosystem-based management, leads to questions of ecosystem versus sectoral boundaries, of the appropriate spatial scale of management (*e.g.*, to match the relevant ecosystem) and of adjusting the scope of management (*e.g.*, to include human impacts that may not have been traditionally managed).

Boundaries. With both fisheries management and IOM now (or soon to be) rooted in the ecosystem approach, a major challenge lies in meshing together ecosystem boundaries with social, economic and institutional boundaries. It is unlikely that the boundaries for a given ocean space can simultaneously reflect ecological, economic, socio-cultural, institutional and political considerations. Further, while EBM typically favours setting boundaries compatible with relevant ecosystems, it is not clear how to balance 'natural' delimitations of watersheds, coastal zones, etc., with boundaries of the system from the perspective of human populations and activities. In particular, a compromise from purely ecological boundaries may be needed in order to obtain broad multi-sectoral support for IOM. This reality may well be present as well within the fisheries sector, but the challenge is even greater in a multi-sectoral context.

Scope. The matter of scope concerns what is included or excluded in IOM. Just as an ecosystem approach broadens the scope of fisheries management beyond simply a 'fish in the sea, people in boats' perspective, so too does IOM broaden ocean governance to include all relevant ocean uses and stakeholders. It becomes important to include interactions between all the elements of the ecosystem and the human system that are relevant to management, but to do so through a suitable balance of a broadened perspective without incurring excessive costs or over-extending the management activities.

This issue of scope arises at times with respect to the links between management of ocean areas (sometimes referred to as marine or sea management) and managing coastal areas. For example, Deboudt et al. (2008) comment on the development of a European maritime policy that avoids coastal areas, arguing that "it would be more logical to develop a maritime policy in the context of integrated littoral and coastal zone management than the opposite. In fact, considering the management of the littoral as separate from a larger strategy, called 'sea policy' or 'maritime policy', is the opposite of a global integrated approach." The balance between integration and pragmatism, in terms of what is or is not included in integrated management, will likely continue to be debated worldwide.

Scale. The scale at which IOM is implemented can vary from the ocean space of a small bay, with its local fish resources and fishing community, to larger areas such as Canada's Large Ocean Management Areas, to those relating to regional multinational bodies such as the European Union, Regional Fishery Management Organizations, or Large Marine Ecosystems (LMEs). It is important to address differences in scale between human (social, economic, institutional) aspects of ocean uses, and the natural scales of the ecosystems and marine resources. There may also be differences in the scales appropriate to deal with each ocean use sector, such as fisheries, shipping, or ocean mining. Furthermore, ocean management will likely be required at multiple scales, with suitable 'cross-scale linkages'. For example, if local or decentralized approaches to IOM are needed to account for heterogeneity within the marine environment, but the activity of one sector, say fisheries, ranges over larger geographical areas, an institutional arrangement may be needed to help coordinate across boundaries. This would arise in exploring how IOM relates to a fishery on a highly migratory stock, such as tuna. While biological and fleet aspects are on a large scale, crossing national boundaries, both the fishers and the fishery management system must fit within IOM at a national or sub-national scale.

In practical terms, each of IOM, EBM and fisheries management takes place at multiple time scales and spatial scales. Figure 2 (Charles, 2001) depicts the various temporal scales in fisheries

management, from daily operational decisions (e.g. relating to enforcement effort) through to medium-term tactical aspects and long-term strategic choices (e.g. with respect to policy directions). In considering how IOM and/or EAF may impact on and support fisheries management, each temporal scale should be addressed. While certainly any moves to connect IOM and fisheries will involve policy and governance aspects, the multi-sectoral and multi-stakeholder processes in IOM will also affect short- and medium-term management (e.g., in relation to the relationship between fishery closures and marine protected areas).

Figure 3 (Charles, 2001) shows the range of spatial scales in fisheries, from local (a fishing community and nearby fishing ground) to large-scale (encompassing multiple ecosystems, or a specific large marine ecosystem, and/or multi-national management). As Norse (2010: p.187) notes, creating a spatial integrated management plan, one that facilitates ecosystem-based management, "requires planning on a scale that works for management: If it is too big, we miss crucial details; if too small, we have an unwieldy number of decision-making groups".

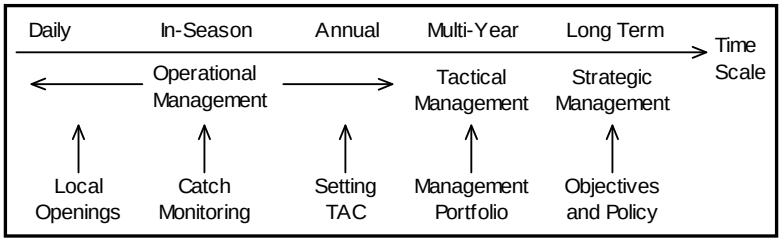

Figure 2. Temporal scales in fisheries management (from Charles, 2001).

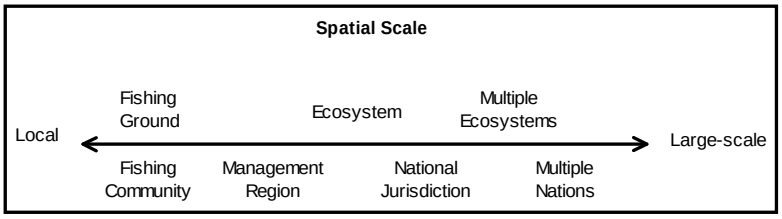

Figure 3. Spatial scales in fisheries management (from Charles, 2001).

Both EAF and IOM are applicable at a variety of spatial and organizational scales, since their key features – a multi-sectoral approach, and an ecosystem-based focus on a specific spatial area – can be applied at multiple scales, depending on the particular situation. At a large scale, initiatives in several parts of the world focus around Large Marine Ecosystems, or LMEs, which are usually multi-national areas of ocean space in which countries agree to undertake data collection and management initiatives to deal with ecosystem health and coordination of economic uses (e.g., Sherman and Hempel, 2008). In these cases, various processes of data collection and analysis are typically undertaken to provide a knowledge baseline which is then applied to large-scale planning exercises. While these and similar large-scale initiatives have

tended to dominate attention in recent years, a balanced implementation of integrated ecosystem approaches across scales, including the local level, may best meet international commitments to the 'principle of participatory governance' (UNEP 2009) as well as producing practical benefits at multiple scales. Specifically, a small-scale community-based approach to IOM (and coastal management) typically involves either a devolution or assignment of authority to the local level (e.g. to coastal municipalities), or a formal co-management arrangement of sharing in responsibilities, given that responsibility for ocean use decision-making is, in many jurisdictions, held at the level of a national or sub-national government (Charles et al., 2010).

Implementing IOM, and marine spatial planning, at a local level has the potential to improve management effectiveness by better utilizing local knowledge as well as scientific information, through community collaboration and participatory research, and by drawing on the strengths of local institutions, as well as the enthusiasm for local ecosystems, to improve efficiency through better compliance. For example, in the community of Eastport (Newfoundland, Canada), fishers partnered with government and universities to improve ocean habitat and lobster stocks, leading to an official MPA in the context of ocean management. On the other side of Canada, the West Coast Vancouver Island Aquatic Management Board is engaged in a locally-driven government-supported process of integrated planning for coastal and marine areas, including both community-scale and large-scale activities (Pinkerton et al., 2005).

To effectively achieve a local approach to IOM (and MSP), governments must pay attention to five key challenges that can limit the success of decentralized planning and management processes (Charles et al., 2010):

- *Scale mis-match* may lead to large-scale initiatives not being compatible with the needs and aspirations of those in local areas;

- *Values mis-match* may arise if government priorities are not connected well with values at the community level;

- *Goals mis-match* may occur between government and community (e.g., interdepartmental integration as a government goal, while that of the communities is livelihood integration);

- *Leadership* may be lacking if community leaders are not yet empowered in an IOM context, in which case governmental support and capacity building may be needed;

- *Equity issues* can play a major role, if the benefits and costs are not proportionate across the economic sectors and across local communities.

To deal with these challenges, governments must (a) ensure governance is participatory, (b) provide the legal and policy 'space' for local initiative, as well as concrete support, and (c) balance goals, temporal scales, geographic and administrative scales. The latter requires learning how to effectively 'scale up' and 'scale down' in order to find the best form of integrated management across multiple scales, and particularly so community-level and government-level processes match up effectively.

2.2 Instruments and institutions for IOM

A variety of practical instruments and institutional arrangements are available for effective governance and management of marine ecosystems. These contribute in diverse ways to the management of ocean natural resources, to addressing user conflicts, and to the efficient allocation among users of available space and resources. Here we focus on three of these: ocean zoning, rights-based approaches, and governance institutions.

(a) Ocean zoning

Ehler and Douvere (2009) describe ocean zoning as:

"An important regulatory measure to implement comprehensive marine spatial management plans usually through a zoning map or maps and regulations for some or all areas of a marine region. Ocean zoning is an effective tool of MSP."

The IOC's MSP initiative (IOC, 2011) notes that:

"…zoning plans and regulations are one of a set of management measures for implementing marine spatial planning. Zoning plans can then guide the granting or denial of individual permits for the use of marine space."

In an examination of "What role does ocean zoning play in marine spatial planning?", the publication Marine Ecosystems and Management (MEAM, 2011) clarifies the key difference between ocean zoning and MSP:

"In the view of many ocean stakeholders, the terms 'ocean zoning' and 'marine spatial planning' are often taken to mean the same thing: that is, lines on a map showing where some ocean uses are allowed and others are not. However, there are in fact distinctions between the concepts. The most basic is that marine spatial planning (MSP) is the process of planning ocean uses, whereas zoning is a regulatory measure to help implement the results of such planning."

While ocean zoning is thus seen as an inherent component of marine spatial planning, which in turn is part of integrated ocean management, zoning nevertheless has a long history of implementation before either of those concepts (IOM or MSP) were in place. Indeed, as Maria Damanaki, European Commissioner for Maritime Affairs and Fisheries, notes (Marine Ecosystems and Management, 2011):

"Allocating marine areas for a specific purpose, or regulating the activities in a specific area, is nothing new. EU member states have practiced this in different forms for some time. We have marine protected areas, shipping lanes, harbors, sand extraction areas, fishing areas, areas designated for wind energy, etc. These can all be called zones."

Indeed, "ocean space has been regulated or allocated in a number of different ways", but "this has been done predominantly within individual economic sectors" (Douvere, 2008). This author proceeds to describe single-sector zoning examples, such as "ship channels, disposal areas, military security zones, concession zones for mineral extraction, aquaculture sites, and most recently marine protected areas".

Two of the best-known examples of ocean zoning, both with a substantial history, arise at very different scales – the Great Barrier Reef Marine Park (GBRMP) in Australia, and the small community of Soufriere in the Caribbean island state of St. Lucia. In Australia, "over the last 30 years, the GBRMP has successfully established a multiple-use spatial management approach that allows both high levels of environmental protection and a wide range of human activities" (Day 2008). In place now is a comprehensive spatial zoning arrangement that has received the broad endorsement of multiple stakeholders.

On a smaller scale, Soufriere worked with officials of the national government, and with external funding, to bring together the community's various ocean users (local fishers, tourism operators, and others) to develop a 'spatial management plan' for the neighbouring ocean areas. The key outcome was an ocean zoning arrangement, through which all were able to agree on where each ocean use would be permitted – with specific zones designated for fishing, diving and eco-tourism, yacht mooring, coral reef conservation, etc. A local institution, the Soufriere Marine Management Association (SMMA, www.smma.org.lc) was established to manage this community-based local-level implementation of integrated management and planning.

In some jurisdictions, ocean zoning has also been implemented on a national scale. Notably, China has widely implemented a program of 'marine functional zoning' (where the term 'functional' indicates zoning based on the 'functions' of the various ocean uses). For example, its application to the coastal urban region of Xiamen, and its relevance in handling the implications of cumulative environmental impacts, is described in Xue et al. (2004). This broad effort of ocean zoning is considered a positive initiative. Indeed, Chua et al. (2006) state that this process in Xiamen "has made significant achievements in terms of environmental improvements and socioeconomic benefits over a decade of concerted efforts of the municipal government and the stakeholders". However, concerns have been expressed about whether enforcement has been adequate (MEAM, 2011).

In other locations, however, it has been the subject of much debate, largely due to actual or anticipated concerns among stakeholders. MEAM (2011) discusses how in the United States, marine spatial planning is being advocated by the national government, but efforts are made there to portray MSP as a planning exercise differentiated from zoning. There can be a fear on the part of governments to even discuss the idea of ocean zoning; for example, when a Canadian workshop (Doherty, 2005) was organized to explore ocean zoning as a tool for the Northwest Atlantic, the government's Department of Fisheries and Oceans declined to be listed as a sponsor of the event, apparently reluctant to be seen as associated with the event.

The knowledge needs and implementation methods for ocean zoning can vary widely from case to case. In considering the information base needed to develop and assess ocean zoning options, the above-noted workshop (Doherty, 2005) highlighted the need to understand several specific aspects, including:

- The ecology of the region (i.e., eco-boundaries at various scales), ecosystem components, existing sectoral zones and intensity of human uses;

- The range of zoning options, including voluntary, non-regulatory-based zoning versus regulatory-based zoning;

- The legal and jurisdictional implications of ocean zoning;
- Issues of scale: which approaches work for all scales versus those for specific scales;
- Costs, benefits and effectiveness of zoning, as well as socioeconomic considerations;
- Best practices and 'lessons learned' on engaging stakeholders in zoning initiatives;
- Levels of risk associated with ocean uses, based on robustness/vulnerability analysis.

Methods potentially useful in initiating and monitoring ocean zoning include (Doherty, 2005): (a) use of indicators to evaluate zoning, including within regulatory zones of MPAs and 'generic indicators' for larger scale, non-regulatory zones; (b) analyzing and modeling zoning options as part of a coordinated geomatic evaluation; and (c) coordinated data acquisition to ensure that data only need be collected once and can be used for multiple purposes.

A final point here concerns the connection of marine protected areas to ocean zoning. While IOM, MSP and zoning may be implemented without necessarily incorporating MPAs, on the other hand, the existence of any MPA necessarily implies an IOM/MSP/zoning arrangement of some sort, even if only in the vicinity of the MPA. An MPA is inherently spatial in nature (as it is defined for a certain ocean space), and requires management measures to be put in place within it, so that by definition, there is spatial management involved. Furthermore, as an MPA inherently involves stronger restrictions within than outside it, there is at least implicit zoning involved.

(b) Governance institutions and rights-based approaches

Implementing IOM in a multi-sectoral context, as for EAF within the fishery sector, implies a range of changes as part of national policy measures, such as: (1) changing policies to include ecosystem-oriented and precautionary approaches, and (2) increasing stakeholder involvement in management and governance. Finding the right governance institutions can be a crucial part of this. In most cases, and at whatever scale IOM is put in place, there will be specific tasks of creating multi-disciplinary and/or inter-sectoral advisory groups/committees, and other mechanisms for consultation and decision making. At a large scale, such as large marine ecosystems, institutional means are needed to participate in multi-country projects, while community-based management institutions may be needed at the local level (De Young et al., 2008).

The value of implementing an integrated area-based approach is highlighted, in the United States context, by Davis (2003, p.340): "By using distinct geographic areas as management units, policymakers might simultaneously deal with multiple objectives, address interrelated uses and resources, and integrate stakeholders and management authorities within ecosystem-based boundaries". The author goes on (p.353) to indicate that "area-based approaches hold particular promise because of their potential value in integrating single-purpose and sectoral laws and regulations" which "are unlikely to offer the advantages of area-based approaches over statewide laws and regulations".

Another key rationale for integrated management is to provide a mechanism to better monitor and manage the cumulative impacts of the full range of ocean uses (Xue et al., 2004). Within the fishery sector, such cumulative effects are considered in the context of so-called 'integrated' fisheries management plans (as are used in Canada, where the idea is to take into account the various interactions among fisheries and with the marine habitat). However, a single-sector approach clearly cannot fully deal with all cumulative impacts from all sectors. As Day (2008) notes, "The cumulative impacts of many small decisions… are real issues for both managers and decisionmakers, particularly those involved in marine spatial management. Unfortunately worldwide, most legislation for marine management does not have suitable provisions for cumulative impacts, since historically it has been based upon single-issue statutes." This, then, is a significant goal of IOM.

A specific element of governance that could be utilized in shifting to IOM is the use of rights-based approaches, which are being discussed, and utilized, increasingly as a mechanism for the governance of environmental and natural resources. Such approaches involve the specification of management rights and use rights (Charles, 2001; 2009). Management rights specify who can be involved in decision making regarding the use and conservation of specific natural resources and/or ocean spaces, while use rights define which stakeholders have access to those natural resources or ocean spaces, and possibly the quantitative levels of use that are permitted (e.g. relating to fishing effort or catch).

Use rights systems, which are becoming widely acknowledged as important to the well-being of fisheries (Charles, 2002, 2009), could be applied in a parallel manner to multi-sectoral ocean management. Consider ocean zoning as a tool of ocean management. While zones inherently involve restrictions on the activities permitted in certain locations (and 'who can do what'), they can alternatively be seen as allocating spatial use rights – the right to undertake certain economic activities in certain locations. This re-defining of zoning is analogous to the role of fishery use rights in specifying *rights* to use resources rather than *limitations* on fishing effort or catch. Theory and experience in fisheries indicates that this is more than a mere matter of terminology – focusing on rights rather than restrictions can enhance a sense of responsibility for stewardship of the resources (or ocean spaces), and can create incentives that alter behaviour in directions more compatible with society's goals, notably marine conservation. A good example of this lies in Territorial Use Rights in Fishing (TURFs). Whether rights over ocean space are secure and government-sanctioned (as in coastal Chile – see Defeo and Castilla, 2005) or informal and *de facto* (as in the fishing community of Eastport in Newfoundland, Canada – see Charles and Wilson, 2009), those rights can create strong stewardship and improved sustainability outcomes.

2.3 The role of economics in design and implementation of integrated ocean management

Economics has a longstanding and well-established role to play in decision making for individual economic sectors, such as fisheries ('fisheries economics') or shipping and marine transportation ('maritime economics'). The basic principles by which economics is useful to such sectors apply as well in the context of integrated management – i.e., to deal with (a) overall optimization of the uses of available spatial and natural resources, and (b) allocation issues relating to access and use of resources and of ocean space. For example, the ideas behind dynamically optimizing the development and use of a specific fishery resource over time can be applied as well to optimizing the dynamics of ocean space use. (Though ocean space, like land but unlike fish, is not a

'renewable' resource as such, it can be seen as a non-depletable resource, the utilization of which will need to be planned and adjusted over time.) Similarly, and embedded within the above, principles relating to the allocation of fish resources between gear types within a specific fishery can be applied to the higher-level issue of allocating ocean resources between sectors.

IOC (2011) notes several economic- and efficiency-oriented benefits of IOM and MSP, related to the above aspects, as follows:

- "To make efficient use of marine resources—marine resources, including ocean space, are increasingly in short supply. Those that are available should be used to produce goods and services in a sustainable manner";

- "To set priorities—to enable significant inroads to be made into meeting the development objectives of the marine management area in an equitable way, it is necessary to provide a rational basis for setting priorities, and to manage and direct resources to where and when they are needed most";

- "To coordinate actions and investments in space and time to ensure positive effects from those investments, both public and private, and to facilitate complementarity among jurisdictions".

It must be noted, however, that applications of economic approaches to IOM go beyond the above microeconomic considerations of optimizing resource use and allocation. Also important in developing and implementing integrated ocean management is an understanding of economic institutions, and the economics of institutions. Institutional economics and socioeconomics are important in the context of fishery governance, and perhaps even more so for integrated management, where 'good governance' and participatory approaches are accepted as necessary ingredients. Designing effective and efficient frameworks to achieve these goals is a crucial requirement, and one that can benefit from judicious application of economics.

(a) Economic analysis for implementation of IOM

With respect to the implementation of IOM, economic analysis can inform decisions about the relative desirability of the various instruments available, as well as decisions about the details of applying the instruments. For example, if zoning of ocean uses is deemed a desirable route to managing those uses, then it becomes important to achieve a spatial pattern of ocean uses that is generally acceptable and arises out of a transparent and participatory process, and that is also efficient. The latter would include ensuring that the different uses take place in locations where they make economic sense – thus, for instance, one would not want to restrict fishing to places where fish are not found, nor would one allow fishing in ways that cause habitat damage, so that economic benefits cannot be sustained over the long term. Furthermore, decisions relating to the balance between economic sectors – such as the location of ocean-floor communication cables, or of marine protected areas, in relation to fishing grounds – can benefit from economic analysis of the costs and benefits involved.

This approach can be applied, for example, in cases such as the Eastern Scotian Shelf Integrated Management initiative (ESSIM), on Canada's Atlantic coast. A compilation of human use

objectives (Walmsley, 2005) parallels a corresponding analysis of ecosystem objectives, leading to assessment both of sensitive ecological areas (where ecosystem values may predominate) and of economic activities in the ocean (where mapping of economic values can inform the development of MPAs as well as assist in conflict resolution). The role of fisheries in the area has been of particular importance to this assessment.

Whatever the mix of objectives being pursued, it will be important to assess the extent to which the potential benefits of IOM are being realized, relative to the costs of the management measures. Specifically, there will be direct management costs (additional costs incurred in IOM), as well as opportunity costs (e.g. short-term foregone fishery catches arising from adoption of an ecosystem approach). From a fisheries management perspective, it is important to understand the fishery-related costs and benefits of each IOM instrument, in order to evaluate how well IOM meets objectives, both fishery-related and otherwise.

Furthermore, it is important to examine distributional considerations, since each of the benefits and costs of IOM may impact those affected in differing ways. Often, this will be on a case-by-case basis, although there may be some widely applicable aspects as well. Assessment of distributional impacts involves understanding who is receiving the benefits and who is incurring the costs, as well as how the benefits and costs are distributed spatially (including at local, regional and national levels) and over time.

(b) Values and valuation

Economic valuation is an important tool of IOM. Consider, for example, the growing recognition of a need to incorporate the values of ecosystem services into decision making. This includes both use values and non-use values. The former arises when ecosystems services are used (or interacted with) in a direct manner, whether in an extractive way (e.g., for income or food) or in a non-extractive way (e.g. for observation or recreation). Non-use values, on the other hand, reflect a valuing of indirect services, notably for the supporting and regulating functions of ecosystems, such as maintaining water quality and community traditions (indirect use). Non-use values also include what are called ‘option value’ and ‘existence value’ – the former being the value of knowing now that we are maintaining the potential to provide ecosystem services in the future (e.g., in case they are wanted for their direct use in the future) and the latter reflects the value of the ecosystem services due to their simple existence, independently of anyone’s current or future uses of these services.

Valuation, as a part of IOM, facilitates an assessment of ocean management options, from a comprehensive perspective of the collective values of a community, or of society as a whole. Potentially, valuation can be carried out as a group process of all stakeholders, and it can help to identify tradeoffs attached to each possible decision, and as a tool for decision-makers in prioritizing available choices.

A cost-benefit framework can be useful for comparing alternative options in ocean management decision making. A choice must be made between approaches based on monetary values and those that allow for a range of values. The former includes a willingness-to-pay methodology (involving estimates of how much people are willing to pay for a service or a change in a service) and includes market-based as well as non-market-based methods. De Young et al.

(2008) note that "Market-based values are relatively easier to estimate… For example, the value of a healthy bay may be nested within the real estate values surrounding the bay. Additionally, the value of a fishery may be theoretically reflected in the value of the use rights to the fishery." However, they also note that "Non-market-based methods are necessary when the ecosystem service in question is not traded in a market. Examples of such services include the cultural identity of coastal communities, the preservation of ecosystems for their intrinsic value, or changes in water quality."

(c) Incentives

A key focus of modern governance lies in designing incentive arrangements that induce those using natural resources (such as fish) and/or spatial areas (such as a specific coastal zone) to do so in a manner compatible with society's objectives and preferences. Incentives can come in a variety of forms – economic, financial, social, cultural, legal/regulatory and institutional (De Young and Charles, 2009). Here we focus on how economic and financial incentives can be applied in IOM, but it should be noted that (1) regulatory incentives, such as fines, are perhaps the most common measure currently in place, and (2) the very act of bringing stakeholders together around an 'integrated management table' can provide an 'institutional incentive' for cooperative stewardship.

Financial incentive mechanisms are based on the idea of establishing a situation in which economic actors/agents are convinced that it is in their private interest to make the socially correct choices. Without such incentives, market failures will continue to exist, leading to outcomes that are not socially optimal. De Young et al. (2008) note that financial incentives "can be considered in two categories: market-based incentives (e.g. ecolabelling and tradable rights) and nonmarket-based incentives (taxes, subsidies). The distinction is made to reflect the idea that, in the former, a buyer and seller interact in the market to determine the price of a good or service; whereas, in the latter, it is the governmental authority defining and imposing changes to the profit function of the fishery."

It is also possible to consider economic/financial incentives in terms of 'carrots' and 'sticks', i.e. 'positive' incentives (to promote desired behaviour) and 'negative' disincentives (that penalize undesirable behaviour). De Young et al. (2008) note three forms of positive incentives (conservation price differentials such as those arising through eco-certification, best-practice/conservation payments, and rights-based incentives), indicating that "all of these seek to shift cost and revenue curves with the aim to attaining a socially optimal level of fishing effort." A particular comment might be made about rights-based incentives, in that, while economists often see these as an economic instrument, they are in fact broader in nature, relating to social and institutional considerations as well. For example, ocean zoning, if implemented suitably, may be seen as creating rights-based incentives by allocating use rights over ocean space. Apart from that example, positive economic incentives in general have not been widely applied to date in an IOM context (i.e. beyond a sectoral approach).

Economic disincentives seek to reduce the level of undesirable behaviour not through fines *per se*, but rather through monetary payments for legal activity, to explicitly compensate for negative effects on the ecosystem or on other people (externalities). Tools for this include cost recovery approaches, payments for resource use (such as royalties, taxes and use rights fees) and payments

for environmental damage prevention or alleviation (e.g. based on a 'polluter pay' principle). Such disincentives typically complement regulatory methods in correcting for existing market failures, by internalizing into the production decision-making process the externalities of natural resource use and of negative impacts on the ecosystem. Specific examples could include fees for the public (and notably tourists) to use marine parks or protected areas, or fishery license fees that can compensate for resource extraction and for ecosystem impacts of fishing.

3. Fisheries and Integrated Ocean Management

While integrated ocean management (and its components, such as marine spatial planning) may often be motivated by a general sense of the need for multi-sectoral planning and management within ocean environments, there may also be specific motivations. These may come from a single sector, from interactions between economic sectors, or from a tension arising between marine conservation and exploitation (e.g., relating to biodiversity loss versus economic gain). Thus IOM, even though inherently multi-sectoral in nature, may provide a mechanism within which to deal with direct fishery-related goals – for example, as a vehicle to delineate sensitive marine habitats where certain forms of fishing may not be allowed. IOM could alternatively be implemented with an emphasis on other economic sectors (e.g. tourism, recreation), on marine conservation and biodiversity goals, or on other values in the marine environment – but these will likely indirectly affect fisheries, even if no fishery-specific objectives are in place.

The motivation to link IOM and fisheries management arises as well if we start from a fisheries perspective and consider the implications of broadening an ecosystem approach beyond single fisheries. In this regard, Fletcher (2005, p.32) suggests:

"What is now needed is a framework that can deal with cross-fishery issues (such as cumulative impacts and allocation amongst groups) up to multisector analyses within the bioregion, leading to regional marine planning which is synonymous with Integrated Ocean Management."

In either view, attention must be paid to the possible *impacts* IOM has on fisheries. A common occurrence of this lies in the effects of MPAs implemented as part of IOM – those effects may be positive (e.g. long-term increased biomass) or negative (e.g. decreased short-term yields). While typically IOM is not designed to serve fisheries management goals *per se*, there may be some attention paid to fishery management needs, and indeed, whether an entirely new IOM is being undertaken or current arrangements are being adapted, it can be useful to focus on opportunities to consider the role of IOM in meeting fisheries management objectives, and conversely.

In implementing IOM, it will be important to assess the extent to which the potential benefits are being realized, relative to the costs that will likely arise – including direct management costs (additional costs incurred to undertake IOM), as well as opportunity costs (e.g. as a result of restrictions put in place through the process). With respect to fisheries management, it will be important to understand the balance of costs and benefits involved with the use of IOM, in comparison with other more specifically fishery-focused management tools. Equally, it is important to examine distributional considerations, since the benefits and costs of IOM may impact each of those affected in differing ways. This involves assessing (1) who is receiving the benefits and who is incurring the costs, as well as (2) how benefits and costs are distributed spatially (including at local, regional and national levels) and over time.

3.1 Linking Integrated Ocean Management and Fisheries Management/Governance

(a) Linking through Objectives

While the objectives being pursued in fisheries management may differ from those in the multi-sectoral environment of ocean management, there are likely to be strong similarities, if both are based on values of sustainable development. For example, with the increasing emphasis on ecosystem-based management for all ocean use sectors, ecosystem objectives being pursued in managing fisheries may mesh closely with those for IOM.

For example, one tool of IOM may be the use of marine protected areas – if MPAs are implemented through a suitable design with fisheries management in mind, there may be choices made that explicitly lead to improved long-term fish yields by protecting spawning fish. At the same time, there may be conflicting goals in some cases, notably in terms of the compromises required between sectors in a multi-sectoral context. If MPAs are implemented with an emphasis on non-fishery marine conservation and biodiversity goals, on other economic sectors (e.g. tourism, recreation), or on other values in the marine environment, there will likely be effects on fisheries, in which case attention focuses on whether the *impacts* of the MPA on fisheries help (or hinder) achievement of fisheries management goals. Such impacts may be positive (e.g. long-term increased biomass) or negative (e.g. decreased short-term yields).

(b) Linking through Spatial Management

Fisheries management is likely to fail if it ignores the spatial heterogeneity of fish stocks, fishing fleets and fishing communities. For this reason, spatial management tools are well-established in fisheries management, alongside the usual range of effort/input controls, quota/output controls, and technical measures. Spatial management measures are those that specify certain sub-areas for differential treatment, in contrast to other measures that apply throughout the jurisdiction or management area in question, whether the EEZ of a nation or an entire statistical area designated by a regional fishery organization. Consider three examples of spatial management measures:

- Fishery ‘closed areas’ (e.g., to protect spawning or juvenile fish) are among the most common management tools, and are spatial in nature because they are implemented within certain defined sub-areas of a given jurisdiction or management area.

- Patchworks of area-specific restrictions have often developed, in which a range of spatial restrictions are imposed on specific fishery sectors (e.g. recreational), or specific modes of production (e.g. to separate large-scale or industrial fleets from small-scale ones) and gear types (e.g. bottom trawling). These systems of spatial measures often involve a wide variety of restrictions, with the measures put in place for varying purposes, e.g. for conservation, habitat protection, allocation and/or conflict resolution.

- Spatial management may arise through access (use) rights can play a large role in managing many fisheries. For example, as discussed earlier, territorial use rights in fishing (TURFs) are spatial management measures found around the world (Christy 1982; Charles 2001). In Chile the Management and Exploitation Areas for Benthic Fisheries (MEABR) are TURFs that are well supported through legislation (Defeo and Castilla, 2005).

Like fisheries management, IOM typically involves dealing with heterogeneity across a well-defined region of ocean space, and utilizing elements of spatial management. Indeed, the IOM (and MSP) 'toolkit' of spatial management overlaps with the corresponding 'toolkit' of fisheries management. However, IOM's spatial tools are often broader in scope. Thus, from the multi-sectoral and ecosystem-based perspectives of IOM, fishery closed areas (which are typically narrowly-targeted, with the goal of protecting and conserving a specific stock) may provide indirect ecosystem benefits, but cannot be expected to provide comprehensive protection or management of the designated spatial area (nor of the full ecosystem, however defined). On the other hand, the other two fishery examples above – the 'patchworks of area-specific restrictions' and the TURFs found in many locations worldwide – have IOM counterparts in comprehensive ocean zoning and in multi-sectoral rights-based approaches.

(c) Linking through the Ecosystem Approach to Fisheries

A key part of IOM is the identification and protection, on a spatial basis, of certain crucial components of marine areas. As noted earlier, the Ecosystem Approach to Fisheries (EAF). The EAF broadens the thinking on fisheries management, and on the utilization of fisheries, by placing the fishery within the context of the surrounding ecosystem, as well as by incorporating relevant human interactions (e.g. FAO 2003, Garcia et al., 2003). From the perspective of EAF, it is important for fisheries management to take into account the impacts of fishing on the ecosystem, and conversely, the impacts of the ecosystem and of other human uses of that ecosystem, on fisheries. This draws logical connections with multi-sectoral IOM, since clearly fisheries are not alone in contributing to the cumulative effects of the various ocean use sectors on marine ecosystems. Furthermore, emerging approaches to management such as a focus on robust portfolios of management tools and on incorporating methods of risk assessment (e.g., Charles, 2008) can be applied both to fisheries and to IOM within an ecosystem context.

(d) Linking through Policy

Fisheries and their management have long had to deal with interactions, competition and conflict with other economic sectors, as well as other interested stakeholders (Charles 1992). At the same time, fisheries are dealing with a new internal emphasis on ecosystem-based management. Both these realities – multi-sectoral and ecosystem-based – must be reinforced and institutionalized as Integrated Ocean Management develops. The particular integration of IOM and fishery policy frameworks is evolving. Certain recurring aspects of a policy and institutional nature need to be understood to provide a larger understanding of how IOM, marine conservation and fisheries management inter-relate. For example, it is important to understand which government departments/agencies are involved in or responsible for IOM, what policy context is governing the development of IOM policy and its implementation, the spatial dimensions of the jurisdiction's IOM initiatives and of its principal fisheries, the range of existing spatially managed ocean areas and how these relate to both fisheries management and IOM, the extent of application and incorporation of IOM (and its constituents, multi-sectoral planning and EBM) within fisheries policy, and whether wider ocean/coastal management regimes are in place. These linkages are important to know in a given situation, but further, an assessment of the international diversity with which IOM and fishery policy interacts (across relevant countries, regions, sub-national jurisdictions and/or organizations) could lead to insights into 'best practices' in connecting IOM and fisheries management.

(e) Linking through Governance Principles

Certain key governance-related thrusts, ones that have become prominent in a wide range of spatial, environmental and natural resource related areas, apply equally to fisheries management and integrated ocean management. Some of these are as follows:

1. Precautionary approach
2. Adaptive management
3. Participatory governance
4. Systems perspective
5. Emphasis on appropriate rights, incentives and institutions
6. Comprehensive/integrated information use and monitoring

Interactions of Integrated Ocean Management and Fisheries Management

(adapted from Charles and Sanders, 2007)

- What societal objectives are being pursued with respect to (1) fisheries, and (2) IOM?
- What international goals or commitments drive and/or constrain these objectives?
- For the specific context being considered, what are the appropriate tools of IOM and of fisheries management? Are spatial management measures potentially feasible and beneficial (e.g. from a biological/species and a governance perspective)? Is there a need for an overall policy or plan for use of spatial restrictions within the EEZ? Is IOM suitably linked to development of the Ecosystem Approach to Fisheries?
- What is the appropriate scale for IOM in the given circumstances? What is the role of large-scale spatial management, notably Large Marine Ecosystems (LME), and under what circumstances is such management feasible?
- What mechanisms can assist in identifying legal/institutional goals for IOM? Is there integration with fisheries management goals? If not, would this integration be beneficial?
- What knowledge base is available? Can available knowledge be 'scaled up' or vice versa, as needed? What institution or mechanism should do this? What research is needed?
- For specific nations, which ministry is responsible for IOM and which is responsible for fisheries management? Is there coordination between the different ministries? At a regional/multi-national level, is there multilateral regional jurisdiction for IOM, and for fisheries management? Is there a need for new regional organizations? What level of integration within national and international agencies/departments would be appropriate to serve both fisheries management and IOM goals? Does harmonization exist between IOM and fisheries management legislation and existing legal frameworks?
- Are appropriate policy mechanisms in place to address the maintenance and enforcement of IOM? If not, how can this be addressed? Has integration of IOM governance instruments and approaches, both in and beyond national jurisdiction, taken place where necessary? Have existing mandates and instruments been taken into consideration?

3.2 Process for Linking IOM and Fisheries Management

How can integrated ocean management and fisheries management become better connected? In IOM implementation, one might typically begin by (a) determining the overall ecosystem and human use objectives, and (b) developing suitable institutional frameworks and processes for ocean governance. On the other hand, in considering fisheries management, one might begin by examining the fishery goals being pursued, along with the current management realities and needs, before choosing suitable tools from the 'toolkit' of fishery management. When we are looking at both together, it is not enough to carry out these processes separately.

Instead, we must consider a 'preliminary stage' of the process to address certain issues before the actual decision of implementing IOM is taken. This could include:

- assessing fisheries management needs together with IOM needs,
- exploring specific objectives and constraints relating to fisheries management and IOM,
- assessing the current and/or potential role of spatial management, and specifically whether spatial measures are already in place, or if not, the amenability of the particular fishery and/or ecosystem to such spatial management measures,
- gathering information on the nature of the marine system, and the fishery, to determine the most effective methods or tools to address the problems at hand, as well as the range of management tools already in place,
- determining the feasibility and potential impacts of IOM for a specific area, and how to integrate IOM with fisheries management,

The preliminary stage can help to determine whether the actual or contemplated spatial management has its emphasis on fishery management objectives, or on other objectives, such as ecological conservation, managing other economic sectors, and/or a broader approach of multi-use management, zoning and spatial planning. It may also provide an appropriate avenue for making decisions on the best possible method for addressing international obligations, implementing the precautionary approach, etc.

The preliminary stage is followed by a 'design stage', in which the focus turns to the specific routes to meet goals and objectives, in terms of institutions and management measures. This includes a scoping phase with suitable assessment (biological, socioeconomic, etc.) to determine feasibility in a specific area as well as appropriateness of the selected management measures to meet the issues being faced. The last stage in the process incorporates management, monitoring and evaluation components. These are key to effective outcomes, and can be seen as providing feedback into the design stage, as an essential ingredient of adaptive management.

If spatial measures are already in place, these may have been (a) fishery-focused in the first place (perhaps a closed area, for example), in which case the issue is whether they are now suitable in an IOM context, or (b) originally implemented for other reasons (perhaps broad biodiversity conservation purposes) in which case the issue is whether they can be adapted to better meet

fisheries management goals. On the other hand, if spatial measures are under consideration (rather than already in place), there may be potentially more flexibility in designing the measures to simultaneously meet fisheries management goals as well as those of EBM and IOM. In either case, the emphasis of spatial management will depend on the mix of objectives, and specifically whether there is a dominant objective or approach. For example, in the case of an MPA, the focus may be on meeting fisheries management objectives (e.g. a closed area designed to protected juvenile fish), on conservation objectives, on non-fishery aspects (e.g. tourism) and/or on multi-use management with zoning or spatial planning involving a variety of spatial elements within the relevant area. Figure 4 (from Charles and Sanders 2007) indicates a hierarchy of scenarios focusing on IOM and MPAs.

If spatial management measures are *already in place*, assessment of their current and potential role in fisheries management might be based on asking a sequential set of questions. Is there room for improvement in meeting fisheries management goals, broader ecosystem goals and other non-fishery objectives? Are the fishery resources and the fishery itself amenable to spatial management? This is expected to be the case, but if available data is sufficient to indicate otherwise, there is unlikely to be any value in continuing to pursue the adaptation of current spatial management measures to better support fisheries management. If, however, the situation could benefit from spatial management, then is it feasible to adjust existing arrangements to improve fisheries management? If not, e.g. if the spatial management measures currently in place cannot be altered (perhaps because they are rigidly set in legislation, or they result from lengthy processes of development, etc.), then no further action can be taken. If, however, it is feasible to alter the current measures, then a positive response to each of the above three questions may make it possible to modify current spatial management to better meet fisheries management objectives. Of course, it will be important to do so without negatively affecting the achievement of the objectives previously in place.

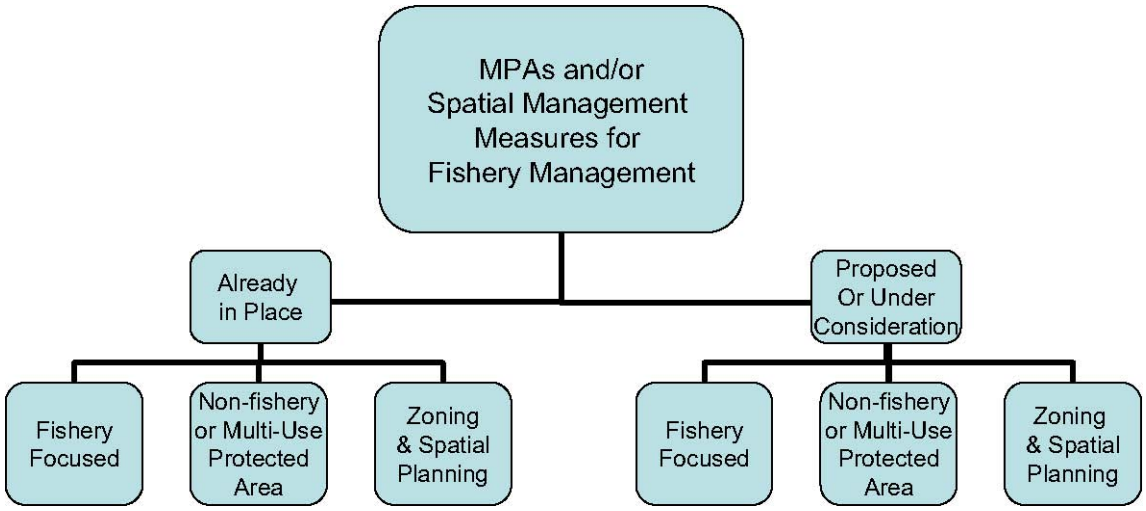

Figure 4. A hierarchy of scenarios focusing on IOM and MPAs.

On the other hand, if IOM is being developed, and spatial management measures are not yet in place, then it is important to clearly assess the objectives and the form of the potential spatial measures under consideration. For example, in the case of MPAs, those with emphasis on *meeting fishery management objectives* might have either (1) a habitat protection focus with the primary aim of protecting the habitat on which the fish species of interest to the fishery depend, or (2) a fishery management focus, constituting a component of the overall 'toolkit' of fishery management. MPAs under consideration, if *without* a particular fishery focus, may have primary goals involving (a) conservation, (b) non-fishery considerations, and/or (c) multi-use management. Finally, broad-based situations involving zoning or spatial planning, with a variety of spatial elements, can be categorized based on whether or not fisheries management is explicitly incorporated in the arrangement. In some real-world cases, such as the Great Barrier Reef in Australia, fisheries are explicitly included in the usage arrangements, and fisheries management is thus at least partially incorporated in the overall management of the area. Indeed, any sufficiently broad-based spatial management scheme, incorporating multiple marine uses and multiple objectives, should explicitly consider the relevant fisheries, in the usage arrangements and in the management system. If, however, this is not currently the case for the situation under consideration, it is important to recognize that reality, and to find ways in which spatial planning or zoning connects with existing fisheries management arrangements.

3.3 Interactions of IOM and MSP with Fisheries and their Management

It is quite common among those involved in fisheries management to express concern about the growing focus on integrated ocean management, as a distraction of time and funding from fisheries per se. This may be a valid concern in some cases, since new initiatives in spatial management and multi-sectoral governance come at a cost – if the governmental funding envelope for ocean-related activities is fixed, and fisheries traditionally received a large fraction of the funding in that envelope, then logic indicates that within-sector fishery funding may well decline. Furthermore, fishery managers and scientists may need to add to the fishery sector meetings they normally attend a new set of multi-sectoral meetings – allocation of limited time can become a real issue. From a strictly fishery perspective, then, one might ask whether allocation of resources to integrated multi-sectoral management, marine spatial planning, and related initiatives provides an improved governance system from a fishery point of view, or whether it merely draws funding away from sectoral management toward integrated multi-sectoral governance.

It should be noted that the same debate takes place within fisheries in terms of implementing an ecosystem approach (or ecosystem-based management). When inertia has kept fishery science and management functioning on a single-species basis, focused on the fish and the fishing fleet alone, or when limited financing for fishery management (as in developing countries) has prevented more comprehensive ecosystem-based approaches from being developed, there is a concern about losing the benefits of current fishery management if the broadened perspective inherent in an ecosystem approach is brought into the fishery. For example, it may be asked how individual fish species can be assessed if funding and time must go more to 'integrated' ecosystem-oriented and/or multi-sectoral assessments and management.

Undoubtedly, integrated management does provide a coordinated mechanism for the fishery sector to deal with externalities imposed by other economic sectors. This can be very helpful in

situations where fisheries may otherwise be under-represented in the broader decision making processes, so that these new fora can provide a means for the fishery voice to be heard. On the other hand, 'multi-stakeholder processes' can be two-edged swords; in cases where fisheries were historically dominant among ocean uses, these processes can equally provide other economic, conservation and civil society sectors with an opportunity to seek compromise from the fishery, and to assert rights to ocean spaces or resources, potentially at the expense of fisheries.

The fishery sector is often a major player in discussion and implementation of integrated ocean management. Indeed, governments often recognize fisheries as having a role to play in discussions that goes beyond strictly the size of the sector relative to others. This reality is due to a range of factors, including the historical and cultural importance of fishing to many coastal communities and regions, the role of fisheries as an economic 'backbone' of such regions, the typically widespread presence of fisheries within most spatially-delineated regions of the ocean considered for IOM, and not unimportantly, the 'traditional use rights' of fishers in many ocean areas, where fishing has been the dominant economic activity for decades or centuries.

Here we consider two case studies of success in developing institutional mechanisms for linking fisheries management, ecosystem-based management and integrated ocean management, in specific locations. First, a small-scale example of fishery-IOM interaction is found in the community of Eastport, within the Canadian province of Newfoundland. As noted in Charles and Wilson (2009) and accompanying references, the small-scale fishers in Eastport, having suffered from the large-scale collapse of the fishery for Northern cod in the early 1990s, sought to safeguard their lobster fishery, by researching (with government and academic scientists) the reproductive cycle of the lobsters, and their critical habitat. The fishers then decided to stop fishing in certain reproductive areas around their community, and found that indeed, this led to strong growth in lobster stocks. Following this success, the fishers saw the benefits of institutionalizing the closed areas, and worked with the Canadian government (DFO) to have an official Marine Protected Area implemented in Eastport (www.eastportmpa.com) – an example of stewardship and marine conservation at a local scale, with a clear underlying rationale based on sustaining livelihoods. There is great potential to replicate this success more broadly but to date apparently no governmental effort to do so.

Makino et al. (2009) describe a second example of fishery-IOM interaction, in this case for a larger geographical area – the Shiretoko Peninsula, in the northeast of Hokkaido, Japan. The authors note (p.207) that "Shiretoko is a very famous fisheries production area in Japan, and the fisheries sector is the most important industry here". In seeking to ensure the health of the region's marine ecosystems, "The approach was not to eliminate local fishers from the area, but to place their activities at the core of the management scheme to sustain ecosystem structure and function. That is, fisheries co-management… was expanded to ecosystem-based management to achieve ecosystem conservation." This also involves IOM, in that a key measure introduced in the region, the Shiretoko World Natural Heritage, "is a system for coordination among the wide range of sectors involved" (p.209), through a Multiple Use Integrated Marine Management Plan, developed in 2007. Makino et al. (2009, p. 212) note that "fisheries co-management has many institutional advantages such as decentralized management, adaptive management, and the use of both local and scientific knowledge… In the Shiretoko Approach, these advantages are recognized and formally incorporated in the Marine Management Plan." The links to IOM are

also based on the 2007 adoption of a new Ocean Basic Act, which "covers all the ministries involved in marine activities and research", along with an Integrated Marine Policy Headquarters "to integrate and coordinate wide-ranging policy measures by marine-related ministries". The latter instituted the Basic Plan of Integrated Marine Policy in 2008, which the authors expect to reinforce the EBM/IOM arrangements in Shiretoko.

Both of these examples, Eastport and Shiretoko, demonstrate that there can be win-win linkages of fisheries management and integrated ocean management. Nevertheless, their interaction will often be challenging. As IOM approaches continue to develop and expand, one can expect that, as with the broadening of fisheries management into ecosystem-based management (which is now widely accepted as necessary), there will be an evolution into a closer linkage of IOM and fisheries. To accomplish this, suitable participatory approaches will be needed, and matters of devolution and of subsidiarity will need to be settled. For example, whereas subsidiarity typically refers to decision-making taking place at the most local level possible, a variation on this may imply making decisions at a sectoral level whenever reasonable and at a full multi-sectoral level only when necessary.

Fisheries management has always utilized a 'toolkit' or portfolio of approaches and methods. This includes input-oriented tools (such as effort and gear limitations), output-oriented ones (e.g., catch quotas), so-called 'technical measures' (such as regulations on the types of gear allowable and the fishing seasons), economic tools (such as taxes), ecosystem-oriented approaches (such as marine protected areas) and institutional measures (including rights-based options). Similarly, IOM and MSP have a range of instruments available; this report has described some of these, such as ocean zoning, rights-based methods, institutional arrangements and incentive structures.

A key question in considering the links between fisheries management and IOM (including MSP), given the above two portfolios of management and governance instruments, lies in the extent to which IOM instruments might be complementary to, or even function in lieu of, single-sector fisheries management. More broadly, what are the synergies between IOM and fisheries management, how do these vary with the spatial scale involved, and what changes in governance models and institutional arrangements will be needed to produce desired levels of effectiveness simultaneously in integrated ocean management, in fisheries management, and in overall ocean governance?

As IOM and MSP are only now being developed as approaches, and slowly being implemented in various jurisdictions, it is too early to be able to definitively answer the above questions. To do so will require considerable effort at compiling and synthesizing specific experiences around the world, and indeed there may be too few such experiences available at present to accomplish this now. However, we can learn something from past analyses of interacting systems, networks and hierarchies. In particular, social-ecological systems theory highlights the need to build cross-scale linkages between the various scales of governance (local to international), and to be able to 'scale up' and scale down' to take advantage of innovations at each scale.

A key element here is the reality that logically, fisheries management should be intrinsically nested within IOM (and the spatial aspects of fisheries management should be nested within MSP). As Norse (2010) has noted, "Successful fishery management must address spatial heterogeneity because fishes live in ecosystems, which are places. Fisheries are therefore

overdue for… a shift to place-based management". If the above nesting approach were fully realized, then there would need to be better connections between decision-making arrangements in fisheries and those relating to multi-sectoral IOM. In reality, however, this coordination continues to be a challenge to achieve, largely due to inertia – the fishery sector has become accustomed to being treated by government as a 'separate world' from other ocean uses, and similarly management systems in fisheries are not accustomed to operating nested within an IOM framework. This inertia will need to be overcome if the efficiencies possible in linking fisheries management and IOM are to be realized, as we move towards a more robust and holistic cross-sectoral ocean management regime.

4. Conclusions

This paper has reviewed the rationale for and concepts of integrated ocean management (IOM), the key ingredients (notably multi-sectoral management and ecosystem-based management) and component tools (such as marine spatial planning), and particularly the links of IOM to fisheries management. Among the specific points emphasized in the paper are (1) the need to deal with issues of boundaries, scope and scale, (2) the range of instruments and institutions for IOM, including ocean zoning, rights-based approaches, and governance institutions, and (3) the role of economics in design and implementation of integrated ocean management, including matters of values, valuation, incentives and institutional economics.

The paper's focus on links between fishery management/governance and integrated ocean management was explored by looking at the objectives being pursued, the common element of spatial management, the unifying framework of the ecosystem approach to fisheries (EAF), policy/governance principles, and the process involved in bringing IOM and fisheries management together. Finally, interactions of IOM with fisheries management were examined by comparing 'toolkits' or portfolios of approaches and methods.

At this point, a number of closing comments are in order:

- Integrated management of oceans, like that of other areas such as coastlines and watersheds, can contribute to sustainable development (through a carefully planned and ecosystem-based approach to resource and space use) as well as enhancing economic efficiency (through conflict resolution and spatial planning/zoning to ensure best use of particular locations). Thus it supports related initiatives, such as development of 'green growth' strategies (OECD, 2011), that also provide concrete mechanisms to move society toward sustainable development.

- Concern can arise in the fishery sector, and among fishery managers, over the potential for IOM processes to act as an additional layer of bureaucracy that may complicate fisheries management, delay decision making, and channel funding, personnel or research away from attention to fisheries. It is important, therefore, to focus IOM on providing a 'value-added' to each ocean sector – which may include reducing the negative impacts of externalities from other sectors through effective higher-level actions, and streamlining decision processes based on the idea of subsidiarity (so decisions are made at the lowest appropriate level). Effective IOM, then, should act as an over-arching multi-sectoral framework within which single-sector management can take place more efficiently, with externalities of one sector on another taken into account at the IOM level (so as not to interfere with management of any one sector).

- IOM, like ecosystem-based management and specific activities such as marine spatial planning, can take place at multiple scales (community-based to large marine ecosystem) and levels (municipal, provincial, national and multi-national). Because it generally must be implemented within (and by) a specific jurisdiction, one with competence over the corresponding ocean space, there is a tendency for IOM to take place at the level of a particular nation. On the other hand, it is apparent that many lower-level jurisdictions, such as municipalities and provinces within a country, have both the motivation and capability to take on stewardship of their neighbouring ocean space (Charles et al., 2010). Furthermore, there may be scope in some circumstances for groups of nations in a given region to undertake IOM jointly. Accordingly, both the local-level and the large-scale implementation of IOM should be given consideration – as is also the case for ecosystem-based management, which can be effective at multiple scales from a coastal community to a large marine ecosystem.

- By its nature, IOM takes place in a spatially-defined manner, at whatever scale is desired, and this necessitates a recognition that each country (or ocean area, LME, etc.) has unique features, whether biophysical, political, structural or cultural, that will require similarly unique implementations of IOM. At the same time, there are common principles and approaches that can be utilized across all nations, or in different parts of a given nation, or at a larger scale of multi-national levels. Thus, the key in IOM lies in drawing on relatively universal tools while adapting to the specifics of each situation.

- Understanding what is or is not required to make integrated management work remains a critically important but unresolved matter. Day (2008) suggests that "management of any marine area cannot be expected to function effectively or achieve any objective unless a number of ongoing management challenges are adequately addressed, including: establishing effective partnering arrangements; providing jurisdictional coordination; ensuring information relevant for management is collected; providing management resources, including an enforcement capability; and developing public awareness and education." These measures would need to be put in place appropriately to the context. For example, when government is working with coastal communities in IOM (or coastal management), a 'bottom-up' perspective indicates the additional need for real appreciation of local values, reconciling of local and top-down goals, and attention to resolving power imbalances and inequities (Charles et al., 2010).

- Finally, it should be reiterated that integrated management, like fisheries management, is fundamentally a people-oriented activity. While the former is often illustrated with the use of organizational charts, and the latter can involve complex stock assessment models, they are both focused on managing people – the role of humans in fisheries and other ocean uses. This is why ecosystem-based management, while based in an ecosystem perspective, must go well beyond ecological matters (De Young et al., 2008), and why both IOM and EBM need to deal prominently with a wide range of human dimensions, including values, objectives, behaviour, incentives and institutions. While there are important biophysical and ecological factors that need to be considered in IOM, its effectiveness will be largely determined by how well human dimensions are taken into account.

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