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SYNTHESIS DOCUMENT ON THE EXPERIENCE AND USE OF MARINE SPATIAL PLANNING

Note by the Executive Secretary

1. The Conference of the Parties to the Convention on Biological Diversity, in paragraph 75 of its decision X/29, requested the Executive Secretary to compile and synthesize available information in collaboration with Parties, other Governments and relevant organizations on their experiences and use of marine spatial planning, in particular on ecological, economic, social, cultural and other principles used to guide such planning and the use of area-based management tools, and to make such information available for consideration at a future meeting of the Subsidiary Body on Scientific, Technical and Technological Advice prior to the eleventh meeting of the Conference of the Parties.

2. Pursuant to the above request, the Executive Secretary collaborated with the Secretariat of the Scientific and Technical Advisory Panel of the Global Environment Facility (GEF-STAP), the United Nations Environment Programme (UNEP), the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC/UNESCO), regional seas organizations/regional initiatives, and other international organizations such as The Nature Conservancy.

3. The Scientific and Technical Advisory Panel of the Global Environment Facility, has thus prepared the attached preliminary report on the experience and use of marine spatial planning. The report synthesizes available information from third and fourth national reports, contributions from the regional seas organizations, and additional information and documents collected from research, as well as the results of expert consultation meetings jointly organized by GEF-STAP Secretariat and the Secretariat of the Convention on Biological Diversity on the margins of the Third Intergovernmental Review (IGR-3) on the Implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) convened in Manila, on 23 to 24 January 2012.

4. The draft report is being circulated in the form and language in which it was received by the Secretariat.

* UNEP/CBD/SBSTTA/16/1.

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Marine Spatial Planning in the Context of Convention on Biological Diversity

A study carried out in line with CBD COP 10 Decision X/29 by the Scientific and Technical Advisory Panel of the Global Environment Facility

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Executive Summary

This report synthesizes available information on the scope of Marine Spatial Planning (MSP) activities around the world, the lessons learned about the utility of spatial planning and management processes and tools, and criteria for success at various scales. It explores spatial management as a means to protect marine and coastal biodiversity while at the same time addressing human needs, concentrating especially on valuable ecosystem services in coasts, estuaries and deltas, nearshore environments, and open oceans. The report reviews conventional planning processes, identifies innovative new tools, and discusses the potential MSP has -- as yet not fully realized, -- in aligning conservation and development interests while protecting vital ecosystems, the services they deliver, and the biodiversity they support.

The report is not intended to be a comprehensive review of marine spatial planning - rather it provides a concise response to the question posed by COP 10 Decision X/29 para 75 *"to compile and synthesize available information in collaboration with Parties, other Governments and relevant organizations on their experiences and use of marine spatial planning, in particular on ecological, economic, social, cultural and other principles used to guide such planning and the use of area-based management tools".*

MSP is a framework supporting ecosystem-based management, in that it recognizes the connections between land, freshwater, and marine ecosystems, and addresses human uses of and impacts of importance in all these systems. As such, comprehensive MSP has the potential to greatly improve management, reduce the loss of ecosystem services, help address or avoid conflict, and create economies of scale and efficiencies for enforcement and management. Planners that have strived for equitable sharing of benefits, and MSP processes in which accountability is a prime consideration, have witnessed more and longer-lasting support for MSP.

MSP is primarily about forward planning of space for all human uses and non-uses in the marine environment, followed by the implementation of such plans. The crucial difference between MSP and other area based management is that MSP is strategic and forward looking rather that reactive and developer led. However, one size doesn't fit all in MSP; in order for MSP to realize its full potential, capacity needs to be built for context-specific planning and governance. Multi-scale processes are needed to bring together top down and bottom up initiatives into a systematic approach. Engaging leaders, creating common understanding, establishing working groups leads to buy-in, co-financing, and improved management.

Given that comprehensive MSP initiatives are relatively new and thus largely untested, in those that are underway there appears to be greater emphasis on planning than on post-plan implementation. This is in contrast to smaller scale, MSP processes, such as those that serve as the foundation for ICAM or MPA design. One of the greatest constraints to comprehensive MSP, whether it is attempting to use spatial management to accommodate all the marine uses of an area, or whether it flows from ICAM initiatives that are then 'pushed out to sea', is that the ambition can exceed the capacity. Robust MSP processes take into consideration the feasibility of implementation, which in turn affects the development of marine spatial plans.

A supportive legal framework to enable MSP, and a governance system that allows participatory planning and adaptive management in which strategic goals and objectives are periodically revisited, provides essential elements for MSP success. Where existence of nested institutions in which local level

institutional policies are supported by national institutions, while local institutional actions are in agreement with national priorities, this is optimal. Careful development of institutional commitments to MSP is needed prior to planning and implementation. In preparing for MSP, there should be clear definition of issues to be addressed by MSP, and the possible risks and costs in engaging in the process. Accountability can and should be built into the planning stage, into the implementation of marine spatial plans or zoning, and into the governance arrangements to support management.

Development of participatory planning processes is essential to developing MSP legitimacy and buy-in. If MSP is forced, initial gains will likely be lost. A governance assessment early in the MSP can indicate how solid the foundations are for participatory planning, and whether it needs to be strengthened. Buy-in is needed, but MSP can allow more effective outreach, which in turn paves the way for better understanding, engagement, and support for policies borne out of spatial planning.

Successful MSP requires not only a legislative framework, but good governance (good here means appropriate to the social and political context and capacity; governance refers to all forms of governance, not just that taken on by governments). The absence of these creates significant barriers to MSP. Even MSP that is generally neutral may require that planners support or even be an advocate for disadvantaged stakeholder groups. There may be institutional resistance to decentralized/participatory planning processes, in which case these sorts of stakeholders may need training and support to make their voices heard. Weaker disadvantaged sectors and stakeholders must be supported in preparing their own spatial policies/plans before coming to the MSP process and/or supported to articulate and negotiate for their needs.

Creating realistic timelines for programs is fundamental to finding and keeping support from stakeholders, donors, and implementing agencies. Recognizing and acting upon the need for sustainable financial streams to support MSP is important. It may be preferable to have modest, but consistent amounts of support, through Payments for Ecosystem Services streams of revenue or from user fees, since large grants can create dependencies.

Multilateral institutions have an enormous opportunity to invest in capacity building, leadership development, mechanisms to address governance challenges, the reduction of institutional overlaps/gaps, and the development and use of conflict resolution mechanisms through MSP initiatives.
It should be noted that MSP as an approach supporting ecosystem-based management has the potential to improve and enforce other existing management frameworks, reduce the loss of ecosystem services, help address or avoid conflict in use of marine space and establish conditions promoting economies of scale. To meet this potential, intergovernmental organizations, as well as national and local governments, should support sufficient capacity-building and public awareness activities targeting relevant audiences on the utility of MSP as one of the key management approaches for coastal zone and maritime space at the international, national and local levels.

MSP has great potential as an organizing framework, and serves as a worthwhile investment through which national marine management can be strengthened, and -- perhaps more importantly -- international marine management can be initiated and then developed over time. Of particular interest is the possibility that MSP will help foster engagement in discussions of how to effectively sustain ecosystems that are transboundary in nature, or which are found in ABNJ. This is an exciting time for planners and managers, as more and more lessons are learned about MSP in all its various forms and applications.

List of Acronyms

ABNJ	Areas Beyond National Jurisdiction
CIESM	Mediterranean Science Commission
CBD	Convention on Biological Diversity
DEFRA	Department for Environment, Food, and Rural Affairs (UK)
EA	Ecosystem Approach
EBA	Ecosystem based Adaptation
EBM	Ecosystem based Management
EBSA	Ecological or Biologically Significant Areas
EEZ	Exclusive Economic Zones
FAO	Food and Agriculture Organization
GEF	Global Environment Facility
GOBI	Global Ocean Biodiversity Initiative
GBRMP	Great Barrier Reef Marine Park
HELCOM	Convention on the Protection of the Marine Environment in the Baltic Sea Area
ICES	International Council for the Exploration of the Sea
ICM/ICAM/ICZM	Integrated Coastal (Area or Zone) Management
IEA	Integrated Ecosystem Assessment
IGO	Intergovernmental Organisation
IMO	International Maritime Organization
ISA	International Seabed Authority
IUCN	International Union for Conservation of Nature
LME	Large Marine Ecosystems
MPA	Marine Protected Area
MSP	Marine Spatial Planning or Maritime Spatial Planning (EU only)
NGO	Non Governmental Organisation
ODEMM	Options for Delivering Ecosystem Based Management (UK)
OSPAR	Oslo & Paris Conventions for the Protection of the Marine Environment of the NE Atlantic
PES	Payment for Ecosystem Services
RACSPA	Regional Activity Center for Specially Protected Areas
REDD	Reducing Emissions from Deforestation and Reduced Degradation
RFMO	Regional Fisheries Management Organisation
SAP	Strategic Action Plans
SEA	Strategic Environmental Assessment
TNC	The Nature Conservancy
TDA	Transboundary Diagnostic Analysis
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
WCMC	World Conservation Monitoring Centre
WWF	World Wildlife Fund

1. Introduction

What is MSP?

Marine spatial planning (MSP) is an approach or framework to provide a means for improving decision-making as it relates to the use of marine resources and space. According to the Aspen institute, MSP is an alternative, public process that collects, analyzes, and identifies where human activities occur, in order to achieve agreed upon ecological, economic and social goals. Key features of successful MSP programs include consideration of multiple scales; a long-term perspective; recognition that humans are an integral part of ecosystems; an adaptive management perspective; and concern for sustaining ecosystem goods and services (Aspen Institute 2011). The ecosystem approach (EA) and ecosystem-based management (EBM) are principles that underlie most MSP in coastal and marine realms. MSP is forward-looking and informed by predefined goals, objectives and policies.

This report considers MSP as broader than the name might imply: consideration of what constitutes MSP extends beyond *planning* to include management, and beyond purely *marine* planning and management to include coastal and even watershed planning and management. The common basis of all MSP is that it is *spatial,* in other words that it is place-based management, no matter at what scale and in what social context or biome it is being practiced. The spatial dimensions of how we understand ecosystems, the links across space that allow for integrated management, and the connections that humans have to marine and coastal ecosystems and their biodiversity are all critically important considerations in planning and implementing effective management.

Marine spatial planning is not only area-based, but it is also temporal; that is, utilizing forecasting, as well as seasonal management. This means that MSP is not only based on predicted responses to management (in the ecological and the social domains), but also the response and lag times involved. In essence this helps answer the question: If uses are allocated to this area and kept to these levels, what will be the benefits, to whom will they accrue, and how quickly?

Marine spatial planning exists in myriad forms, and is increasingly used to improve management and reduce conflicts, either between direct users of marine and coastal resources and space, or between institutions playing a role in managing activities impacting those resources and areas. The proliferation of MSP suggests that without it, coastal and marine management regimes are unable to meet rising challenges brought about by ever-increasing coastal and marine use, and clashes over access and rights to resources.

MSP is not a substitute for Integrated Coastal Zone Management or Integrated Coastal Area Management (see for instance Cicin-Sain and Knecht 1998 and Kay and Alder, 2006), but rather builds on these important approaches and the policies that support them. MSP also builds on other, more circumscribed spatial tools, such as area-based fisheries assessments, local or municipal land use plans, area-based biodiversity measures such as identification of Ecologically and Biologically Significant Areas (EBSAs), and the siting of Marine Protected Areas (MPAs) and MPA Networks. The management that flows from MSP, broadly defined, thus includes ICAM, MPA design and implementation, and the spatial allocation of maritime uses/ maritime sectors (e.g. shipping lanes, oil & gas leases, fisheries closures, scientific research sites, etc.).

Marine protected areas and MPA networks merit special attention, as these are the most common arenas for MSP throughout the world today. Perhaps the most widely touted example is the spatial planning and zoning that has taken place within the Great Barrier Reef Marine Park (GBRMP) in Australia – a vast, multiple use area accommodating many different maritime uses and targeting a wide variety of conservation and sustainable use goals (Agardy 2010). The initial zoning of the GBRMP, and subsequent rezoning, is an evolving MSP process guided by operating principles and the best available technologies, including GIS and decision-support tools. MSP within the GBRMP is also notable because of Outlook reporting, in which the management authority develops and communicates scenarios for the future based on predictions of what will happen to the park's ecosystems, their services, and their values given the performance of GBRMP management. This scenario development allows adaptive management to take place, such that underperforming management (i.e. management that does not succeed in meeting specified objectives laid out in the spatial plan) can be adjusted to keep the park on track to meet its goals and vision for the future.

There are smaller scale examples that deserve mention as well. In a review of global MSP processes for the US Coastal and Marine Spatial Planning (CMSP), the example of St. Kitts and Nevis stands out as a small scale, developing country initiative (NOAA Science Advisory Board 2011). Lessons learned from this initiative are detailed later in this report (see Box D). In light of the CBD's revised Aichi Target 11, protected areas should be integrated into the wider land- and seascape, and relevant sectors, bearing in mind the importance of complementarity and spatial configuration. MSP represents a useful area-based management tool in this context. Furthermore, the information flowing from MPAs should help guide not only MPA designation efforts, but also MSP efforts (Meliane et al., 2010). The wide variety of MSP approaches suggests that there is no single way to do MSP effectively. It should also be noted that biodiversity conservation is not normally a major goal of MSP, nor is it always a consequence of it. Nonetheless, there are elements of successful MSP that contribute to positive conservation and development outcomes which are elucidated in this study.

Such positive biodiversity outcomes occur through MSP when interconnected ecosystems are treated systematically and all impacting uses/ pressures are addressed, as warranted by the problems that management must address (Agardy et al. 2011a). A distinction can thus be made between the use of spatial tools (as in many of the aforementioned measures that are part and parcel of MSP) and holistic or comprehensive MSP, which occurs at large scales (state waters, EEZs, and even regional sea scales) and typically involves addressing all impacting sectors/uses. A biodiversity focus can exist within these large scale efforts, although in some cases biodiversity conservation is a secondary concern or even a consequence of, rather than a goal of, MSP.

MSP is not an end in itself, and it is not a policy - rather it is a framework that focuses on the three dimensional, often dynamic space required to deliver the goods and services society needs or desires from marine ecosystems and to plan how this space will be used. At its most effective, MSP considers this in terms of both natural and political boundaries, reconciling conflicting uses of space in a fair and equitable manner, identifying and promoting synergistic uses, recognizing the intrinsic value of biodiversity, and working within the prevailing political, legal, administrative and cultural regime.

2. Overview of theory and practice of implementing MSP

MSP, and the spatial management regimes that flow from it such as coastal management and ocean zoning, already occurs at various scales throughout the world, from small locally-managed marine areas and coastal planning undertaken by municipalities, through mesoscale planning and management at the state and provincial level, to planning of ocean use throughout EEZs, from ridges to reefs (coastal areas through watersheds and out to sea, sometimes across national boundaries), and within regional seas and Large Marine Ecosystems (LMEs)**.** Size of MSP initiatives, methodologies for engaging stakeholders and doing planning, and tools vary, as do stated goals and objectives of MSP.

There are many definitions of marine spatial planning to be found in the literature, most of which see MSP as an approach that includes the following features: it is marine and coastal planning that is forward looking, participatory, iterative, and which includes environmental and socio-economic considerations; it is also management that is comprehensive, science-supported and area-based, and promotes sustainable development. Decision makers and managers often ask how this is different, or - more importantly – better than the frameworks already being used such as ICAM, EBM, Ecosystem-based Adaptation (EBA), zoning etc. Experience shows that it is not better than these concepts and tools, but it rather coordinates their use, thereby improving outcomes that flow from their use.

Integrated coastal management (ICM) merits particular attention here, especially as it is practiced in developing country contexts. ICM (or ICZM – Integrated Coastal Zone Management) has been an appropriate response to the challenge of integrating different activities and managing the impacts that flow from them in the coastal setting – primarily coastal lands (along coastlines, within coastal municipalities and communities, and across watersheds and drainage basins), as well as the nearshore marine environment. ICM planners have worked not only to address issues specific to circumscribed coastal areas, but also to scale up from these localized efforts, either through expansion of the management area targeted, or through replication (Chua 2012).

There is little doubt that it is the prevailing political, legal, administrative and cultural regimes that dictates if and how marine spatial planning will be implemented. In any discussion on marine spatial planning these differences must be recognized and accommodated and for that reason there is no one size fits all marine spatial planning model.

While there is no single model for MSP, there is a generic planning process that involves establishing a vision, setting goals, and determining measurable objectives, from which allocation of space and resources within that space can flow, as well as the area-specific management needed to sustain the ecosystems that stakeholders collectively value. This process is described in subsequent chapters of this report, with select case studies detailing certain aspects. It should be noted that the case studies presented are not a review of all MSP examples, but rather illustrate specific points. Other publications such as Agardy 2010; Ehler and Douvere 2009; Meliane et al. 2010; and NOAA Science Advisory Board provide further examples.

3. Visioning, setting goals, and determining objectives

Planning processes for coastal or marine management systematically follows these generic steps: 1) determine a vision for the future (what it is that management should achieve), 2) identify what is in the way of achieving that vision (pressures, conflicts, drivers behind threats, etc.), 3) outline specific goals for management that overcome the most important threats and constraints, and 4) create management plans for achieving those specific goals (ELI 2009). Thus, goal-setting is a necessary first step in all MSP. In embarking on MSP initiatives, visions and goals should be articulated as clearly as possible, with the involvement of as many stakeholder groups as possible (including different agencies of government that have sectoral management responsibilities). A survey of MSP initiatives shows that the broad-based visions for an MSP-guided world include vastly reduced user conflict, improved and more efficient management of coasts and seas, healthy ecosystems and intact biodiversity, and maintenance of the ecosystem services that oceans, coasts, and estuaries provide human societies (Agardy et al. 2011a).

The scope of MSP varies according to the vision. Some MSP initiatives are very localized, whereas others span entire regional seas and the coastal and watershed areas associated with them. Some MSP focuses only on marine or maritime uses, other MSP initiatives integrate coastal and watershed planning and management with marine management, in an Ecosystem Approach or EBM way. Such MSP can be considered comprehensive -- comprehensive in considering a wide variety of uses and the connections between and within social and natural systems, not necessarily large in geographical scale or in scope of management.

Strategic goals, defining what needs to be done to achieve the vision, are somewhat more general than objectives in MSP processes. The most effective plans are those developed in response to very clearly stated, very specific objectives. Measurable success occurs when objectives have metrics associated with them, with agreed upon indicators and targets. At the same time, systems to monitor social-ecological impacts of MSP must be in place – these can be scientific and/or participatory depending on the context. Information from monitoring should inform management adaptation. But, as goals can change just as ecological conditions and human needs change, MSP should be a cyclical process in which there is a periodic assessment of whether goals and objectives continue to be relevant.

Katsanevakis et al (2010) provides a methodology of how these high-level goals can be translated into operational objectives, Fig.1. They also provides examples of methods for evaluating the performance of adaptive management frameworks as well as the effectiveness of spatial management plans through the use of ecological, socioeconomic and governance indicators and thresholds.

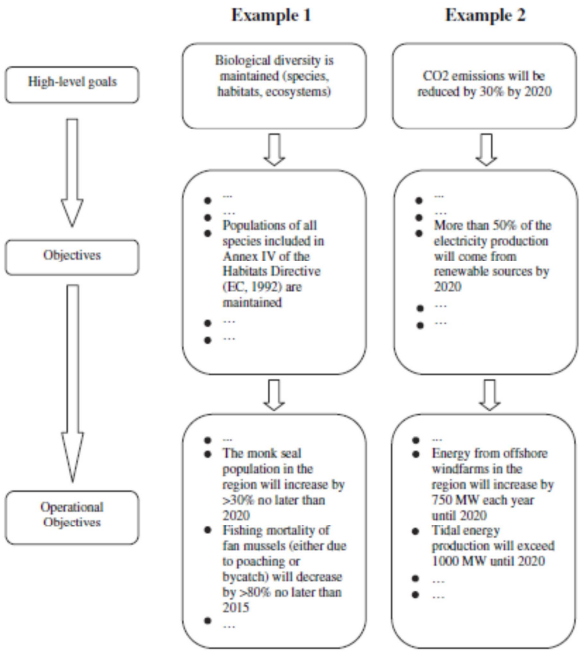
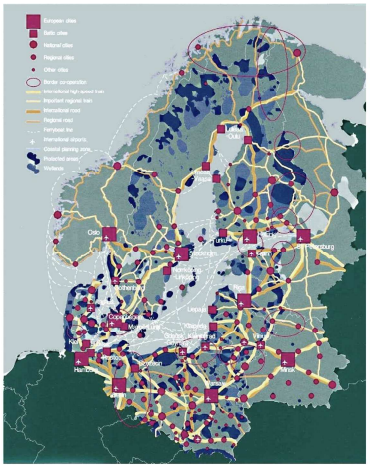


Fig. 1. From high-level goals to operational objectives: visualisation and examples. Source: Katsanevakis et al. 2010.

In common with many other marine management approaches, including ICZM, Strategic Environmental Assessment (SEA), Ecosystem Based Management (EBM) and Integrated Ecosystem Assessments (IEA), MSP can be very data demanding. Frequently, however, data for setting goals, objectives, and thresholds are limited. Nonetheless, there are examples where MSP has guided not only national marine and coastal planning, but transnational planning within a regional sea. Perhaps the best example is in the Baltic Sea region (see Box A).

BOX A. National and transnational MSP in the Baltic Sea Region



The Baltic Sea Region is probably the most advanced in developing transnational MSP. The Baltic Sea is a semi-enclosed sea area connected to the North Sea through the narrow Kattegat. It is a self-contained sea that is brackish on average, fairly shallow and covered by ice in some areas in winter.

In October 2010 the HELCOM-VASAB MSP WG was launched to ensure cooperation among the Baltic Sea Region countries on coherent regional MSP. HELCOM is the Regional Seas Convention for the Baltic. VASAB (Vision and Strategies around the Baltic Sea) was established in 1992 is an intergovernmental network of 11 countries of the Baltic Sea Region. Its mandate is to promote cooperation on spatial planning and development in the Baltic Sea Region. Co-operation between the land and marine planners is fundamental to the success of this process. The Baltic Sea Maritime Spatial Planning Principles were adopted by HELCOM and VASAB in 2010 to provide guidance for achieving better coherence in the development of MSP in the Region (HELCOM VASAB 2010). MSP is seen as a key tool for sustainable management by balancing economic, environmental, social and other interests in spatial allocations. The ecosystem approach is the overarching principle and long term sustainable management has priority when balancing interests and allocating uses in space and time. The work plan for the Working Group up to 2013 includes the application of the 10 principles, to find a common understanding for planning and to explore the possibilities for a Spatial Vision for the Baltic Sea.

For the Baltic Region much of the thinking on transnational MSP takes place in the EU funded projects BaltSeaPlan (www.baltseaplan.eu) and Plan Bothina (http://planbothnia.org/). Of particular interest is "Vision 2030". This looks back from that year showing how MSP would ideally have been translated into practice between 2011 and 2030. This encourages pan-Baltic thinking, spatial connectivity, spatial subsidiarity and the formation of a transnational MSP coordinating body. It identifies four topics that cannot be achieved at a national or sub-national level alone, including a healthy marine environment; a coherent pan-Baltic energy policy; safe, clean and efficient maritime policy; and sustainable fisheries.

A submission by HELCOM-VASAB MSP WG (2012) identified the most important practices for ensuring cross-border maritime spatial planning concern the following issues:

- Enhancement of the stakeholder involvement from the very beginning of the planning process –due to need of development of socio-economic impact assessment of different sea uses for prioritizing among uses and mitigating spatial conflicts and for ensuring broader ownership of maritime spatial plans and by that improving their enforcement;
- Development of the Strategic Environment Assessment (SEA) methodology – due to need of joint common denominator of the SEA reports for the maritime spatial plans at the Baltic sea basin level;
- Alleviation of information constraints and proper identification of information gaps – since only a Baltic-wide coordination effort in this filed can allow the production of evidence based maritime cross-border spatial plans;
- Development of the BSR data model – since cross-border maritime spatial planning needs joint data standards for easy data exchange;
- Conducting conscious inventory– since cross-border maritime spatial planning needs conscious decision among BSR countries on priorities with regard to maritime research uncoordinated action in this field will only add to the existing information gaps;
- Agreeing on the future use of the Baltic sea space – since existence of such Baltic-wide vision is an important prerequisite for coherent cross-border planning in particular deciding about priorities, ensuring synergies among plans and safeguarding proper conflict mitigation.

However, the vision, strategic goals, and objectives at the site level may not correspond to wider visions for a region. In the best cases, the collective vision at the large geographic scale reflects the needs and desires of local users and communities. Determining these large scale visions and achieving MSP to scale is a challenge, especially in regions where intergovernmental frameworks are not developed that can support a regional, ecosystem-based approach, or in parts of the world where effective conservation and sustainable development starts from the ground up. A case in point is the Philippines, where planning that is grounded in communities and municipalities can be effectively scaled up in an additive fashion.

Co-management and community-based approaches have been essential for progress toward sustainable resource use, especially in the tropics (Christie and White 1997; Olsen and Christie 2000). When government institutions and traditional management regimes are weak, there is often little recourse but to rely on community or co-management regimes. The development of ecosystem-scale relevant approaches, embodied in EBM, LME and other seascape management approaches, while grounded in ecological understandings, will need to complement and build from best practices based on decades of research on functional environmental management approaches in developing countries (Christie and White 2007). Investments in community-scale programs thus can spur large-scale conservation or resource management programs. The case of Danajon Bank management in the Philippines (see Box B) is an example of experimentation in scaling up through spatial management while maintaining articulation with community or co-management planning processes.

The example of Danajon Bank thus shows how visions for community-based management that grew out of a recognition of the importance of using area-based management to conserve biodiversity, as an important ecosystem service benefiting local people, can be scaled up for more regional MSP.

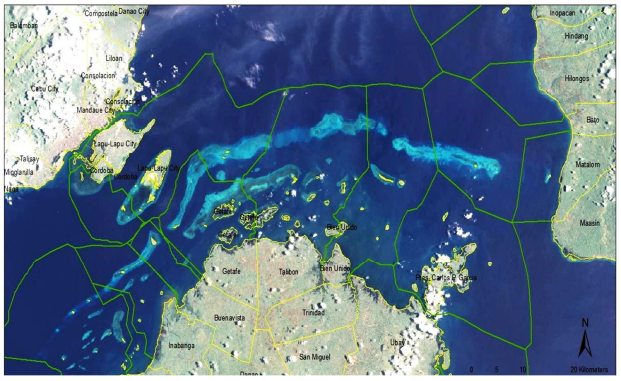
Box B: Community-based Conservation scaled up to MSP in the Danajon Bank Marine Park Project (Sparks 2012; CCEF website)

The Danajon Bank Marine Park Project is a two year project funded through USAID which seeks to establish the first collaborative large-scale MPA in the Philippines (CCEF 2012). The project is being undertaken by Coastal Conservation and Education Foundation (CCEF), a local NGO that has worked with local communities in the central Philippines for over 14 years, in collaboration with municipal and provincial government offices. CCEF is facilitating the creation of a large MPA on the outer bank of Danajon Bank (Figure 3), which has not been under active management and is a state of decline with serious impacts on vulnerable local community well being and food security (Figure 4). This project is an extension of recent management efforts in the inner Danajon Bank, namely Project FISH (USAID funded, www.oneocean.org), which have measurably improved conditions in the inner reef (Armada et al 2011). While it is unlikely that the inner reef will fully recover due to sedimentation, it is projected that the outer reef will rapidly recover if appropriate protection is provided.

The purpose of the Danajon Bank Project is to provide food security, protect biodiversity and create alternative livelihood options for fishermen. The project aims to enhance the quality of life for resource dependent stakeholders through increased economic opportunities, improved fisheries output and enhanced coastal environments. Specific project outputs include:

1. Baseline profiling of socio-economic, biophysical, institutional, policy and governance conditions in the Danajon.
2. Develop a Danajon Bank Marine Park governance framework plan through inter-local government cooperation at the municipal, provincial and regional level
3. Develop the Danajon Bank Marine Park management plan in conjunction with stakeholders
4. Develop constituencies and support for the establishment and management of the park through and extensive information and education campaign
5. Plan and catalyze tourism enterprises

The program uses a mixture of ICM , MPA and MSP planning concepts. Regarding MSP efforts, ocean uses are being mapped and the project recently held a 'summit' of dozens of local and provincial government leaders, scientists, and NGO staff resulting in the signing of a 'pledge of commitment' wherein zonation of ocean uses is specified as a key goal. The eventual goal, which may not be realistic in two years, is to create a large park with zones for uses and protected areas. Given the continuing challenges facing coastal communities in the Danajon, a collaborative effort among stakeholders is a key planning focus within the MSP effort (Armada et al 2009).



4. Available tools and innovative methodologies

Marine spatial planning is increasingly becoming an important framework for ocean governance and is being developed in many countries around the world. International organizations such as the EU (EC 2010), OSPAR (OSPAR 2010), HELCOM/VASAB (HELCOM 2007; HELCOM VASAB 2010), and ICES (ICES 2009a and 2009b), are promoting MSP at a national level and are starting to address the important issues around transnational MSP processes (EC 2008). Throughout the world a very significant body of research is ongoing (or recently completed) looking at developing new, or adapting existing tools and methodologies for use in MSP. Keeping up to date with these developments and research is a challenge and describing existing tools and methodologies at any particular moment will become dated in a relatively short period of time. Fortunately, many of the projects looking and MSP use web-based communication platforms, many of which are updated regularly. This report will, whenever possible, provide reference to these websites to allow access to the most up-to-date information and to aid in the identification and selection tools most appropriate to needs and resources.

There is already a plethora of tools available for use in MSP - depending on the understanding of what a 'tool' is, exactly. These range from legislative instruments and policies through, planning systems, environmental and economic standards and thresholds, remote sensing, use zones, decision support tool, GIS applications, mathematical models and web-based dissemination and consultation methods, data handling and visualization tools to simple 3D physical models and maps. This will not be a comprehensive review of all tools available for use in MSP but will identify some of the more widely used.

Innovative concepts, technologies, and processes that inform or guide MSP significantly increase its potential to improve coastal and marine management. These new concepts include planning done simultaneously or in a systematic and phased way across a hierarchy of scales; and three dimensional planning of ocean space that includes benthic and water column considerations. New tools to support MSP are used in a variety of contexts, depending on the goals of MSP and the capacities of planning authorities. Matching the technology to context, including consideration of human capacity and appropriateness is important.

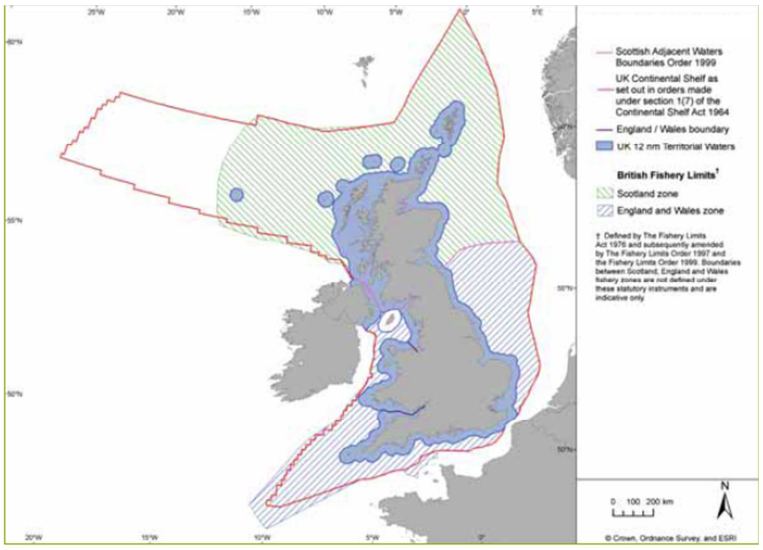
a. Policy and Legislation – High Level Goals for MSP

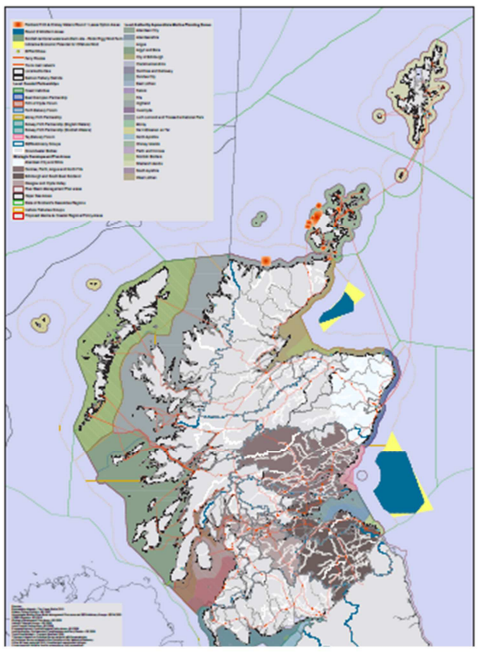
No planning process starts with a blank canvas. Obligations are derived from global, regional, national and local commitments and builds on existing policies. Any planning system must recognize and take account of the existing context and work with these high-level goals.

For countries with large maritime jurisdictions and devolved or decentralized administrations it may be useful to consider a nested or tiered approach to marine spatial planning. This approach was taken in the UK where certain powers are devolved to national parliaments or assemblies. At the highest level, the UK Government, the Scottish Government, the Welsh Assembly Government and the Northern Ireland Executive adopted UK Marine Policy Statement. This policy statement defines the framework for preparing Marine Plans, ensuring consistency across all UK marine area, and provides direction for new marine licensing and other authorization systems in each UK Administration. It sets out the general environmental, social and economic considerations that need to be taken into account in marine planning. It also provides guidance on the pressures and impacts which decision makers need to consider when planning for, and permitting development in, the UK marine area (see Box C).

BOX C: **Nested or tiered hierarchy of plans in the UK.**

The UK Marine Policy Statement was prepared under the Marine and Coastal Access Act 2009. The Marine Policy Statement will remain in place until it is withdrawn, amended or replaced. As set out in the Marine and Coastal Access Act 2009, it will be reviewed as and when the relevant policy authorities consider it appropriate to do so. The Marine Policy Statement commits the 4 different administrations to coordinated marine planning across administrative boundaries. To ensure consistency between marine and terrestrial planning there is a spatial overlap between marine and terrestrial planning areas. Terrestrial planning generally extends to mean low water spring tides and marine planning to mean high water spring tides. In addition, the UK Administrations are committed to ensuring that coastal areas, and the activities taking place within them, are managed in an integrated and holistic way in line with the principles of Integrated Coastal Zone Management (ICZM) as set out in the EU ICZM Recommendation.





From a national perspective, there are number of overarching international conventions, treaties and laws recognise the need to consider human pressures in the marine environment through an integrated, ecosystem approach to management of maritime activities. The most relevant international legislation and policies to MSP are the United Nations Convention on the Law of the Sea (UNCLOS), the Convention on Biological Diversity (CBD), the United Nations Agenda 21, and the FAO Code of Conduct for Fisheries (Katsanevakis et al. 2010). CBD has three high-level goals: (1) the conservation of biological diversity; (2) the sustainable use of its components; and (3) the fair and equitable sharing of benefits arising from the use of genetic resources. These international legal instruments, coupled where relevant, with overarching goals of Regional Seas Conventions and LMEs, are useful in defining high-level goals for a marine spatial planning system. Arguably, the most important tools in MSP are clearly defined high-level goals that derived their authority from international agreements and/or national legalisation.

At a high level, the objectives of conventions governing the conservation and sustainable use of marine resources and their definitions appear to be closely aligned. However, trade-offs do occur when faced with the conservation of biological diversity while simultaneously permitting the sustainable use of its components. Turning these objectives into more specific goals and management actions requires time and spatial scales to be defined.

b. Ecosystem Approach and Assessments for MSP

An essential tool for MSP is Integrated Ecosystem Assessment (IEA) which will assist in monitoring the spatial effects of existing, and predict the effects of proposed, human activities. Tallis et al (2010) describe how to undertake the various steps required in IEAs including scoping, selecting indicators and defining thresholds, risk analyses, management strategy evaluation and monitoring in situations where both data and governance vary independently in quality. They describe various models that can be used in these different situation which include the use of Ecopath with Ecosim models (see http://www.ecopath.org/) to assess food webs and identify critical biological indicators and thresholds. Setting indicator thresholds between good and bad is frequently a contentious issue and both Ecopath with Ecosim and Atlantis (see http://atlantis.cmar.csiro.au/) can help. Combining Atlantis with non-point agricultural pollution models such as AnnAGNPS (http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/?ss=16&navtype=BROWSEBYSUBJECT&cid=stelprdb1042468&navid=140100000000000&pnavid=140000000000000&position=Not%20Yet%20Determined.Html&ttype=detailfull&pname=AGNPS%20Home%20Page%20|%20NRCS) can be a powerful tool for considering multiple objectives for terrestrial-marine and human-natural systems (Tallis et al. 2010).

Katsanevakis et al. (2011) point to the growing emphasis on outcome, rather than activity, based performance and describes methods for management evaluation based on biophysical, socioeconomic and governance goals and the use of indicators and thresholds to define decision rules for adaptive management.

In a response to an OSPAR request, ICES (2010) advise that the specification of threshold values between levels of ecosystem status can facilitate policy application and communication but should be interpreted with caution since they are arbitrary, often aggregated, points on a continuum of changes caused by of both natural as anthropogenic origin. The most appropriate scale for assessments linking pressures and status is one in which there is a close association between human pressures (activities), ecological attributes, management objectives and the socio-economic value, because these will result in

a more robust outcomes in response to management actions. In addition, thresholds between good and bad can be based on human induced pressures, set either as absolute values or temporal trends. The ICES Working Group on Ecosystem Effects of Fishing Activities compares the strengths and weaknesses of the IEA approach used in OSPAR area, USA, Canada, and the North Sea, and includes information on the selection and evaluation of indicators (ICES 2010).

ODEMM (http://www.liv.ac.uk/odemm/), an EU funded project, is developing a set of fully-costed ecosystem management options that will assist delivery of the objectives of the Marine Strategy Framework Directive (EU 2008a), the Integrated Maritime Policy for the European Union, which promotes sustainable maritime spatial planning (EU 2007) and the Guidelines for an Integrated Approach to Maritime Policy (EU 2008b). The key objective of ODEMM is to produce scientifically-based operational procedures that allow for a step by step transition from the current fragmented system to fully integrated management. Two tools have been developed. The first is a pressure assessment tool to aid the identification of key pressures (specifically from human activities) on marine ecosystem characteristics to allow management action to be focused on the most damaging activities and identify the most vulnerable ecosystem characteristics. The second is a Linkage Framework conceptual tool to describe the relationships between the ecological, socio-cultural and economic characteristics (ODEMM 2012).

c. Mapping, Decision-Support, and Tools for Forward Planning

Mapping is central to MSP. Maps of environmental characteristics, species and habitat distributions, ecosystem goods, services and vulnerabilities, human activities or pressures and their cumulative impact are data demanding and are often not available. In many cases this is one of the main technical and scientific barriers to MSP.

Successful MSP involves not only developing plans, but examining trade-offs and developing scenarios that can help raise awareness about the consequences of decisions regarding access to, and use of, ocean and coastal space and resources. Tradeoff analyses are commonly done in decision-making, but MSP frameworks can make those tradeoff explicit and transparent, allowing cost/benefit analyses to guide decision-making (White et al., 2012).

Optimization methodologies and decision-support tools such as MARXAN can help evaluate options, but the guiding principles must be clearly stated and agreed. In most cases of actual MSP around the world, the options are first derived by expert opinion, then assessed by tools that are supported by available data. The consequences of implementing a spatial management plan (both negative and positive - e.g. displacing fishers, adding costs for industrial users, reducing user conflicts) should be anticipated and evaluated, either through trade-off analysis, scenario development, or by simple stakeholder discussions on possible outcomes.

MSP is concerned with spatial optimization of marine uses and marine protected areas. GIS based tools, such as MARXAN (see http://www.uq.edu.au/marxan/) and Ecopath are used to find optimal locations based on defined constraints and targets, however, the evaluation of the risks and consequences options are beyond their capability (Stelzenmuller et al. 2011).

Foley *et al.* (and references therein) lists a number of planning processes and tools that could be used in implementing ecosystem-based MSP. These include:-

- Feasibility analyses as a means of identifying the best spatial placement of activities (e.g., determining possible locations for renewable wind projects; see Massachusetts Ocean Plan, www.mass.gov/ and Coastal Wind Energy for North Carolina's Future, http://www.climate.unc.edu/coastal-wind).
- Vulnerability analyses integrating spatial data on the distribution of marine habitats using expert assessments of the level of vulnerability of each habitat type to the suite of human activities that occur there.
- Cumulative impact studies that quantify the number, map the spatial extent, and assess the frequency of multiple human activities at multiple spatial scales.
- The combination of vulnerability and cumulative impact maps to inform regional MSP by identifying areas where ecosystem vulnerability and cumulative impact levels meet the objective of maintaining healthy ecosystems or where they are mismatched.
- Existing and developing decision support tools, such as MARXAN and MarineMap (http://www.marinemap.org/), can be used to visualize how different configurations of use areas can reduce (1) the level of cumulative impacts in any one area, (2) the number of conflicts between users and between users and the ecosystem, and (3) the number of trade-offs that are necessary for each use sector. MarineMap, in particular, can build the ecological goals of a spatial planning project into the program so that it is easy to evaluate whether or not a particular planning scheme meets the ecological goals of the process (Foley et al. 2010).

The Finnish Center for Excellence in Metapopulation Biology's Biodiversity Conservation Informatics Group uses the same primary datasets (e.g. fishing pressure, exposure to thermal stress and biodiversity) to compare different methods for mapping conservation management options across a relatively vast, poorly known region, to see if broad trends emerge irrespective of approach. They also evaluated the conditions where alternative approaches might provide results comparable to methods using optimization. The different mapping methods used were i) visual gradient overlay in RGB colour space, ii) Categorical classification of proposed conservation and management action zones, iii) MARXAN target-based site optimization algorithm and iv) Zonation conservation priority ranking (http://www.helsinki.fi/bioscience/consplan/software/Zonation/index.html)

This study showed that despite the different mapping methods employed, the results show substantial similarities. The authors concluded that:-

- The RGB maps are valuable for providing a rapid visual overview of the distribution of input variables and their interactions. The primary intent of this technique was descriptive, not prescriptive. Therefore, translating these simple RGB maps into specific management actions is challenging.
- The Marxan result, weighted Zonation result, and the categorical management action classification can be used to recommend specific management and conservation actions, but based on different assumptions.

Delavenne et al. (2012) also compared Marxan and Zonation and found the conservation-value maps produced by Marxan and Zonation were strongly influenced by the cost metric, but each identifying similar areas as being important. They also point out that the approaches that underpin Marxan and Zonation are fundamentally different, with Marxan seeking to minimize costs while meeting specified targets, and Zonation seeking to maximize biodiversity benefits given a specified cost.

Stelzenmüller et al (2010) developed a Bayesian Belief Network (BN) linked to GIS as a practical tool to support marine spatial planning. This allows the relationships between human activities and their combined impacts on marine habitats to be established using empirical and qualitative data and to test management objectives by means of scenarios. Building on this work, and to incorporate socioeconomic assessments of planning objectives, Stelzenmüller et al (2011) used the BN-GIS modelling framework to assess the risks of possible spatial management options in relation to 2 further scenarios i.e. (1) a shift of resource distribution due to environmental change and the assessment of spatial management options under a defined management objective, and (2) the spatial expansion of wind energy development with a related fishing effort allocation and the prediction of ecological and economical risks. The BN-GIS modelling framework supports marine planning by assessing what/if scenarios for different planning objectives and related management measures. It is a useful tool for mapping and communicating scenario uncertainty, allowing planners to assess the uncertainty of management measures due to future changes in human uses of the sea and to examine the spatial pattern of uncertainty related to planning targets and management options. Furthermore, it offers a visualisation tool that facilitates the engagement of different stakeholders in such a process (Stelzenmuller et al. 2010). However, it needs to be adapted to each case according to the available data (such as driving factors for fishers' behavior) spatial scale and management objectives, in particular, the definition of targets and acceptable thresholds against which predicted changes can be assessed (Stelzenmuller et al. 2011).

d. Ocean Zoning

Ocean zoning can provide many benefits in marine management including recognizing the relative ecological importance and environmental vulnerability of different areas, allowing harmonization with terrestrial land-use and coastal planning, better articulating private sector roles, minimizing conflict between incompatible uses and maximize the achievement of social, economic, and ecological objectives while minimising the total social, economic, and ecological cost (Katsanevakis et al. 2011; Agardy 2010). In addition it may not only reduce conflicts through the creation of use-priority areas but also act as a catalyst for users within zones to coordinate their activities, especially with the creation of dominant-use zones (Agardy 2009a).

Ocean zoning as an outcome of MSP is widely accepted in Europe, but is considered a political non-starter in other places. For example, it is interesting that the US approach to MSP, as contained in the CSMP Policy framework proposed by the Obama Administration, does not go so far as to explore ocean zoning options. Some have suggested that the term zoning is a political non-starter in the US, untenable to even discuss in a political atmosphere charged with discussions of how to avoid undue government intrusion in people's lives (Agardy 2009b). Yet recent analyses have shown that MSP, when it leads to mapping of optimal areas for different ocean uses (i.e. zoning) can provide clear economic and policy-streamlining benefits (White et al. 2012), even in the US. China, which has mandated ocean zoning in national waters, has advanced significantly with its national MSP effort.

Guidance on using MSP to develop ocean zoning plans is emerging. Sanchirico et al (2010) describe the process in theoretical terms, while TNC has elucidated best practices (TNC 2009). The latter NGO's leadership in assisting the country of St. Kitts and Nevis to develop an ocean zoning plan has provided the foundation for a forthcoming training module, which should prove to be useful in other contexts, particularly MSP in Lesser Developed Countries. Details about this initiative are provided in Box D below and preliminary lessons learned follow.

Box D. Marine zoning in Saint Kitts and Nevis: a path towards sustainable management of marine resources
(adapted from Agostini et al. 2010)

The marine spatial planning exercise undertaken as part of USAID funded project in St Kitts and Nevis is one of few examples to date of comprehensive marine zoning for tropical island nations. This project developed one of the first comprehensive marine zoning designs for the waters of a small island nation in the Eastern Caribbean. The government's awareness of marine zoning as a useful management approach and their desire to apply it in their country were important contributors to the success of the Marine Spatial Planning Process.
The goal of this project was to develop a marine zoning design and provide a set of tools that could inform this and other management efforts, which would lay the groundwork for future implementation of marine zoning in St. Kitts and Nevis and other management efforts. The project had two primary guiding principles: (1) rely on the best available science for making decisions and (2) engage stakeholders at all possible levels. The project team used the following process:

1. **Engage Stakeholders.** A variety of informal meetings with diverse stakeholders and decision makers from government, community groups, the private business sector, and fishers' associations were conducted to ensure stakeholder participation along the way. A steering committee whose membership included the various groups outlined above was established to guide the marine zoning process
2. **Establish Clear Objectives.** Through a participatory process, stakeholders and decision makers defined a vision for marine zoning in their waters. This vision was used as a basis for all project activities.
3. **Build a Multi-objective Database.** The project team devoted significant resources to gathering, evaluating and generating spatial data on ecological characteristics and human uses of the marine environment. Three main approaches were used to fill data gaps: (a) expert mapping, (b) fisher surveys, and (c) habitat surveys.
4. **Develop Decision Support Products.** To help the people of St Kitts and Nevis to make planning decisions, finalize a zoning design, and implement a marine zoning plan, the project team produced a spatial database, a web-based map viewer, maps of fisheries uses and values, seabed habitat maps, use compatibility maps, outputs of multi-objective analysis
5. **Generate Draft Zones.** As a culmination of the aforementioned activities, the project team, key government agency staff and stakeholder groups generated a marine zoning design.
6. **Establish a governance framework.** To help establish a governance framework that will enable implementation the team conducted a review of existing laws and potential mechanisms available to support marine zoning in Saint Kitts and Nevis.

The draft marine zoning design and all of the project activities leading up to it have built a strong foundation for marine zoning in St. Kitts and Nevis. The next phase of this work involves continuing the work with government and stakeholders of St. Kitts and Nevis to finalize and implement the existing draft marine zoning plan. Moving the marine zoning design generated for St. Kitts and Nevis to a fully implemented marine zoning plan will take a concerted effort on the part of government, user groups, NGOs, and the international community.

Following are some key lessons learned that emerged from the first phase of the St. Kitts & Nevis zoning project (provided by The Nature Conservancy):

The importance of establishing strong relationship with stakeholders (users, government and private sector)

The project team invested a great deal of time and resources in forging relationships with government Ministries, their respective agencies, and stakeholders of St. Kitts and Nevis. A steering committee with membership across agency staff and user groups was established to guide the Marine Spatial Planning process. These relationships were instrumental for many activities from project management to collection of data during field surveys.

The challenge of representing habitat and uses at the edges (for example off-shore and watershed areas)

Although the country indicated the desire for a zoning plan that extends out to the EEZ

The project team was not able to address this due to the lack of clear methodology for the collection of spatial information for habitats extending beyond the 30-meter depth contour line, and the scope of resources for the project. Future efforts should carefully consider this element and invest in approaches and tools aimed at describing deeper habitats and offshore waters. In addition, the inshore boundary for the marine spatial planning process was defined as the farthest extent of seawater influence. While information on sand mining and some other land activities that affect coastal waters was included, important influences such as watershed inputs and coastal development were not represented. There was a decision early on that these land-based influences were beyond the scope of this project, but they will need to be addressed in the future to improve the effectiveness of any eventual zoning plan. Approaches to represent human impacts and activities on coastal lands, short of including them in a full land-sea zoning plan, should be developed.

The challenge of representing the future vision for marine systems in quantitative and analytical tools deployed in a marine zoning process

The project team dedicated considerable effort to helping citizens of St. Kitts and Nevis to define a shared vision for their marine space. The challenge was then spatially representing this shared vision and explicitly incorporating the vision into quantitative and analytical tools. The decision support products developed under this project are successful at representing current conditions, but they are not effective at depicting projected uses of the ocean into the future. At present, there seems to be a disconnect in most zoning efforts between the desire to represent human uses and impacts into the future (including climate change impacts) and the ability to map projected distributions of system characteristics (both ecological as well as human uses) into the future. There is a need to develop practical examples of approaches that link current state and future vision for marine space. While ocean zoning represents a promising framework to represent future vision for marine space, the lack of existing data and tools makes it difficult to address this need.

The important yet challenging task of effectively integrating socio-economic and ecological data

Prioritizing the collection of a wide variety of information across both the socio-economic and ecological spectrum and integrating this information can be challenging. Making balanced decisions on

investments of data resources, acknowledging the mismatch in scale between types of data, and making transparent choices to overcome this challenge is essential.

The importance of careful and thoughtful use of systematic conservation planning tools

The systematic conservation-planning tool applied in this project (Marxan with Zones) helped organize a wide range of information and assign actions to specific locations across the seascape. Like any modeling tool, Marxan with Zones presents a set of challenges and opportunities. There is a danger of such tools becoming a "black box" with choices and assumptions unclear to stakeholders, setting up a negative chain reaction against other decision support products. In order for these tools to be useful, it is important that they are applied in the most transparent manner, with stakeholder involvement in the definitions of key assumptions and parameters.

The challenge of effectively matching the scale of the problem with the solutions

There is a fundamental dilemma in ocean management: the scale at which we can readily practice effective management and the scales at which marine ecosystems operate are very different (Agardy 2010). This is a very common problem in small island developing states. Successfully achieving sustainable ocean use will require recognition of this problem, mobilization of resources to develop solutions, and leadership in driving change.

d. Area-Based Innovative Financing of Management

Government agencies are increasingly pressured to monitor ocean and coastal uses, undertake surveillance and enforcement activities, and support other aspects of operational management across ever-wider areas, with ever-decreasing budgets. The need to identify sustainable financing for both planning and management has never been greater. MSP, and the ocean zoning schemes that can emerge from spatial planning, can be harnessed to support innovative financing that allow revenues streams originating from the private sector to supplement public funds for ocean management.

Though not yet put into practice in a systematic (and explicit way), MSP can result in the identification of "trading zones" for environmental markets – such as Payments for Ecosystem Services (PES) markets and both biodiversity and carbon offsets (Agardy 2008). The UN dialogues about REDD and REDD+ (see for instance http://www.redd-oar.org/links/REDD-OAR_en.pdf) suggest that blue carbon markets may come online in the future, allowing countries to sell carbon credits from management that prevents destruction of carbon-sequestering habitats such as mangrove forests, seagrass beds, and saltmarshes. In an MSP context, these values could be evaluated against other uses of the area (for instance, resort development, forestry, etc,), and if decisions are made to preserve these habitats for the carbon sequestering services, preservation zones could be established as an outcome of the marine spatial plan.

e. Adaptive Management

MSP initiatives which have built in monitoring or evaluation mechanisms also allow for true adaptive management, which can be promote maximum resilience (ecological and social) in light of climate change and other large scale environmental changes. In such assessments, as in the planning, scientific information can and should be supplemented by user knowledge, but how to link and use these different sorts of datasets in an open and transparent manner must be given careful consideration.

Communicating information about how well management is succeeding under MSP is an essential element of MSP and can drive good decision-making (Leisher et al, 2012). WWF has recognized the potential power of such outreach and has developed a cartoon booklet detailing the negotiations around MSP in the Baltic, and the benefits that can accrue from MSP there (see Figure 2; WWF 2010). Communication is made easier when processes are fully participatory, but in the absence of much stakeholder involvement (due to capacity limitations or cultural constraints to participation), planners can engage in outreach that effectively makes the planning process transparent and understood.

Figure 2. WWF cartoon depicting MSP stakeholders negotiating MSP (WWF 2010)

Some key web-based resources describing new advances in MSP initiatives utilizing these tools are provided below.

Select MSP Tool Resources

A vast amount of information on tools for MSP is available on the website of different agencies and research projects. Information and software on the wide range of tools is available on these sites or links are provided to specific websites where these can be obtained. In addition to the specific sites identified in the text and references, the following provides links to a number of very useful websites where additional information of tools for MSP is available.

NOAA Coastal Services Center: http://www.csc.noaa.gov/tools/
At the time of access this site contained an 18 tools dealing with analyses, data handling, data visualisation and simulation used to turn data into information needed in decision making. There is a further link from this site to the NOAA Digital Coast site http://www.csc.noaa.gov/digitalcoast/tools/index.html which, at the time of access, contained a further 26 tools. Tools include habitat priority planners, essential fish habitat mapper, cumulative impact models. Some tools are Web-based, providing direct online analysis and viewing, while others are downloadable extensions that provide new functionality for desktop geographic information systems

The Ecosystem-Based Management (EBM) Tools Network
http://www.ebmtools.org/about_ebm_tools.html
The Ecosystem-Based Management (EBM) Tools Network is one of the premier sources of information about coastal and marine planning and management tools in the United States and internationally. Coastal and marine planning and management tools help practitioners incorporate scientific and socioeconomic information into decision making. The mission of the Network is to promote healthy coastal and marine ecosystems and communities through the use of tools that help incorporate ecosystem considerations into management. At the time of access there were 173 tools, 176 books and guidance documents and information on 29 projects posted on the site. Many, but not all are free.

Monitoring and Evaluation of Spatially Managed Areas (MESMA)
http://publicwiki.deltares.nl/display/MESMA/TOOLS
MESMA is an EU-FP7 funded project on monitoring and evaluation of spatially managed marine areas. At the time of access there were 72 tools available with summary description of many. In addition, the site provides links to a wide range of website where additional information on spatial planning and decision can be found, http://publicwiki.deltares.nl/display/MESMA/Related+links.

UNESCO MSP http://www.unesco-ioc-marinesp.be/marine_spatial_planning_msp
The UNESCO Intergovernmental Oceanographic Commission (IOC) has a website dedicated to Marine Spatial Planning, with updated information on MSP in Australia, China, Europe, and North America, and a reference library of key documents on MSP. This is the institution that spurred the development of key MSP guides such as Visions for Sea Change (Ehler and Douvere 2007) and A Step-by-Step Guide to MSP (Ehler and Douvere 2009).

5. The strategic role of MSP in management of transboundary resources

MSP can be done in transboundary space and Areas Beyond National Jurisdiction (ABNJ) in theory, but systematic planning in such areas is rare. With few exceptions, MSP is still a localized or national approach, tailored to the specific needs and conditions of a particular society or state.

MSP has great potential to improve management of shared resources both at a local and ecosystem scale. Establishing and clarifying institutional roles, responsibilities and connectivity is crucial to success. How difficult this is depends largely on administrative/jurisdictional issues. If the ecosystem components are within a single jurisdiction or spans the boundary between two separate administrations within a state, between two states or between state and the high seas different governance issues come into play. MSP governance with a single administration is probably the simplest situation and requires institutional connectivity between authorities regulating fisheries, conservation, shipping, coastal and watershed land use, energy etc. The complexity increases moving from national, through transnational to transboundary with the high seas.

Existing multilateral institutions such as those that support Regional Seas and Large Marine Ecosystems are the obvious transnational platform for the implementation of transboundary MSP. An example of this includes the Baltic Sea, a semi-enclosed sea area providing vital ecosystem goods and services to Baltic Sea states but vulnerable to environmental pressures (see Baltic case study detailed in Box A). The recognition of the importance between land and marine spatial planning has had a significant beneficial effect on MSP in the Baltic. In addition, MSP can take Transboundary Diagnostic Analyses (TDA) and Strategic Action Plans (SAP) that flow from those analyses into the management realm. Regional Seas, LME and internationals organizations (IMO, ISA, fisheries organizations) are thus the correct institutional platforms to progress transnational and transboundary ecosystem based MSP. These are also being successfully used to exchange experiences and knowledge and improve capacity for MSP. There is significant potential for their use as a platform for early transnational consultation on MSP.

The groundwork for MSP in transboundary areas and international waters exists in many regions. For example, EBSAs have been identified, using internationally accepted criteria such as the Azores criteria of the CBD, in ABNJ in the Mediterranean, and within the Arctic. However, participation of international organizations such as IMO, Regional Fisheries Management Organizations (RFMOs), and the International Seabed Authority and International Maritime Organization is necessary for implementing MSP in areas beyond national jurisdiction.

One of the most obvious candidates for transboundary discussions around use of ocean space is the Arctic region. Unlike the Southern Ocean (surrounding the Antarctic continent), the Arctic has no international treaty like CCAMLR which could guide consensus-building on use of resources and space.
Marine spatial planning has entered the conversation among countries that have vested interests (territorial claims and countries that would use the newly opened up waters of the increasingly ice-free Arctic for transportation/shipping). The Aspen Institute hosted a multinational and multi-institutional dialogue about MSP in the Arctic, and published a report about its potential in this hotly contested region (Aspen Institute 2011). Additionally, IUCN's Global Marine and Polar Programme has spearheaded an international effort to objectively evaluate the biodiversity significance of various areas of the region, and has come up with a list of 77 EBSAs (Ecologically and Biologically Significance Areas) in the region, using CBD criteria and methodology furthered by the GOBI – Global Ocean Biodiversity Initiative (IUCN 2011). In addition, thirteen "Super EBSA"s – these are areas 'Super' EBSAs that met

most or all seven of the CBD EBSA criteria, or met one or more of the criteria at a global level of significance (Speer and Laughlin, 2011).

This is not to say that MSP has been embraced by nations with jurisdictions in the Arctic region as a framework for reconciling conflicting views of use of ocean space and resources. Yet the groundwork is there for understanding the relative ecological importance of different areas within the Arctic region, and for examining tradeoffs. The Aspen Institute dialogue (Aspen Institute 2011) focused on the viability of just such an approach, to build on the wealth of ecological information already amassed for the region. Similarly, in the Mediterranean region, a commitment by Parties to the Barcelona Convention to the Ecosystem Approach has provided many of the elements that could be drawn upon should the Parties decide an MSP process might apply in ABNJ (much of the ocean territory of the Mediterranean, where EEZs have not been established). The Regional Activity Center for UNEP's Mediterranean Action Programme (MAP) dealing with biodiversity (known as RACSPA) has identified EBSAs in Mediterranean ABNJ, and CIESM (the coalition of scientific institutions doing marine science in the Mediterranean) has also identified key areas for top marine predators (CIESM 2010). These spatially explicit data and analyses are part of the necessary foundation of information for MSP, should the Mediterranean countries decide to move in that direction. Addressing spatial management at the regional scale will, however, be likely only once coastal countries experiment with MSP within their own jurisdictions.

It is clear from regional MSP initiatives that it is challenging to find correct scale in which meeting ecological goals, while not outstripping institutional capacity. It is best to plan incrementally/adaptively and to invest in finding common interests, goals and vision when working across national boundaries, as in the creation of learning networks. Perceived barriers to transboundary MSP include protectionism regarding national jurisdictions, national and transboundary institutional silos, cultural traditions, information exchange restrictions, and lack of information about valued resources/services that might drive transboundary MSP.

Transboundary MSP is sometimes perceived as a challenge to the independence of sovereign nations in deciding how they plan and manage their marine space. Reluctance to seek the views of their neighbours occurs even in nations with reasonably well developed MSP systems. Border disputes and uncertainties at a territorial, EEZ, continental shelf levels make dialogue difficult. This also impacts on MSP in ABNJ. Nonetheless, opportunities exist for examining transnational and transboundary constraints and barriers to ecosystem based MSP and developing mechanisms to overcome them in order to realize MSP's true potential in improving management and safeguarding biodiversity and ecosystem services.

6. Barriers to MSP and means to overcome them

Multiple constraints and barriers to comprehensive or large scale MSP exist, especially in multi-jurisdictional arenas. These can be categorized in four ways: institutional barriers, environmental or ecological considerations, social constraints, and economic limitations. The report discusses each of these sets of barriers and suggests solutions to overcoming them.

a. Institutional barriers

Fear of loss of control of the decision making process. This stems from a perception that planning is neutral – a black box into which data and information goes, and leads to unpredictable outcomes

(uncertainty around the decision/recommendation that might come out). National institutions with regulatory responsibilities for particular sectors seem to be more comfortable working independently and may prefer to make decisions on the basis of applications received (developer led) rather than being led by a plan developed by consensus.

Lack of understanding of MSP and what kind of conflicts it can help overcome. MSP is a new term, and one that has not been carefully defined or explained. Communication about how MSP improves quality and efficiency of decision making by ensuring all available information is collated and made available in the process has been inadequate. Opportunities for misunderstanding are ripe in the marine management domain, and once misunderstanding or lack of clarity about objectives of management occurs, the investment of time and energy in spatial tools and approaches may be wasted as conflicts emerge (Agardy et al 2011b).

In general, spatial management options can result in 2 types of conflicts, namely conflicts between human activities and the environment and conflicts between different human activities. The former type of conflict requires an assessment of the risks of anthropogenic activities, which vary in their intensities and footprints on ecosystem components that are sensitive to those activities. An increasing number of studies has presented practical approaches for quantifying the impacts of specific human activities or the cumulative impacts of a number of activities on ecosystem components (Halpern et al. 2008, Ban et al. 2010, Foden et al. 2010, Stelzenmüller et al. 2010). In the context of marine planning, the impact of one human activity on other activities is being studied to a lesser extent in particular studies assessing the risks of spatial management options by integrating more than one sector of human activity and by analysing their potential impacts on each other and on ecosystem components are lacking.

Planning that is forced on institutions, rather than developed by them. The need for MSP should arise from the stakeholders (including governments). Thus one barrier is when the approach is imposed or forced. Tendency to offer MSP or other management framework or tool before there is a strong felt need or commitment. On occasion, proponents of new initiatives 'get out in front' of institutions with actual decision making authority. There is a tendency to rush the process and respond to financial opportunities, rather than create institutional constituency or commitments prior to formal adoption of programs.

Grafting MSP on to existing governance structures appeals in terms of administrative and related efficiencies but may have served to frustrate efforts at implementing the ecosystem approach, especially because of its long tradition of sectoral management. This problem is compounded where existing agencies do not have the authority to hold other government departments or agencies to account, or to compel them to comply with the plan. Pre-existing interagency conflict may lead to a reluctance to share power and collaborate with other agencies. This makes the adoption of an integrated approach difficult and slow to accomplish (EU 2008a). Existing governance entities may also have a history of conflict with some marine stakeholders that may make them reluctant to engage in a process that reinforces the status quo (ODEMM 2012). Using existing structures may also raise issues regarding transparency and accountability. These issues require full consideration when deciding whether to create a new administrative agency to lead MSP or to assign the task to an existing entity. It is wise to assess whether the existing institutional arrangement is fit for purpose before entrusting it with the challenging task of MSP (Flannery and O´Cinneide 2012).

Lack of strong supportive legal frameworks. Without consistent legal frameworks/or legal consistency/harmony at local, state and national levels is problematic and can create redundancies,

confusion and contradictory policies. However, a supportive legal framework is perhaps not an essential or realistic initial condition, but can be created through practice.

Knowledge of laws, harmonization of laws, and consistency (Eisma et al. 2005) are all essential to environmental policy in almost any context (Ostrom 1990; Hershman et al. 1999). The Consistency Clause of the Coastal Zone Management Act, as highlighted prior, is a powerful mechanism to ensure linkage and harmonization between federal and state policies. While it was enacted through an act of the US Congress, most legal frameworks supporting ocean, fisheries and coastal management in developing countries emerge from practice and over time. In Kenya, decades of effort have resulted in institutional and legal underpinnings (Christie et al. in press; McClanahan et al. 2005). Similarly, in the Philippines and Indonesia, decades of consistent effort has resulted in increasingly decentralized coastal and ocean legal frameworks (Eisma et al. 2005; Christie et al. 2007; Patlis et al. 2005). While these legal frameworks which allow for localized management not wholly dependent on distant national agencies are essential, they are relatively rare in large portions of the world such as South Asia and the Indian Sea (Christie and Ole Moi-Yoi 2011).

The practice of large-scale, and especially offshore, MSP may be hindered by decentralized planning/legal structures (Christie et al. 2009; Eisma et al. 2009). While decentralization tends to encourage buy-in at the local level, it can also complicate multi-institutional (e.g., municipal governments) across planning at an ecosystem-relevant scale.

The emergence of laws over time has the advantage of allowing for context-relevant design. As was learned with ICM, extending laws or policy frameworks directly from the developing to developed world is unlikely to be successful given the contextual and historic differences (Olsen and Christie 2000). However, tropical country policy makers, in general, are interested in strengthening governance structures and learning and adapting experience and laws from other contexts. Therefore, the information exchange and capacity development are essential investments when conceptualizing the diffusion of MSP globally.

Inadequate capacity. Long term investment in development of human and institutional capacity for essential MSP related activities is a key to success. This includes relevant information development/storage/analysis, planning, implementation and evaluation. Capacity development includes fostering leadership of public sector MSP champions, including those in resource user sectors (fishers, tourism, etc.). In cases where MSP is built on a solid foundation of ICAM, it may be challenging to move offshore with comprehensive MSP due to financial constraints, institutional capacities, enforcement challenges, and- perhaps most importantly – lack of legal frameworks that may reflect priorities that are more coastal than marine. Investment in enforcement, while important, must be balanced with investment in capacity development and participatory planning processes.

Long-term investments in capacity development, sometimes viewed as a luxury or non-essential to rapid progress, is the underpinning of sustained success. Pressures may exist to invest mainly in enforcement or tangible infrastructure development. The internalization and commitment to ICM in some countries is based on decades of effort to raise capacity through formal (e.g., educational degrees) and information mechanisms (e.g., field experience, etc.). The increasing importance of the internet-based communication has allowed for distributed learning (Kay and Christie 2001) and is creatively employed by capacity development/learning networks such as the Locally Managed Marine Area Network (http://www.lmmanetwork.org/). Learning networks organized amongst peers with common interests and experiences, with occasional external inputs by technical advisors, has been central to the rapid

growth and success of the LMMA network. Similarly, creation of newsletters about MPAs (MPA News) or EBM (MEAM- Marine Ecosystems and Management) create opportunities for sharing practical experiences, challenges and solutions.

One of the defining characteristics of the tropics is the lack of formal institutional strength. Ambitious efforts toward EBM or MSP may reach institutional capacity barriers quickly as efforts to scale-up management are attempted (World Bank 2006; Christie et al. 2009). Contexts such as the Caribbean LME or Benguela Current LME with both rich and poor nations, create opportunities for capacity development, but also constraints and conceptual gaps (Cochrane et al. 2009; Fanning et al. 2009). How a planner from the US conceptualizes EBM planning (as science and technology-based) is not likely to be relevant in poor Haiti or contexts with large indigenous people populations such as the Caribbean Coast of Nicaragua. Therefore, MSP efforts must be grounded in careful contextual and institutional assessments prior to action, with the guidance of Transboundary Diagnostic Analyses or governance assessments done in the context of capacity-building initiatives (Olsen et al. 2006). While not conventional, developed states have a great deal to learn from developing countries in the arenas of multi-objective planning (e.g., balancing development, biodiversity conservation), participatory planning and decentralized planning. Various marine resource planning efforts in high-technical capacity contexts are stalled due to lack of commitment or trust in decentralized planning modes.

As MSP is expanded offshore, the ability to overcome strongly vested interests or create necessary technical or implementation capacity will be a major determinant of progress. Progress toward developing relatively inexpensive vessel tracking technology and remote sensing capacity may allow for greater control, as is the recent engagement of the maritime industries in engaging in collection of information on environmental parameters as well as ship activities (see WOC 2012). In some instances, there may be cultural resistance to enclosing the commons which may privilege certain economic interests over others. As discussed elsewhere, a transparent, objective, inclusive planning process will likely determine the acceptance of outcomes.

b. Environmental barriers

The perception that MSP is either not sufficiently conservation-oriented, or is too nature-centric. MSP is generally concerned with conflict resolution and the allocation of space to different users and not conservation or protection. However, MSP does catalyze the identification and allocation of areas for conservation and it can facilitate general environmental improvement by compiling available information into maps of ecosystems goods and services and vulnerabilities and using these in decision making. Again, communications and training can overcome this barrier. A recent study on outreach around MPAs suggests that the investment of effort in education can yield significant benefits in terms of active engagement in planning and management (Leisher et al. 2012).

People act based on perception. The diffusion of MSP by institutions perceived to have either a development or conservationist bias will influence how it is perceived and received by various social groups. The Nature Conservancy's MSP guidebook (TNC 2009) has useful guidelines for an environmentalist-oriented MSP process. The NOAA review of MSP experiences in the EU, USA and Australia provides a more balanced perspective (NOAA 2011). The book entitled "Ocean Zoning – Making Management More Effective" (Agardy 2010) provides examples of MSP processes that have led to zoning in coastal and marine environments, at various scales and for various purposes. Examination of and communication about these guidelines and methods will allow for a better understanding of MSP, and a clear sense of the trade-offs associated with adoption of any one (or mixture) of MSP

planning processes. No approach is right or wrong, but it is important that guideline users are aware of and understand the implicit and formative assumptions within any approach to MSP.

What information is used in MSP is a fundamentally important decision which can strongly influence the trajectory of the process. While GIS and other decision support tools have the capacity to manage many types of information, some information or concepts are irreducible to shape files or data layers in a GIS system. For example, cultural meanings of indigenous people, power relations between genders, institutional capacities and needs are examples of important 'data' which are frequently qualitative, difficult to access, and not amenable to reduction. The framing and presentation of MSP-relevant information as primarily ecosystem goods and services and ecological functions may come with consequences for particular social groups (and will affect how social groups perceive the planning process). MSP proponents should be cognizant of these inherent epistemological issues, and plan for how to fill information gaps or diffuse biases. Or, at least, if aware of the consequences of how information types and forms affect planning trajectories, then planners can discuss the pros and cons of planning outcomes across social groups.

Challenges in coming to terms with multiple, cumulative impacts. Forward planning can identify gaps in policy and help to avoid slow incremental damage, but only if all critical impacts are monitored and the management response is a solution tailored to the management issues and the goals and objectives laid out for MSP to address.

While policy-making institutions tend to be organized by sector and laws usually address direct impacts (rather than cumulative, indirect impacts), there remains a great need to plan for and manage multiple, cumulative impacts (Kay and Alder 2005). Good examples of incremental change are coastal development through shoreline armoring or ratcheting up of fishing effort through either politically-derived/close door negotiated fishing quotas (as in the EU) or reluctance to close open-access regimes in developing countries (Christie and White 2007; Kay and Alder 2005; Ye et al. 2012). Commonly, tropical artisanal fishers are poor and fisheries resources are poorly managed, resulting in a downward cycle as individuals ratchet up fishing effort (Cinner and McClanahan 2009; Pauly 1990).

Understanding cumulative or indirect impacts can be difficult. Cascading trophic effects from over-exploitation of particular species or introduction of exotic species are complex and difficult to predict (Pauly 1990). The problem is compounded by the fact that basic social-ecological data on relevant spatial or geographic scales is rarely collected. While ocean temperature regimes are increasingly monitored at a gross scale by remote sensing methods, the monitoring of fish yields, especially artisanal fishing yields, is a very imprecise science. The Food and Agriculture Organization (FAO) aggregates national level self-reported data, but these data are not always reliable. The linking of social with resource extraction or ecological data is even more uncommon. Programs such as SocMon (http://www.socmon.org/), ReefCheck (http://www.reefcheck.org/) or MPA global (http://www.mpaglobal.org/home.html) databases are challenged by limited funding and the challenges of collecting valid data in remote places.

c. Social barriers

A sense that MSP is the next big thing, and that planners and management agencies need to drop what they are doing to embrace this new approach. Comprehensive MSP is relatively new and it unclear how it will complement, rather than replace, community based approaches to coastal and marine resource management.

Human communities are particularly concerned with their immediate surroundings, families, and conditions over which they have influence. These concerns are not always at the scale of ecological function. For example, it is difficult for fishers on a remote coast to understand or control the forces of climate change. However, in communities can cooperate with one another, and begin to 'scale-up' their efforts to ecologically relevant scales (Christie et al. 2009; Eisma et al. 2009).

Difficulty in reconciling top-down, large scale planning with bottom-up and more localized management. MSP must recognize the importance of existing bottom up approaches – it is not meant to replace these initiatives but coordinate and build on them. The process of MSP is iterative and encourages the bottom up initiatives as well as the top governance improvements. MSP can in fact identify synergies and manage uses to promote multiple use of space.

Reconciling top-down, large scale planning with bottom-up and more localized management is a complex challenge and one that is not well understood. Institutional feedback loops and disincentives to cooperate across various governance levels may stand in the way of reconciling these approaches. For donors, supporting large scale management may be more feasible than scaling-up community based approaches. Funding allocation and accounting may become complex. Also, incentives to demonstrate impact over large areas, use of sophisticated analytics, and securing of large budgets for centralized management schemes may encourage adoption of centralized approaches (Christie et al. 2007).

d.Economic barriers

Established sectors with perceived free access such as fisheries, oil and gas, pipes and cables, shipping and navigation may see themselves losing out in the MSP process. The demand for marine space from new uses such as renewable, sand and gravel extraction and conservation will continue and probably increase. There is a distinct disadvantage by not being involved in the forward planning spatial allocation for these activities. Being involved and seeking mitigation, compromises and synergies is essential.

Steinberg (2001) convincingly argues that, over the span of centuries, mercantilism and militarism have been essential forces in shaping ocean governance regimes and the 'freedom of the seas' concept. He argues that the emergence of biodiversity or environmental concerns may not rise to the same degree of influence. However, with climate change, and associated sea level change, and food insecurity-driven migrations, the imperative to respond to large-scale environmental change is growing rapidly. Acidification is now threatening important sectors of the US economy such as aquaculture and there may be instances when there is strong impetus for raising environmental standards and reducing carbon emissions (http://productiveoceans.org/studygroup/). The demand for spatially separating conflicting uses of coastal and marine resources was one of the initial motivations for ICM (Kay and Alder 2005). Recently, the well-organized 'right to fish' movement and lobby had major impacts in MSP planning efforts in the Australian Great Barrier Reef and California MSP and MPA planning efforts. The balance between industries and sectors which want uses to be rationalized and spatially organized and those which prefer unfettered access to marine resources and spaces will be one of the main dynamics which MSP will need to address.

Lack of attention to costs and benefits. Tangible benefits (even if deemed greater than costs) are not always made clear to institutions and leaders. Change can be costly and will alter present benefit streams from the status quo. Prospective benefits should be identified and assessed realistically, while at the same time, costs are considered. Incentives for inter-institutional collaboration (funds, cost

reductions, etc) can facilitate the launching of an MSP process and its eventual success. Capacity developing is a slow and laborious, but essential, task. Without capacity for managing complex processes, MSP is likely to fail. Sustaining capacity is difficult due to the generally short-term time horizon of funding.

Institutional arrangements and governance structures emerge for complex and historical reasons (Grindle 1997). The also tend to benefit certain parties and epistemic communities--of networks of individuals or institutions which share common perspectives and goals (Christie 2011; Hass 1990). Change from the status quo entails cost and may reduce benefit streams to certain parties, and may be resisted. MSP, and EBM, are likely to require new institutional arrangements, especially if new management systems attempt to address marine and coastal issues at broader temporal and spatial scales (Christie et al. 2007; Christie et al. 2009b). The maintenance of new institutional arrangements, which require inter-institutional coordination, will likely require tangible incentives to induce participation and commitment (Lowry et al. 2009).

Realistic timelines and financial commitments are also necessary. In some cases, complex, multi-institutional arrangements have been maintained for the management of important marine systems, such as the UNESCO World Heritage Site Tubbataha National Marine Park, which is supported by a mixture of public and user fee funding (Tongson and Dygico 1990). But, in general, large, complex institutions (e.g. the Lingayen Gulf (Philippines) management council, in contrast to Tubbataha) are difficult to maintain and tend to be donor dependent (Pollnac and Pomeroy 2005). LME management systems in the Caribbean and Benguela Current areas have faced similar challenges (Cochrane et al. 2009; Fanning et al. 2009). While GEF financial support for LME process has been substantial, the long-term financial support mechanisms for these efforts are uncertain. Financial support by most bilateral or private foundation sources is generally short-term, on the scale of 3-7 years (Olsen and Christie 2000). This funding horizon tends to result in compressed planning and implementation horizons, in order to demonstrate progress to donors, but also may erode long term sustainability (Christie et al. 2005). As donor support is phased out, expensive institutions and governance mechanisms are unlikely to be maintained.

Not anticipating resistance to MSP. Resistance to MSP, whether that resistance is on economic (or perceived economic) grounds, or for reasons of social or political ideology, should be anticipated. This resistance can come from powerful, vested interests (military, political leaders, resource user groups, etc) or disinterested institutions with authority (lack of perceived need, low priority in face of pressing issues). Jurisdictional overlaps and 'turf battles' should be identified and overcome through the MSP process. It is worth stressing again that MSP is not a panacea and will not overcome such resistance in all cases, as is evident from failed or inadequate MSP initiatives outlined in the report.

For all the reasons enumerated, resistance to MSP is likely to emerge in many forms and at different steps in the process. In the US context, MSP has, despite leadership from the Obama and current NOAA administration, encountered considerable resistance. It is unclear how widespread implementation of Coastal and Marine Spatial Management will proceed in the current polarized political context and budgetary cuts (http://www.whitehouse.gov/files/documents/OPTF_FinalRecs.pdf). Therefore, having leaders who will effectively respond to resistance is essential to success. Leadership skills, as emphasized by groups such as the Avina Foundation (http://www.informeavina2010.org/english/) and identified as central to field effort success (Pietri et al. 2009), are essential to MSP progress and acceptance at the field level.

To avoid derailing MSP processes once they are begun, where conflicts arise, they should be mediated rather than suppressed. Marine Spatial Planning is generally considered neutral in striving to deliver and even promote development that is socially, economically and environmentally sustainable. However, in reality MSP, (as well as ICAM, MPAs and other more focused spatial management tools) can depart from being neutral. In these cases MSP becomes a representation of a particular value system, which may be considered valid and may represent the majority interest, but which will meet resistance by others who hold other values. That conflict must be mediated.

Conflict can emerge either prior or after adoption of MSP. Outreach is a worthwhile investment for informing stakeholders about frameworks and tools which can be used Progress has been made in the last decades to develop conflict resolution mechanism and institutions for particular issues and sectors, such as water rights or forest rights negotiations in the USA (U.S. Institute for Environmental Conflict Resolution http://www.ecr.gov/). No such broad analysis or institution exists for conflict resolution of marine issues despite the prevalence of conflict among marine uses and marine/coastal planning processes (Bennett et al. 2001). Other planning processes such as ICM identified conflict as an important challenge but were generally silent on context-appropriate resolution mechanisms (Kay and Alder 2005). McCreary et al. (2001) offer one means to reduce conflict through single-text negation, a process that may work in legalistic and text-based contexts.

While unmanaged and large-scale conflict can be problematic, some degree of conflict and intense disagreement is logically part of any process that allocates rights and cost-benefits. In fact, some have argued that conflict is an essential component of empowerment for any disenfranchised social group (Freire 1993). Therefore, rather than try to suppress or 'manoeuvre around' resistance to and conflict surrounding MSP, a process for understanding and adequately addressing stakeholder interests and expectations is a better approach. The process is ongoing because conflicts will emerge and change over time.

Perceptions and language matter. There are cases in which one or more user groups have resisted MSP, but there is also evidence that perceptions can be changed by open discussion of what MSP is and is not. In some cases, users have not only supported but have driven MSP processes. Outreach becomes a vital step in the planning process (Leisher 2012), allowing misperceptions and language barriers to be overcome by mediated discussion, and a planning process which is as participatory, open, and equitable as possible.

In some parts of the world an uneven understanding of the goals and practice of MSP persists, and various stakeholder groups have ended up advocating against the planning processes. This is natural given its recent formulation as a planning tool. However, careful and consistent communication about what MSP is or is not and how it relates to other, closely related, frameworks and tools is essential to progress. Similarly, contextualization of MSP is important, and will likely take decades and local 'interpretation' of the MSP. The M in MSP has been interpreted as standing for both Maritime in the EU and Marine in the US contexts—with associated meaning associated with these terms. The focus on managing economic sectors/uses rather than ecosystems is a significant policy decision and may be suggestive of the ultimate goals of MSP proponents (Christie 2011).

Making explicit marine uses that are being considered as foci for a marine spatial plan will similarly raise important discussions about resource allocations. The collection of spatially-explicit marine use data has been undertaken by the Marine Map (http://marinemap.org/) and the NOAA MPA Center Ocean Uses Atlas (http://www.mpa.gov/dataanalysis/ocean_uses/ and http://www.mpa.gov/pdf/helpful-

resources/mapping_human_uses_nov2010.pdf) is challenging and essential part of MSP. While these tools have the potential to increase transparency and objective planning, they will generate controversies if it is perceived that they are tools intended to exclude traditional or current uses of marine resources. Nonetheless, they can also serve as platforms for useful, mediated discussions, as has been the case in California and other contexts which have used such tools.

In the end, accountability also matters, not just perceptions. Accountability can be built into MSP in three ways: 1) by having plans with concrete goals and measurable indicators by which to measure success; 2) by having accountable governance practices put into place, such as vesting decision-making in a multi-stakeholder regional body, requiring regular reporting, and supporting continued public participation mechanisms; and 3) by establishing a fair and just monitoring and evaluation system that reports both successes and failures and allows for adaptive management (ELI, 2009).

7. Conclusions and implications for CBD

MSP is a framework supporting ecosystem-based management, in that it recognizes the connections between land, freshwater, and marine ecosystems, and addresses human uses of and impacts of importance in all these systems. As such, comprehensive MSP has the potential to greatly improve management, reduce the loss of ecosystem services, help address or avoid conflict, and create economies of scale and efficiencies for enforcement and management. Planners that have strived for equitable sharing of benefits, and MSP processes in which accountability is a prime consideration, have witnessed more and longer-lasting support for MSP.

Marine Spatial Planning is primarily about forward planning of space for all human uses and non-uses in the marine environment, followed by the implementation of such plans. The crucial difference between MSP and other area based management is that MSP is strategic and forward looking rather that reactive and developer led. **However, one size doesn't fit all in MSP; in order for MSP to realize its full potential, capacity needs to be built for context-specific planning and governance.** Multi-scale processes are needed to bring together top down and bottom up initiatives into a systematic approach. Engaging leaders, creating common understanding, establishing working groups leads to buy-in, co-financing, and improved management.

Given that comprehensive MSP initiatives are relatively new and thus largely untested, in those that are underway there appears to be greater emphasis on planning than on post-plan implementation. This is in contrast to smaller scale, MSP processes, such as those that serve as the foundation for ICAM or MPA design. One of the greatest constraints to comprehensive MSP, whether it is attempting to use spatial management to accommodate all the marine uses of an area, or whether it flows from ICAM initiatives that are then 'pushed out to sea', is that the ambition can exceed the capacity. Robust MSP processes take into consideration the feasibility of implementation, which in turn affects the development of marine spatial plans.

A supportive legal framework to enable MSP, and a governance system that allows participatory planning and adaptive management in which strategic goals and objectives are periodically revisited, provides essential elements for MSP success. Where existence of nested institutions in which local level institutional policies are supported by national institutions, while local institutional actions are in agreement with national priorities, this is optimal. Careful development of institutional commitments to MSP is needed prior to planning and implementation. In preparing for MSP, there should be clear

definition of issues to be addressed by MSP, and the possible risks and costs in engaging in the process. Accountability can and should be built into the planning stage, into the implementation of marine spatial plans or zoning, and into the governance arrangements to support management.

Development of participatory planning processes is essential to developing MSP legitimacy and buy-in. If MSP is forced, initial gains will likely be lost. A governance assessment early in the MSP can indicate how solid the foundations are for participatory planning, and whether it needs to be strengthened. Buy-in is needed, but MSP can allow more effective outreach, which in turn paves the way for better understanding, engagement, and support for policies borne out of spatial planning.

Successful MSP requires not only a legislative framework, but good governance (good here means appropriate to the social and political context and capacity; governance refers to all forms of governance, not just that taken on by governments). The absence of these creates significant barriers to MSP. Even MSP that is generally neutral may require that planners support or even be an advocate for disadvantaged stakeholder groups. There may be institutional resistance to decentralized/participatory planning processes, in which case these sorts of stakeholders may need training and support to make their voices heard. Weaker disadvantaged sectors and stakeholders must be supported in preparing their own spatial policies/plans before coming to the MSP process and/or supported to articulate and negotiate for their needs.

Guidance on evaluating or assessing governance and developing best practices in governance is growing daily. So, too, are innovative policy mechanisms for enabling co-management, and for expanding governance beyond its traditional roots in the government domain, to a shared responsibility of government and civil society. To this end, the UN recently approved The UN Voluntary Guidelines for Land Tenure and Access Rights to Land, Fisheries and Forests, approved by 96 countries on Mar 14, 2012. The UN Food and Agricultural Organization (FAO) has coordinated developed of Voluntary Guidelines (see http://www.fao.org/nr/tenure/voluntary-guidelines/en), the purpose of which is to assist States, civil society and the private sector in improving the governance of tenure, and thus contribute to alleviating hunger and poverty, empowering the poor and vulnerable, enhancing the environment, supporting national and local economic development, and reforming public administration. Voluntary Guidelines set out principles and internationally accepted standards for responsible practices and a framework that States can use when developing their own strategies, policies, legislation and programmes. The Committee on Food Security will consider that text for final approval at a special session, tentatively scheduled to be held in Rome on 18 May 2012. **Though largely terrestrially focused (especially on land tenure issues), these guidelines on tenure and access could have implications for MSP frameworks as plans are developed and implemented, in Lesser Developed Countries most especially.**

Creating realistic timelines for programs is fundamental to finding and keeping support from stakeholders, donors, and implementing agencies. Recognizing and acting upon the need for sustainable financial streams to support MSP is important. It may be preferable to have modest, but consistent amounts of support, through Payments for Ecosystem Services streams of revenue or from user fees, since large grants can create dependencies.

Multilateral institutions have an enormous opportunity to invest in capacity building, leadership development, mechanisms to address governance challenges, the reduction of institutional overlaps/gaps, and the development and use of conflict resolution mechanisms through MSP initiatives.

MSP as an approach supporting ecosystem-based management has the potential to improve and enforce existing management frameworks, reduce the loss of ecosystem services, help address or avoid conflict in use of marine space and establish conditions promoting economies of scale. To meet this potential, intergovernmental organizations, as well as national and local governments, should support sufficient capacity-building and public awareness activities targeting relevant audiences on the utility of MSP as one of the key management approaches for coastal zone and maritime space at the international, national and local levels across a range of themes, including:

- Strengthening governance, institutional and legal frameworks conducive for MSP mainstreaming into existing management frameworks;
- Establishing or enhancing monitoring, data analysis and scenario modeling of ecosystem goods and services as a basis for MSP development;
- Supporting impact assessments and embedding effectiveness monitoring into existing MSP efforts;
- Nurturing and facilitating collaboration across multilateral organizations, government, private and public sectors, educational and scientific institutions, indigenous and local communities in the development and implementation of MSP.

When considering establishing marine spatial plans, national and local governments should recognize that successful MSP development is a long-term cyclical process facilitated by the following:

- Creating long-term political commitment;
- Establishing a vision, goals, and measurable objectives for the agreed timeline;
- Recognizing the multiplicity of scales for MSP and taking into account socio-economic traditions and practices;
- Basing planning on ecosystem-based management while providing adequate treatment of multiple economic, environmental and social priorities and different economic sectors;
- Mainstreaming MSP into the existing legal, administrative and institutional frameworks for the management of coastal and marine space;
- Considering complementarities between MSP and tools such as ICAM, MPA, EBA and zoning;
- Developing strong participatory processes and mechanisms in MSP;
- Committing to conflict resolution mechanisms into MSP arrangements;
- Integrating adaptive management and effectiveness evaluation into the MSP framework.

MSP has great potential as an organizing framework, and serves as a worthwhile investment through which national marine management can be strengthened, and -- perhaps more importantly -- international marine management can be initiated and then developed over time. Of particular interest is the possibility that MSP will help foster engagement in discussions of how to effectively sustain ecosystems that are transboundary in nature, or which are found in ABNJ. This is an exciting time for planners and managers, as more and more lessons are learned about MSP in all its various forms and applications.

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