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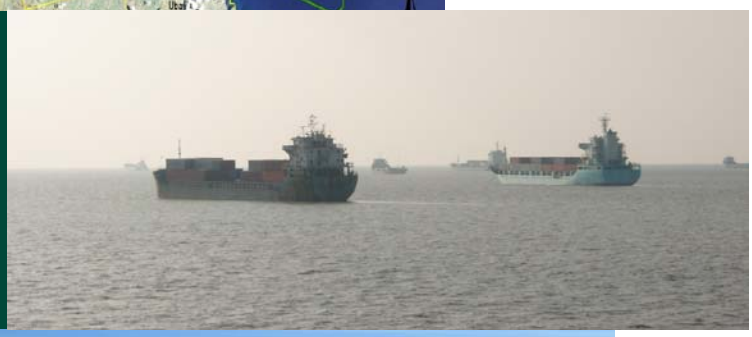
68

MARINE SPATIAL PLANNING IN THE CONTEXT OF THE CONVENTION ON BIOLOGICAL DIVERSITY

A study carried out in response to CBD COP 10 decision X/29



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Marine Spatial Planning in the Context of the Convention on Biological Diversity

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About STAP
The Scientific and Technical Advisory Panel comprises seven expert advisers supported by a Secretariat, which are together responsible for connecting the Global Environment Facility to the most up to date, authoritative, and globally representative science.
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FOREWORD

Recently in June 2012, world leaders at the Rio + 20 Conference in Rio de Janeiro recognized the crucial role of biodiversity in ensuring sustainable development and called for greater efforts to implement the Convention on Biological Diversity (CBD).

In the outcome document of Rio+20, entitled "The Future We Want", world leaders reaffirmed the importance of area-based conservation measures, including marine protected areas, as a tool for the conservation of biological diversity and the sustainable use of its components. They noted Aichi Biodiversity Target 11, which states that by 2020, 10 per cent of coastal and marine areas – especially areas of particular importance for biodiversity and ecosystem services – are to be conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures. Much of the success in this effort from a biodiversity perspective will depend on the degree to which these protected areas are situated within a broader, multi-sectoral planning context.

Area-based planning and management processes have been important environmental and resources management tools for many decades. They provide effective frameworks to consider environmental, social, cultural, institutional, and economic variables within a common bio-geographic context – bringing what are at times competing interests together to form a common management vision. Marine spatial planning represents an important step to improving collaboration amongst multiple users of the marine environment towards a shared vision and outcomes. Understanding successes and challenges in marine spatial planning and scaling up these experiences to large marine areas and trans-boundary regions are therefore essential to effective achievement of the Aichi targets on marine and coastal biodiversity.

As such, the Conference of the Parties to the Convention on Biological Diversity, in its tenth meeting, 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. In response to this request, the Scientific and Technical Advisory Panel of the Global Environment Facility prepared this publication in collaboration with the Secretariat of the Convention on Biological Diversity. We welcome this collaboration, and hope this publication will provide useful information to countries, organizations and many diverse users of the marine environment in finding their pathways towards our common goals of the conservation and sustainable use of marine biodiversity.

Braulio Ferreira de Souza Dias
Executive Secretary
Convention on Biological Diversity

Thomas E. Lovejoy
Chair, Scientific and Technical Advisory Panel
Biodiversity Chair
The Heinz Center

KEY MESSAGES

OVERVIEW AND RATIONALE FOR THE REPORT

Marine Spatial Planning (MSP) has the potential to transform the way the oceans are managed. This report explores spatial management as a means to protect marine and coastal biodiversity while at the same time addressing human needs across coasts, around estuaries and deltas, in near shore environments, and on open oceans. It synthesises available information on the scope of MSP activities around the world, the lessons learned about the utility of spatial planning and management, processes and tools used, and criteria for success at various scales. The report reviews conventional approaches, identifies innovative new tools, and discusses the potential MSP has – as yet not fully realised – in aligning conservation and development interests while protecting vital ecosystems, the valuable goods and 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 request by COP 10 Decision X/29 para 75 *"to compile and synthesise available information in collaboration with Parties, other Governments and relevant organisations 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"*. Large and small scale MSP practices have been examined in countries of different socio-economic characteristics. Although most MSP processes are still in their early stages, making it difficult to draw inferences, commonalities are already emerging in terms of what works and what does not in various contexts.

DEFINING MARINE SPATIAL PLANNING

Marine spatial planning (MSP) is a framework which provides a means for improving decision-making as it relates to the use of marine resources and space. It is based on principles of the ecosystem approach (EA) and ecosystem-based management (EBM). All MSP exercises are spatial (place-based) management processes no matter at what scale and in what social context or biome it is being practiced. It is also temporal, utilizing forecasting methods and fully taking into account seasonal dimensions.

Marine spatial planning is not a substitute for integrated coastal zone management (ICZM) or integrated marine and coastal area management (IMCAM), but rather builds on these important approaches and the policies that support them – including efforts to establish marine protected areas (MPAs). MSP is not an end in itself nor is it a specific policy – rather it is a planning framework that focuses on the unique and dynamic spatial planning requirements in marine ecosystems to sustain the goods and services society needs or desires from these environments over time.

THEORY AND PRACTICE OF MARINE SPATIAL PLANNING

One size does not fit all in marine spatial planning. 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 can flow, as well as the area-specific management needed to sustain the ecosystems that stakeholders collectively value.

Goal-setting is a necessary first step in all marine spatial planning exercises. 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.

Effective mapping and spatial enabled data is central to the success of MSP. Maps of environmental characteristics, species and habitat distributions, ecosystem goods, services and vulnerabilities, the ways society values marine and coastal space, human activities or pressures and their cumulative impact are data demanding. In many cases this is the main technical and scientific barrier to MSP.

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. 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.

CHALLENGES AND BARRIERS TO MARINE SPATIAL PLANNING

Multiple constraints and barriers to comprehensive marine spatial planning exist, especially in multi-jurisdictional arenas. These can be categorized primarily in four ways: institutional barriers, environmental or ecological considerations, social constraints, and economic limitations. In some cases poor institutional engagement with MSP may exist, due at times to a lack of understanding of the process and the multi-disciplinary nature of the exercise (along with the technical capacity required to engage in these processes). Moreover, agencies may believe that they are being disenfranchised from traditional areas of management.

As noted above, successful MSP is data dependant, which represents challenges in particular to the environmental and ecological data required. Understanding and accurately assessing multiple and cumulative impacts to marine environments represents an important element in the process. In addition, reconciling large scale planning which is typically top-down in nature with local, bottom up planning approaches is also essential.

Economic considerations are important to all planning processes and is certainly the case with MSP, particularly where traditional uses are coming up against new economic activities in the marine environment – such as wind farms, mining, or deep sea oil drilling. Clear attention to costs and benefits, as well as accurately representing the true value of marine resources is critical.

THE STRATEGIC ROLE OF MARINE SPATIAL PLANNING IN MANAGEMENT OF TRANSBOUNDARY RESOURCES

In theory, marine spatial planning can be undertaken in transboundary space, but experience in 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 state, however it has great potential to improve management of shared resources at ecosystem and transboundary scales.

Existing multilateral institutions such as those that support Regional Seas and Large Marine Ecosystems (LMEs) are the obvious platform for the implementation of transboundary MSP, and can take the diagnostic analyses and strategic action plans (SAP) that flow from these analyses into the management realm. The participation of organizations such as the International Maritime Organization (IMO), regional fisheries management organizations (RFMOs), and the International Seabed Authority and the International Maritime Organization is necessary for implementing MSP in areas beyond national jurisdiction.

KEY CHARACTERISTICS OF SUCCESS

Essential elements for MSP success include a supportive legal framework to enable MSP and to drive obligatory objective-setting and prioritisation, and an effective governance system that allows participatory planning clear accountability – within a framework of adaptive management in which strategic goals and objectives are periodically revisited. The optimal approach seems to be of nested institutions in which local level institutional policies are supported by national institutions, while local institutional actions are in agreement with national priorities. 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. Finally, creating realistic timelines for the MSP process is fundamental to finding and keeping support from stakeholders, donors, and implementing agencies.

Conclusions

The development and introduction of MSP offers multilateral institutions an enormous opportunity to invest in capacity building, leadership development, mechanisms to address governance challenges, reduction of institutional overlaps/gaps, and development and use of conflict resolution mechanisms through MSP initiatives. Key management approaches include:

- Strengthening governance, institutional and legal frameworks conducive for MSP mainstreaming into existing management frameworks;
- Establishing or enhancing monitoring, data analysis and scenario modelling of ecosystem goods and services as a basis for MSP development;
- Supporting impact assessments and embedding effectiveness monitoring into existing MSP efforts; and
- 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.

Marine spatial planning is a framework supporting ecosystem-based management, in that it recognizes the connections between land, freshwater, and marine ecosystems, and addresses human uses and impacts of importance in all these systems. As such, comprehensive MSP has the potential to greatly improve management of marine ecosystems, reduce the loss of ecosystem services, help address or avoid conflict, and create economies of scale and efficiencies for enforcement and management. MSP has great potential as an organising framework, and serves as a worthwhile investment through which national (and transboundary) marine management can be strengthened.

LIST OF ACRONYMS

ABNJ	Areas Beyond National Jurisdiction
CIESM	Mediterranean Science Commission
CFP	Common Fisheries Policy
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 Organisation
GEF	Global Environment Facility
GOBI	Global Ocean Biodiversity Initiative
HELCOM	Convention on the Protection of the Marine Environment in the Baltic Sea Area
ICES	International Council for the Exploration of the Sea
ICM	Integrated Coastal Management; also known as Integrated Coastal Zone Management (ICZM) and Integrated Marine and Coastal Area 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
TEK	Traditional Ecological Knowledge
TDA	Transboundary Diagnostic Analysis
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
WCMC	World Conservation Monitoring Centre
WSSC	World Summit on Sustainable Development
WWF	World Wildlife Fund / Worldwide Fund for Nature

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Recognition must go to David Cooper, Jihyun Lee, and Jacqueline Grekin at the Secretariat of the Convention on Biological Diversity Secretariat, as well as Marjo Vierros of the United Nations University, who frequently provided important technical assistance, content, and editorial contributions. The following reviewers provided excellent comments that helped clearly articulate conclusions, while also providing additional examples and literature to support those conclusions: Imen Meliane of The Nature Conservancy, Peter Jones of Imperial College London, Richard Kenchington and Ole Vestergaard of UNEP, as well as two anonymous reviewers. Editorial work was undertaken by Marie-Thérèse Maurice and Margarita Dyubanova. The authors and STAP greatly appreciate their advice, and thank them all for their contributions.

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1. INTRODUCTION

WHAT IS MARINE SPATIAL PLANNING?

The challenges of managing human impacts on the world's oceans and coasts are ever-increasing. In recognition of these challenges, ecosystem-based management (EBM) has emerged as a paradigm to explicitly account for the interconnectedness among systems, the cumulative impacts to ecosystems and to integrate ecological, social, economic and institutional perspectives, recognising their strong interdependences (Global Ocean Protection). However, the concept of EBM can be overwhelming and complicated to implement. Marine Spatial Planning (MSP) is emerging as one of the most pragmatic tools to advance EBM because it focuses on the most concrete aspects of EBM – area-based planning and management, and addresses multiple human uses, their cumulative impacts and interactive effects (GOP).

Marine spatial planning (MSP) is an area-based management framework that addresses multiple management objectives. It is not a single tool, but rather an approach or framework to provide a means for improving decision-making as it relates to the use of marine resources and space. MSP is seen as a new form of public process that collects, analyses, and identifies where human activities occur, and sets into motion planning of future activities in order to achieve agreed upon ecological, economic and social goals. Key features of successful MSP programmes 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. In many countries, it has been notably driven by the intensifying and increasing uses and competition in the ocean space, in particular offshore energy (both extractive and renewable).

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, regardless of the scale and in what social context or biome it is being practiced. Like land-use planning, it allows consideration of many different perspectives on what constitutes value, and integrates information on a wide variety of both direct and indirect uses and the impacts they might have. 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 also temporal in that it utilises 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 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 has been used at various scales, in various forms, through various processes, and to achieve various ends, including broad-based socio-economic and environmental goals. The wide diversity of ways in which MSP has been put into practice creates challenges for deriving lessons learned. Nonetheless there are common features relating to where this approach has been successfully used, and where and by what it has been constrained. Even though the history of comprehensive and formalised marine spatial planning is relatively short, it appears to have 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 protected areas have played an important role in the ontogeny of MSP as a widely accepted framework for identifying what sorts of uses, and at what levels of use, are appropriate. Marine protected areas have served as demonstration sites for testing participatory planning processes, and for integrating uses – current and prospective, direct and indirect – of ocean space. Ban *et al.* (2012) and others have suggested that the planning processes for MPA networks and for MSP are not necessarily different, except in scale and scope. But MPAs also contribute to MSP in other ways. Protected areas in all forms often serve as the foundation for zoning to safeguard what is most ecologically important, biologically diverse, or vulnerable; where MSP entails developing a "blueprint" for instituting various zones of protection or use, the MPAs can constitute a particular, established zone. Clearly, however, MSP is not a substitute for MPAs, but rather a broader framework that can use and systematically extend or amend protected area management to go far beyond what even well-planned and well-managed MPAs can achieve.

Similarly, MSP is not a substitute for Integrated Coastal Area Management (ICAM—otherwise known as Integrated Coastal Management (ICM) or Integrated Coastal Zone Management (ICZM)—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 identification of sites for MPAs and MPA networks. The management that flows from MSP, broadly defined, includes ICAM, MPA design and implementation, and the spatial allocation of maritime uses (e.g. shipping lanes, oil & gas leases, fisheries closures, scientific research sites, etc.).

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 consider (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. 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 the primary 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 spaces 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, recognising the intrinsic value of biodiversity and the value of collective ecosystem services that oceans and coasts provide, and working within the prevailing political, legal, administrative and cultural regime. In summary, multi-objective marine spatial planning is emerging as one of the most pragmatic tools to implement comprehensive EBM by supporting:

- proactive planning for multiple human uses and address of socio-economic aspects;
- scaling up of marine management;
- evaluation of cumulative impacts so that all key threats can be addressed;
- reconciliation of elements that may at first seem incompatible with protecting marine biodiversity; and
- the use of trade-off analysis where needed to guide management actions.

2. OVERVIEW OF THEORY AND PRACTICE FOR IMPLEMENTING MARINE SPATIAL PLANNING

Marine spatial planning and the spatial management regimes that flow from it, such as regional marine management and ocean zoning, already occurs at various scales throughout the world: from small locally-managed marine areas and coastal planning undertaken by municipalities, to 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). Clearly there is a significant variance in the size of MSP initiatives, methodologies for engaging stakeholders along with planning and associated tools, as well as in the stated goals and objectives of MSP.

There are many characterisations 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 MSP 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 there is a substantial degree of overlap and complementarity in these concepts and tools; MSP can provide an overarching coordinating framework, thereby improving outcomes that flow from their use.

Integrated coastal management (ICM) merits particular attention here, especially in the context of its practice in developing countries. 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 near shore marine environment. ICM planners have worked not only to address issues specific to circumscribed coastal areas, but also to scale up from these localised 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. Specifically, whether MSP flows out of an existing process such as ICAM, or is imposed as an entirely new framework tying together many existing or as yet unrealised processes, depends on the governance and policy in place, as well as the needs that MSP must address. Marine spatial planning must recognise these differences in circumstance and be responsive to them; for that reason there is no one size fits all marine spatial planning model.

In the various experiences around the world, MSP has been mainly driven by the following factors:

- Increased demands & conflicts for ocean space & resources;
- Increasing development of offshore energy;
- Need for integrated information and regional decision making;
- Single sector management that does not meet multiple demands/objectives; and
- One-off zoning efforts that are seen as establishing exclusive rights or favouring a particular use or stakeholder group.

A recent review of 17 marine spatial plan experiences performed in support of the emerging Coastal and Marine Spatial Planning (CMSP) process in the US, following similar analyses of ocean zoning case studies reviewed by Agardy (2010), shows that virtually all plans include considerations of ecological objectives such as the conservation of biodiversity and critical habitats, the sustainable use of natural resources, avoiding pollution and eutrophication, and enhancing resilience to climate change. Most of the plans also have explicit economic objectives which relate to energy development, fisheries, maritime transport, and sand extraction. Market and non-market uses are contained in seven of the plans, involving the maintenance of culturally important marine areas, sustaining culture and livelihoods in coastal and indigenous communities dependent on marine resources,

and enhancing public participation and support for decision-making (NOAA SAB, 2011). One example of a nascent marine plan that balances development and conservation objectives is presented by Venezuela (see Box A below).

Regardless of specific driver(s) or motivating factor(s), in essence MSP arises in response to the need to reconcile conflicting uses by spatially planning activities and determining different zones for different uses, or the need to balance development and conservation by spatially planning and zoning according to objectives (conservation, economic development, maintaining existing uses, etc.). For example, the former approach has been used in national planning done by the Netherlands for its EEZ, while the latter is adopted by Norway in the Barents Sea. These approaches do not, however, represent a strict dichotomy – they are points along a spectrum of MSP that demonstrate both conservation and development interests. The right combination will be best determined through a participatory process according to the specific context of the place where planning and management is needed.

BOX A: VENEZUELA—BALANCING ENERGY DEVELOPMENT AND MARINE CONSERVATION OBJECTIVES

(Provided by I. Meliane, TNC)

The goal of the MSP planning process in Venezuela is to design and implement a comprehensive, ecoregional assessment that considers the needs for maintaining energy production while ensuring that objectives for biodiversity conservation are met. Venezuela is among the top 10 most biologically diverse countries in the world, and its Southern Caribbean Basin is a centre of extraordinary marine biodiversity. In addition to harbouring a number of ecosystems inhabited by numerous threatened species, the basin is an important site for fishing and tourism. Venezuela is continuing to expand its network of marine protected areas currently covering some 3.4% of the country's waters. Venezuela also has abundant oil and gas reserves and is the fifth-largest oil exporter and seventh-largest oil producer in the world. The company responsible for managing and tapping those reserves is Petróleos de Venezuela, S.A. (PDVSA).

PDVSA has identified the development of the offshore oil and gas reserves as an important component of its strategic plans. PDVSA is currently engaged in a large-scale assessment of oil and gas deposits in the Venezuelan Caribbean Sea region and will lease blocks or marine areas to private energy companies that will be in charge of exploring and drilling.

In anticipation of the planned oil and gas block development, and in recognition of the potential risks to the marine biodiversity, PDVSA engaged with The Nature Conservancy and Venezuela's Institute of Technology and Marine Science at Simón Bolívar University (Intecmar) to identify priority areas for the conservation of marine biodiversity and to recommend practices that could be used by the energy industry to minimise impacts on ecologically important areas identified for conservation.

Through this partnership, a set of conservation-based standards and practices were proposed to be incorporated into the documentation for each oil and gas lease. The compensation hierarchy — Avoid, Minimize/Restore, Offset — was used as a framework for addressing environmental impacts of oil and gas development projects. For each project, the preferred option is to avoid impacts, particularly in high biodiversity areas. If some impacts cannot be avoided, then environmental practices can be used to minimise the impacts, and ecological restoration can be conducted. Residual impacts are those that remain after avoidance, minimisation, and restoration. Offsets can be implemented to counteract the residual impacts, potentially bringing the net environmental impact of a project to zero or even producing a net positive contribution to biodiversity.

Lessons learned

- Decision makers prefer to make informed decisions. Make scientific information more digestible, so they can use it.
- Development sectors are interested in reducing environmental risk to save money.
- Funding for planning and licensing can be allocated more strategically when higher-level conservation outcomes have been defined.
- Simple, practical, and transparent methods for environmental assessment and monitoring are needed that can be adopted by government, developers, and environmentalists. The science needs to be made operational for these stakeholders.

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.

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 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 localised, whereas others span entire regional seas and the coastal and watershed areas associated with them. Some MSP focuses only on maritime uses, other MSP initiatives integrate coastal and watershed planning and management with marine management in an Ecosystem (or ecosystem-based management) Approach. Such MSP can be considered comprehensive in the sense that it considers a wide variety of uses and the connections between and within social and natural systems.

Strategic goals, that define needs to achieve the vision of marine spatial planning, 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, derived to the maximum extent possible from stakeholders through participatory planning. Measurable success occurs when objectives have metrics associated with them, with agreed upon indicators and targets. In addition, 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. However, since 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.

Marine spatial planning, like many other marine management approaches, including ICAM, Strategic Environmental Assessment (SEA), Ecosystem Based Management (EBM) and Integrated Ecosystem Assessments (IEA), can be very data demanding. In cases where science-derived data for setting goals, objectives, and thresholds are limited, information can be obtained from user groups and/or local communities with traditional ecological knowledge (TEK). New planning platforms such as MarineMap (used in California for the Marine Life Protection Act process) and SeaSketch (a software growing out of MarineMap for international use) can provide a vehicle to reach out to these communities and institutions which have crucial information, use their inputted information to enhance MSP, and at the same time draw new stakeholders into the planning process.

4. AVAILABLE TOOLS AND INNOVATIVE METHODOLOGIES FOR PUTTING MARINE SPATIAL PLANNING INTO PRACTICE

Ecosystem Approach and marine spatial planning

Marine spatial planning is increasingly becoming an important framework for ocean governance and is being developed in many countries around the world. International organisations 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, as describing existing tools and methodologies become dated in a relatively short period of time. Fortunately, many of the projects looking at 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 marine spatial planning – depending on the understanding of what constitutes a 'tool'. These range from legislative instruments and policies to 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 visualisation tools to simple 3D physical models and maps. The following section is not a comprehensive review of all tools available for use in MSP, but will identify those that are 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.

Policy and Legislation – High Level Goals for marine spatial planning

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 recognise and take account of the existing context and work with these high-level goals.

Many of the 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 marine spatial planning are the United Nations Convention on the Law of the Sea (UNCLOS), the Convention on Biological Diversity, 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. Countries with shared high level goals and commitments can use them as a point of departure for developing cooperation in cross boarder MSP.

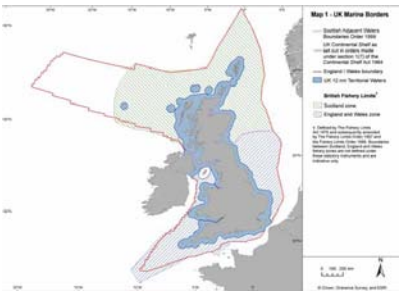
At a high level, the objectives of conventions governing the conservation and sustainable use of marine resources and their definitions appear to be closely aligned. However, trade-offs do occur when faced with the conservation of biological diversity while simultaneously permitting the sustainable use of its components. Turning these

objectives into more specific goals and management actions requires time and spatial scales to be defined. And it should be acknowledged that some tensions will linger between maximising participatory planning and the need to meet obligations under international agreements; MSP can help reduce these tensions, by making objectives clear and by linking all planning explicitly to these objectives.

At a national level, for countries with large maritime jurisdictions or with devolved or decentralised 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 the 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 authorisation 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 B).

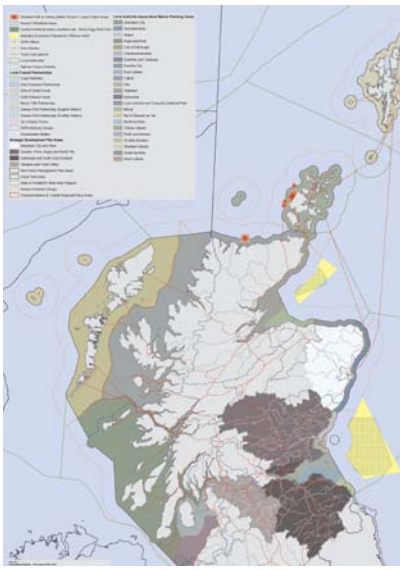
BOX B: NESTED OR TIERED HIERARCHY OF PLANS.

The UK Marine Policy Statement was prepared under the Marine and Coastal Access Act in 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 of 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.



Crown copyright from Safeguarding Sea Life—The joint UK response to the Review of Marine Nature Conservation, Defra Publications, London available from http://archive.defra.gov.uk/environment/biodiversity/marine/documents/rmnc-review-1205.pdf .

The Marine Policy Statement reiterates the UK vision for the marine environment, that is for 'clean, healthy, safe, productive and biologically diverse oceans and seas', and sets out the high level marine objectives. The Marine Plans will then provide a clear, spatial and locally-relevant expression of policy, implementation and delivery. They will ensure that different and potentially competing activities are managed in such a way that they contribute to the achievement of sustainable development. A key principle will be to promote compatibility and reduce conflict. This separation of policy development from the planning process seems important in the UK system.



Crown copyright available from http://www.scotland.gov.uk/Resource/Doc/295194/0113189.pdf .

The approach taken in the UK, while being based in legalisation, does allows for different approaches to be taken by each administration thus permitting the development of a planning system that allows for regional political, legal, administrative and cultural differences. For example, in England there is a two tiered approach been taken i.e. the Marine Policy Statement will provide the over arching vision and objectives and there will be 10 marine planning areas making up the second tier.

Scotland, on the other hand, has included an additional tier consisting of a National Marine Plan for Scotland under which Regional Planning by Marine Planning Partnerships working within the boundaries of Scottish Marine Regions will be housed – currently being defined.

Ocean zoning

Ocean zoning can provide many benefits in marine management including recognising the relative ecological importance and environmental vulnerability of different areas, allowing harmonisation with terrestrial land-use and coastal planning, better articulating private sector roles, minimising conflict between incompatible uses and maximise 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, ocean zoning 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 marine spatial planning is widely accepted in Europe, but is considered a political non-starter in other places. For example, the US approach to MSP, as outlined in the CSMP Policy framework proposed by the Obama Administration, does not 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 debate over 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.

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 is exemplary and should prove to be useful in other contexts, particularly MSP in Lesser Developed Countries (see Box C below). China, which has mandated ocean zoning in national waters, also merits tracking as it advances with its national MSP effort. Web-based resources describing new advances in these and other MSP initiatives are provided in Appendix A.

Sustainable Financing

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. Marine spatial planning, and the ocean zoning schemes that can emerge from spatial planning, can be harnessed to support innovative financing that allows revenue 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 that prevent destruction of carbon-sequestering habitats such as mangrove forests, sea grass beds, and salt marshes. 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. Other potential sources for generating revenues from PES, or entering into existing markets (water quality, for instance) can be guided by the Natural Capital Project's Marine Invest software, which identifies areas most important for the generation of ecosystem services of value.

Adaptive management

Marine spatial planning initiatives which have built in monitoring or evaluation mechanisms also allow for true adaptive management, which could 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

BOX C: MARINE ZONING IN SAINT KITTS AND NEVIS: A PATH TOWARDS SUSTAINABLE MANAGEMENT OF MARINE RESOURCES

(provided by TNC)

There are few examples to date of comprehensive marine zoning for tropical island nations. One example is the marine spatial planning exercise undertaken as part of a USAID funded project in St Kitts and Nevis. 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 its 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 in turn 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:

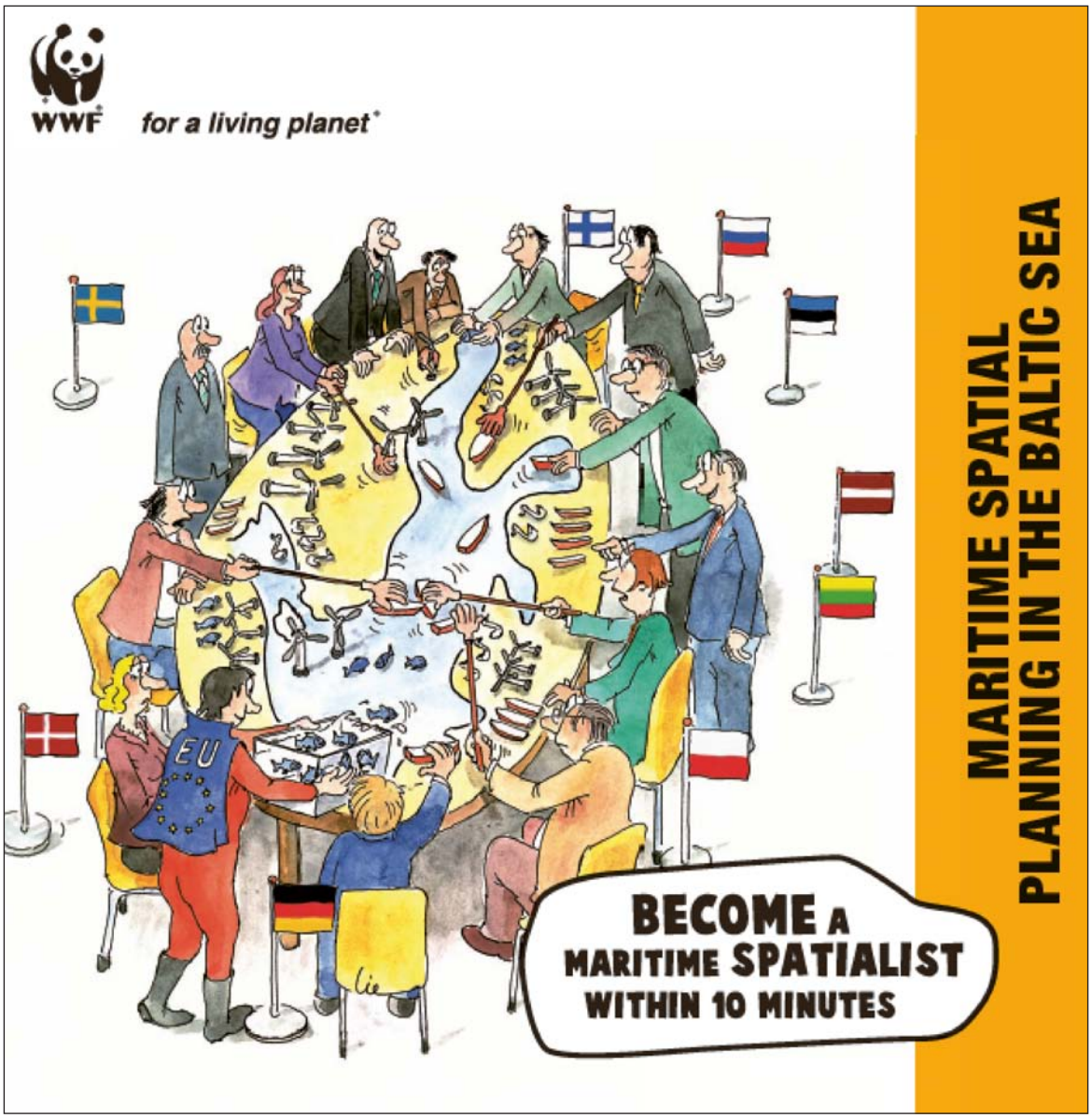
1. **Engage Stakeholders.** A variety of informal meetings with diverse stakeholders and decision makers from government, community groups, the private business sector, and fishers' associations were conducted to ensure stakeholder participation along the way. A steering committee, whose membership included 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 make planning decisions, finalise 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, and 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 would enable implementation, the team conducted a review of existing laws and potential mechanisms available to support marine zoning in Saint Kitts and Nevis.

The project team dedicated considerable effort to helping citizens of St. Kitts and Nevis 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. They are not, however, effective at depicting projected uses of the ocean into the future.

The draft marine zoning design, and all of the project activities leading up to it, has built a strong foundation for marine zoning in St. Kitts and Nevis. The next phase involves continuing the work with government and stakeholders of St. Kitts and Nevis to finalise 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.

in an open and transparent manner must be given careful consideration. Legislation can help in this regard by providing clear deadlines for periodic assessment, reporting, and outlook forecasting, as in the case of the Great Barrier Reef Marine Park Authority's Outlook Reports (GBRMPA 2009), along with the UK Marine and Coastal Access Act 2009 and the Dutch Water Law of 2009. The UK Act requires the effects and effectiveness of the policies set out in a plan to be reviewed and reported on every 3 years.

Communicating information about how well management is succeeding under marine spatial planning is an essential element of MSP and can drive good decision-making (Leisher *et al*, 2012). WWF, having recognised the potential power of such outreach, has developed a cartoon booklet detailing the negotiations around, and the benefits that can accrue from MSP in the Baltic (see example of MSP cartoon from WWF 2010, below). 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.



http://www.baltseaplan.eu/index.php?cmd=download&subcmd=downloads/WWF_Cartoon_MSP.pdf

5. THE STRATEGIC ROLE OF MARINE SPATIAL PLANNING IN MANAGEMENT OF TRANSBOUNDARY RESOURCES

In theory, marine spatial planning can be done in transboundary space. However, systematic planning in such areas is rare. With few exceptions, MSP is still a localised 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. The difficulty of this endeavour 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 within a single administration is probably the simplest scenario, as it 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 regions 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. The FIELD review of transboundary marine environmental protection presents good case studies on nascent MSP within and beyond national jurisdictions (Cole *et al*., 2012). A prime example is the Baltic Sea, a semi-enclosed body of water providing vital ecosystem goods and services to Baltic Sea states, but vulnerable to environmental pressures (see Box D below). 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. Therefore, Regional Seas, LME and international organisations (IMO, ISA, and fisheries organisations) are probably the correct institutional platforms to progress transnational and transboundary ecosystem based MSP. These organisations are also being successfully used to exchange experiences and knowledge and improve capacity for MSP, and there is undoubtedly significant potential for their use as a platform for early transnational consultation on MSP.

The groundwork for marine spatial planning in transboundary areas and international waters exists in many regions.

The Arctic region is one of the most obvious candidates for transboundary discussions concerning the use of ocean space. Unlike the Southern Ocean (surrounding the Antarctic continent), the Arctic has no international treaty which could guide consensus-building on the use of resources and space.

Marine spatial planning has entered the conversation among countries that have vested interests in the Arctic (territorial claims, and countries that would use the newly opened up waters of the increasingly ice-free Arctic for diverse national interests, including transportation/shipping and resource extraction). The Aspen Institute hosted a multinational and multi-institutional dialogue about MSP in the Arctic, and published a report about its potential in this highly contested region (Aspen Institute 2011).

This is not to say that marine spatial planning 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 such an approach in order to build on the wealth of ecological information already amassed for the region.

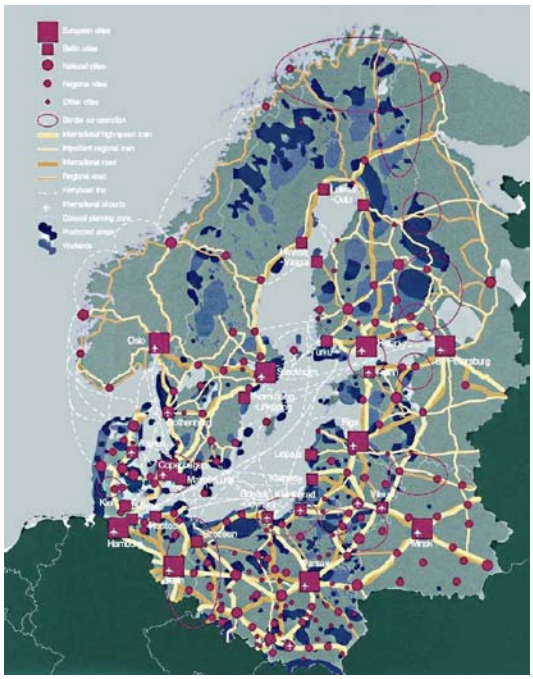
Similarly, in the Mediterranean region, a commitment by Parties to the Barcelona Convention to the Ecosystem Approach has provided many of the elements that could be drawn upon should the Parties decide an MSP process might apply in ABNJ (much of the ocean territory of the Mediterranean, where EEZs have not been established). The Regional Activity Centre for UNEP's Mediterranean Action Programme (MAP) which deals with biodiversity (known as RACSPA), has done scientific work on describing areas meeting CBD's scientific criteria fore ecologically or biologically significant marine areas in Mediterranean. It 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.

BOX D. BALTIC SEA REGION

The Baltic Sea Region is probably the most advanced in developing transnational marine spatial planning. The Baltic Sea is a semi-enclosed body of water connected to the North Sea through the narrow Kattegat. It is a self-contained sea that is normally brackish, fairly shallow and covered by ice in some areas in winter.

In October 2010 the HELCOM-VASAB MSP Working Group (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 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, (http://www.helcom.fi/stc/files/HELCOM-VASAB%20MSP%20WG%20Principles.pdf). Marine spatial planning 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 (http://www.helcom.fi/stc/files/HELCOM-VASAB%20MSP%20WG%20Work%20Plan%202010-2013%20and%20Annex.pdf) 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.

Much of the thinking on transnational MSP for the Baltic Region takes place in the EU funded projects BaltSeaPlan (www.baltseaplan.eu) and Plan Bothina (http://planbothnia.org/). Of particular interest is "Vision 2030" that looks back from the future 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 subnational level alone. These are:



Visions and Strategies around the Baltic Sea 2010 available from http://www.vasab.org/

- A healthy marine environment
- A coherent pan-Baltic energy policy
- Safe, clean and efficient maritime policy
- Sustainable fisheries

The HELCOM-VASAB MSP WG will take "Vision 2030" into consideration when further considering deliberations on an agreed vision for the Baltic Sea Region.

Addressing spatial management at the regional scale will, however, be likely only once coastal countries experiment with MSP within their jurisdictions.It is clear from regional marine spatial planning initiatives that there exists a significant challenge to finding the correct scale/balance in which to meet ecological goals while not outstripping institutional capacity. It is best to plan incrementally and to invest in finding common interests, goals and visions 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, and continental shelf levels make dialogue difficult. Nonetheless, opportunities exist for examining transnational and transboundary constraints and barriers to ecosystem based MSP, and developing mechanisms to overcome them in order to realise MSP's true potential in improving management and safeguarding biodiversity and ecosystem services.

6. CHALLENGES IN IMPLEMENTING MARINE SPATIAL PLANNING AND MEANS TO OVERCOME THEM

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

■ INSTITUTIONAL

Need for cross-sectoral 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 possible decision/recommendation). 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 submitted by developers rather than being led by a plan developed by a wide array of stakeholders.

Need for addressing multi-use conflicts through MSP

Marine spatial planning is a relatively new term, and one that has not necessarily been clearly defined or explained in all regions of the world. Communication about how MSP improves quality and efficiency of decision making by ensuring transparency and information access has been facilitated by publications such as TNC's *Best Practices for Marine Spatial Planning (TNC 2009)* and WWF Baltic's cartoon describing the planning process in Europe (WWF 2010). Nonetheless, opportunities for misunderstanding are numerous in the marine management domain, and once misunderstandings or lack of clarity about objectives of management occur, the investment of time and energy in spatial tools and approaches may be wasted as conflicts emerge (Agardy *et al.* 2011b).

Generally speaking, spatial management options can result in two main types of conflicts: namely conflicts between human activities and the environment, and conflicts between different human activities. The former requires an assessment of the risks of anthropogenic activities, which vary in their intensities and footprints on

ecosystem components 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 presently being studied. There are, however, insufficient 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.

Need for stakeholder driven planning

There is a tendency by proponents of new initiatives to offer MSP or other management frameworks or tools before there is a strongly felt need or commitment by the institutions and communities that have the actual decision making authority. The inclination is to rush the process and respond to financial opportunities, rather than create institutional constituency or commitments prior to formal adoption of programmes. The need for marine spatial planning should arise from the stakeholders (including governments) thus eliminating the "cart before the horse" barrier often created when the approach is imposed or forced on stakeholders.

Although grafting MSP onto existing governance structures appeals in terms of administrative and related efficiencies, it 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 conflicts 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 in which case there may be a reluctance to engage in a process that reinforces the status quo (ODEMM 2012). In addition, 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, or able to transform to achieve broader goals, before entrusting it with the challenging task of MSP (Flannery and O´Cinneide 2012).

Need for strong supportive legal frameworks

Without consistent legal frameworks or legal consistency/harmony at local, state and national levels, redundancies, confusion and contradictory policies can be created. 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 decentralised coastal and ocean legal frameworks (Eisma *et al*. 2005; Christie *et al.* 2007; Patlis *et al*. 2005). While these legal frameworks which allow for localised 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 *et al*. review for BOBLME/FAO).

The practice of large-scale, and especially offshore MSP may be hindered by decentralised planning/legal structures (Christie *et al.* 2009; Eisma *et al*. 2009). While decentralisation tends to encourage buy-in at the local level, it can also complicate multi-institutional processes.

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 experiences and laws from other contexts. Therefore, information exchange and capacity development are essential investments when conceptualising the diffusion of MSP globally.

Need for capacity development

Long term investment in development of human and institutional capacity for essential MSP related activities is a key to success. This includes relevant information analysis, planning, implementation and evaluation. Capacity development includes fostering leadership of public sector marine spatial planning 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. In some countries, the internalisation and commitment to ICM is based on decades of effort to raise capacity through formal (e.g., educational degrees) and information mechanisms (e.g., field experience). The increasing importance of internet-based communication has allowed for distributed learning (Kay and Christie 2001) and is creatively employed by capacity development and learning networks such as the Locally Managed Marine Area Network (http://www.lmmanetwork.org/). Learning networks organised amongst peers with common interests and experiences, with occasional external inputs by technical advisors, have 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 conceptualises EBM planning (as science and technology-based) is not likely to be relevant in Haiti, or contexts with large indigenous people populations such as the Caribbean Coast of Nicaragua. Therefore, marine spatial planning 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). 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 decentralised planning, where appropriate. Various marine resource planning efforts in high-technical capacity contexts are stalled due to lack of commitment or trust in decentralised 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. For example, the maritime industries have recently engaged in the collection of information on environmental parameters and ship activities (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.

A major shortcoming in many MSP projects is the lack of integration or application at the appropriate ecosystem scale (Meliane *et al*, 2010). This is an important challenge in areas such as Europe where national waters tend to be small in comparison to the size of the ecosystem. Countries such as Belgium, Germany and the Netherlands have enacted laudable efforts at MSP in territorial waters, but lack integration at the larger scale (Douvere & Ehler 2009). In contrast, efforts in Australia, outside of the GBR, have focused on defining appropriate bioregional scales for approaching ecosystem-based management. While this "bioregionalization" effort in Australia is useful in terms of defining ecosystem boundaries, these efforts do not address near shore waters, uses and impacts within 3 nautical miles, or consideration of current or future human uses at a level needed for zoning or planning within the regions (Meliane *et al*., 2010).

■ ENVIRONMENTAL

MSP's catalytic role for sustainable development

Marine spatial planning is commonly concerned with conflict resolution and the allocation of space to different users. It is not created explicitly for conservation or protection. However, MSP does catalyse the identification and allocation of areas for conservation. It can also 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). Still, people act based on perception, and the diffusion of MSP by institutions perceived to have either a development or conservationist bias will influence how MSP is perceived and received by various social groups.

Choosing hat 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. 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

Need to address 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 organised 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 armouring 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). For example, tropical artisanal fishers are poor and fisheries resources are poorly managed, resulting in a downward cycle as individuals ratchet up fishing efforts (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 Organisation (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. Programmes 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.

■ SOCIAL

MSP complementing traditional management approaches

Because comprehensive MSP is relatively new, it is unclear how it will complement, rather than replace, community based approaches to coastal and marine resource management.

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). As funding has streamed toward large-scale conservation or resource management programmes, it has become all the more important that investments in community-scale programmes remain intact or increase.

Human communities are particularly concerned with their immediate surroundings, families, and conditions over which they have influence. The social science theory and empirical evidence for this is relatively elementary. However, 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. Nonetheless, 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). The case of Danajon Bank management in the Philippines (see Box E) is an example of experimentation in scaling up through spatial management while maintaining articulation with community or co-management planning processes.

Reconciling top-down, large scale planning with bottom-up and more localised management

MSP must recognise the importance of existing bottom up approaches – it is not meant to replace these initiatives, but rather 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 localised 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).

BOX E: DANAJON BANK MARINE PARK PROJECT

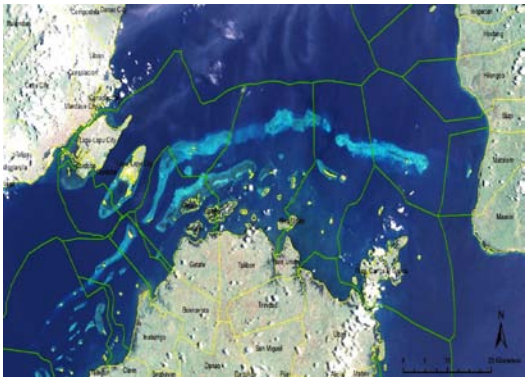
(Sparks 2012, CCEF website)

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 in 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 an extensive information and education campaign
5. Plan and catalyse tourism enterprises

The programme 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 useful approach. 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).



Danajon Bank, Municipal water boundaries marked

Calituban Island, Danajon Bank, Philippines
© Coastal Conservation and Education Foundation

■ ECONOMIC

Harmonizing access to marine space by established economic sectors such as fisheries, oil and gas, pipes and cables, shipping and navigation

The demand for marine space from new uses such as renewable, sand and gravel extraction and conservation, will continue and probably increase. While there is a distinct disadvantage to not being involved in the forward planning spatial allocation for these activities, there can be a large benefit to being involved and seeking mitigation, compromises and synergies.

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, 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-organised 'right to fish' movement and lobby had major impacts in MSP planning efforts in the Australian Great Barrier Reef, as well as in California MSP and MPA planning efforts. The balance between industries and sectors that want uses to be rationalised and spatially organised and those that prefer unfettered access to marine resources and spaces, will be one of the main dynamics which MSP will need to address.

Assessing 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 considering costs. Incentives for inter-institutional collaboration (funds, cost reductions, etc) can facilitate the launching of an MSP process and its eventual success. Developing capacity 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). They also tend to benefit certain parties and epistemic communities or networks of individuals/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, which consequently may create resistance. 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, may also 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; Subade, 2007). However, 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 processes 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 in order to demonstrate progress to donors, and may also erode long term sustainability (Christie *et al.* 2005). As donor support is phased out, expensive institutions and governance mechanisms are unlikely to be maintained.

Full trade-off analyses (including clear benefits and costs) have as yet rarely been used in MSP efforts. However, many decision-support tools include some trade-off assessment. Trade-offs are analysed with quantitative and qualitative methods (Barents Sea, Netherlands) and with expert judgment (Wadden Sea). Where there has been prioritisation of spatial uses, trade-off analysis consists of prohibiting incompatible uses (e.g. German EEZ) and permitting decisions (Shetland Islands and China). In some cases, decision support tools were used to develop and compare alternative scenarios to identify potential 'least-cost' solutions (SK&N, Belgium, California). White *et al.* (2012) recently completed a trade-off assessment for MSP in Massachusetts (USA), showing the economic benefits of adopting a systematic planning approach for use of ocean space, particularly in regards to the growing offshore renewable sector.

A review of 17 marine spatial plan initiatives around the world (NOAA SAB, 2011), which builds on an earlier analysis undertaken by Agardy (2010), shows what sorts of uses are typically considered in trade-off analyses, whether formal or informal. All plans had ecological objectives, such as the conservation of biodiversity and critical habitats, the sustainable use of natural resources, avoiding pollution and eutrophication, and resilience to climate change. Most of the plans had explicit economic objectives, which relate to energy development, fisheries, maritime transport, and sand extraction. Market and non-market uses are contained in seven of the plans. These involve the maintenance of culturally important marine areas, sustaining culture and livelihoods in coastal and indigenous communities dependent on marine resources, and enhancing public participation and support for decision-making (NOAA SAB 2011).

Multi-stakeholders partnerships for MSP

Resistance to marine spatial planning, whether on economic (or perceived economic) grounds, or for reasons of social or political ideology, should be anticipated. It 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 successfully overcome 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 polarised political context and budgetary cuts (http://www.whitehouse.gov/files/documents/OPTF_FinalRecs.pdf). Therefore, having leaders who effectively respond to resistance is essential to success. Leadership skills, as emphasised 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.

In order to avoid derailing MSP processes once they are initiated, arising conflicts should be mediated rather than suppressed or ignored. Marine Spatial Planning can be considered neutral when it strives to deliver and even promote development that is socially, economically and environmentally sustainable. However, in practice MSP is not always neutral, as well as ICAM, MPAs and other more focused spatial management tools). In these cases MSP can become a representation of a particular value system, which may be considered valid and may represent the majority interest, but which may be resisted by those who hold other values.

Conflict can emerge either prior to, or after adoption of MSP. In the last decades, we have seen the development of conflict resolution mechanisms and institutions for particular issues and sectors: for example, the 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 disagreements among marine uses and marine/coastal planning processes (Bennett *et al*. 2001). However, McCreary *et al*. (2001) offer a solution to reduce conflict. 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). It must be acknowledged that not all conflict can be resolved, and ultimately decision-makers (at any level) will need to make difficult choices which may not necessarily suit everyone.

While unmanaged and large-scale conflict can be problematic, some degree of conflict and intense disagreement is generally 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 continue to 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 what it is not. In some cases, users have not only supported, but 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 marine spatial planning 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. Local context and interpretation of MSP is important. However, reaching a common understanding of MSP context may take decades. For example, the M in MSP has been interpreted as standing for Maritime in the EU and Marine in the US contexts—with associated meaning related 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).

Explicitly identifying those marine uses being considered in 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). While these tools have the potential to increase transparency and objective planning, they may generate controversy 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.

Ultimately, accountability matters as much as 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 AND GEF INTERNATIONAL WATERS PROJECTS

Marine spatial planning facilitates multi-objective planning and management, recognises the connections between land, freshwater, and marine ecosystems, and addresses human uses of and impacts of importance in all these systems. As such, MSP is an essential framework to support ecosystem-based management in these environments. 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 a forward thinking planning process of space for all human uses and non-uses in the marine environment, followed by the implementation of these 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.

One size doesn't fit all in MSP; in order for MSP to realise 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.

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. The ideal scenario is when there are nested institutions in which local level policies are supported by national institutions, and local level policies are in agreement with national priorities. Careful development of institutional commitments to MSP is needed prior to planning and implementation. In preparing for MSP, there should be clear discussion on the 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 may be lost. A governance assessment early in the MSP process can indicate how solid the foundations are for participatory planning, and whether they need to be strengthened. Although buy-in is necessary, 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 also good governance ("good" meaning appropriate to the social and political context and capacity; "governance" referring to all forms of governance, not just that taken on by governments). The absence of good governance creates significant barriers to MSP. Even neutral marine spatial planning may require that planners support or even advocate for disadvantaged stakeholder groups. There may be institutional resistance to decentralised or participatory planning processes, in which case these stakeholders may need training and support to make their voices heard. Weaker disadvantaged sectors and stakeholders must be assisted in preparing their own spatial policies or 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. 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 are also emerging. To this end, the United Nations recently approved The UN Voluntary Guidelines for Land Tenure and Access Rights to Land, Fisheries and Forests, approved by 96 countries on March 14, 2012. The UN Food and Agricultural Organisation (FAO) has coordinated the development of Voluntary Guidelines (see http://www.fao.org/nr/tenure/voluntary-guidelines/en), which seek to assist States, civil society and the private sector in improving the governance of tenure, thus contributing to the alleviation of hunger and poverty, the empowerment of the poor and vulnerable, the enhancement of the environment, the support of national and local economic development, and the reform of public administration. Voluntary Guidelines set out principles and internationally accepted standards for responsible practices and a framework which 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 an upcoming special session. **Though largely terrestrially focussed (especially on land tenure issues), these guidelines on tenure and access could have implications for MSP frameworks as plans are developed and implemented, particularly in Lesser Developed Countries.**

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

Through MSP initiatives, multilateral institutions are offered 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.

Marine spatial planning 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 on use of marine space, and establish conditions promoting economies of scale. To meet this potential, intergovernmental organisations, 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 to MSP mainstreaming into existing management frameworks;
- Establishing or enhancing monitoring, data analysis and scenario modelling of ecosystem goods and services as a basis for MSP development;
- Supporting further development of tools to enable improved assessment of cumulative impacts to ecosystems and trade off analyses that balance ecological, social and economic objectives;
- Supporting impact assessments and embedding effectiveness monitoring into existing MSP efforts;
- Nurturing and facilitating collaboration across multilateral organisations, government, private and public sectors, educational and scientific institutions, and indigenous and local communities in the development and implementation of MSP.

When considering establishing marine spatial plans, national and local governments should recognise 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;
- Recognising 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 organising framework, and serves as a worthwhile investment through which national marine management can be strengthened. 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. 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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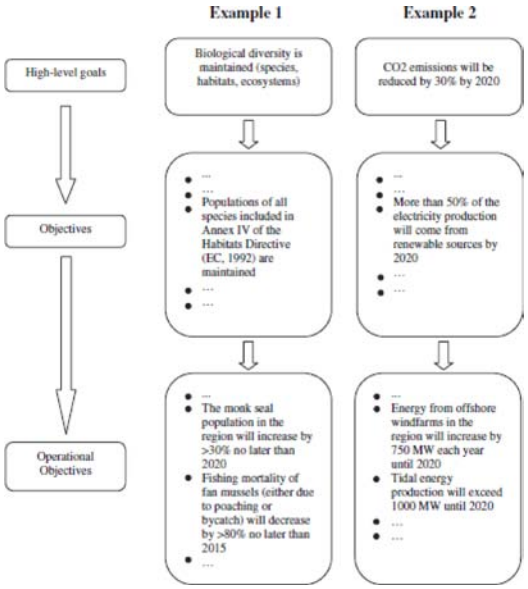
APPENDIX A
ASSESSMENT, MAPPING, DECISION-SUPPORT: TOOLS FOR FORWARD PLANNING

ASSESSMENT

Even though assessment can be a complex business, it is an essential step in developing a marine spatial plan. Integrated Ecosystem Assessment (IEA) is an indispensable tool for MSP which assists in monitoring the spatial effects of existing, and predicting 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 in quality. They describe various models that can be used in these different situations including Ecopath with Ecosim models (see http://www.ecopath.org/) to assess food webs and identify critical biological indicators and thresholds. Setting indicator thresholds 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 describe methods for management evaluation based on biophysical, socioeconomic and governance goals, as well as the use of indicators and thresholds to define decision rules for adaptive management. An earlier paper by Katsanevakis *et al.* (2010) provides a methodology of how high-level goals can be translated into operational objectives (see below). It also gives 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.



In response to an OSPAR request, ICES (2010) advised that the specification of threshold values between levels of ecosystem status could facilitate policy application and communication. However, all specifications should be interpreted with caution since they are arbitrary and often aggregated points on a continuum of changes caused by both natural and anthropogenic origins. 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 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 areas, 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 help identify key pressures (specifically from human activities) on marine ecosystem characteristics. This tool would help focus management action on the most damaging activities and identify the most vulnerable ecosystem characteristics. The second is a Linkage Framework conceptual tool created/used to describe the relationships between the ecological, socio-cultural and economic characteristics (ODEMM, 2012).

MAPPING

Mapping is central to marine spatial planning. 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.

MSP is concerned with spatial optimisation 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 build on mapping and 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 related 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 (see Ban *et al.* 2010 for instance).
- 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 visualise 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 programme 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). MarineMap has now been expanded for broader international application in software called SeaSketch.

The Biodiversity Conservation Informatics Group from The Finnish Centre for Excellence in Metapopulation Biology used 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, lesser 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 optimisation. 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 optimisation 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 are significantly similar. 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 that their conservation-value maps were strongly influenced by the cost metric. However, each identified similar areas as being important. They also pointed out that the approaches that underpin Marxan and Zonation are fundamentally different, with Marxan seeking to minimise costs while meeting specified targets, and Zonation seeking to maximise biodiversity benefits given a specified cost.

DECISION SUPPORT

Successful marine spatial planning not only involves developing plans, but also 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. Trade-off analyses are commonly done in decision-making, but MSP frameworks can make those trade-offs explicit and transparent, allowing cost/benefit analyses to guide decision-making (White *et al*., 2012).

Optimisation methodologies and decision-support tools such as MARXAN can help evaluate options, but the guiding principles must be clearly stated and agreed upon. In most cases of actual MSP around the world, the options first derive from expert opinion, and are subsequently assessed by tools 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.

In addition to the MARXAN and Zonation software, there exist other tools that also support zoning decisions. It is worth noting that the Center for Ocean Solutions has undertaken a Decision Support comparative analysis which compares different tools used in MSP approaches (Center for Ocean Solutions, 2011).

Stelzenmüller *et al*. (2010) developed the Bayesian Belief Network (BN), linked to GIS as a practical tool to support marine spatial planning. It allows the relationships between human activities and their combined impacts on marine habitats to be assessed using empirical and qualitative data, and it also tests management objectives by means of scenarios. In order to also 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 two 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 potential 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).

Such agent-based approaches are helpful to further MSP, but it should be acknowledged that patterns of use or behaviours may not necessarily persist or follow the historic trends trajectory. The need to understand and address outlooks for major demographic and economic drivers that may change both the social and environmental contexts is critical to all forward planning.

BOX: SELECT MSP TOOL RESOURCES

A vast amount of information on tools for MSP can be found on the websites of different agencies and research projects. Information and software on the wide range of tools is either available on these sites or through links to other websites. 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/

When last accessed, this site contained 18 tools dealing with analyses, data handling, data visualisation and simulation, all useful tools in turning 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, when last accessed, contained a further 26 tools. Tools include habitat priority planners, essential fish habitat mapper, and 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 world. These 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. When last accessed, there were 173 tools, 176 books and guidance documents, and information on 29 projects posted on the site. Many, but not all, are free.

MESMA

http://publicwiki.deltares.nl/display/MESMA/TOOLS

MESMA is an EU-FP7 funded project on monitoring and evaluation of spatially managed marine areas. When last accessed, there were 72 tools available, many with summary descriptions. In addition, the site provides links to a wide range of websites where additional information on marine spatial planning and decision support 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).

The Nature Conservancy

http://www.marineplanning.org

The Nature Conservancy developed a website to provide updated information and support for undertaking multi-objective planning through MSP. The website contains technical and policy resources related to MSP, as well as case studies and information on decision support tools.

APPENDIX B
SUMMARY TABLE OF MULTI-OBJECTIVE MARINE SPATIAL PLANNING PROJECTS PROPOSED OR UNDERWAY INTERNATIONALLY

Achievements range from framework development (1), through the planning process, to implementation and measured results. Perceived benefits include both the motivation for initiating a MSP project or, in some cases, measured achievements. (From Meliane *et al*., 2010)

Note : The list below is not an exhaustive list, but provides some selected cases available.

MSP Project	Management Objectives	Achievements	Perceived Benefits	Citation
Australia *Bioregionalisation Programme*	■ Conservation ■ Multiple activities as they relate to ecological criteria of marine plans	Framework developed Planning in progress	By zoning activities based on ecological criteria, will ensure ecologically-sustainable development.	(Day *et al*. 2008)
Australia *GBRMP*	■ Conservation ■ Transportation ■ Fisheries ■ Tourism ■ Aquaculture	Spatial Management Implemented Results measured	Extensive conservation zones in place. High level of compliance	(Day *et al*. 2002)
Belgium *Part of the North Sea (BPNS)*	■ Conservation ■ Fisheries ■ Transportation ■ Resource extraction (dredging, sand and gravel) ■ Alternative energy ■ Tourism ■ Aquaculture ■ Infrastructure (cables and pipelines) ■ Dumping ■ Defense	Spatial Management Implemented	Reduces user conflict. Enables proactive, anticipatory action to address new and emerging human uses.	(Douvere *et al*. 2007)
Canada *Eastern Scotian Shelf (EESIM)*	■ Conservation ■ Fisheries ■ Transportation ■ Resource extraction (offshore oil and gas, minerals) ■ Infrastructure (cables and pipelines) ■ Tourism ■ Defense ■ Research	Plan complete		DFO (2007)
Germany *North Sea and Baltic Sea*	■ Conservation ■ Fisheries ■ Transportation ■ Resource extraction ■ Alternative energy	Plan complete 2007. Adopted 2009.	Enables proactive, anticipatory action to address new and emerging human uses.	Federal Maritime and Hydrographic Agency. (2009)
The Netherlands	■ Conservation ■ Fisheries ■ Resource extraction (sand) ■ Alternative energy ■ Transportation	Plan complete in 2005	Enables planning for emerging human uses and increasing intensity of human uses, as well as future planning for sea-level rise.	Interdepartmental Directors' Consultative Committee North Sea (2005)

MSP Project	Management Objectives	Achievements	Perceived Benefits	Citation
Norway	■ Energy (oil and gas) ■ Fisheries ■ Transportation ■ External pressures (e.g. pollution)	Plan complete in 2006	Integration of previously separate management regimes	(Olsen *et al*. 2007)
Sweden	■ Not specified	Framework developed	Improved ecological conditions	Better management of the marine environment (2008)
United Kingdom	■ Not specified	Framework developed	A more coherent and integrated approach to addressing marine threats.	
US *Massachusetts*	■ Conservation ■ Alternative energy ■ Aquaculture ■ Infrastructure (cables and pipelines) ■ Resource extraction (sand and gravel)	Plan complete in 2008	Enables proactive, anticipatory action to address new and emerging human uses.	EEA (2009)
US *Florida Keys*	■ Conservation ■ Tourism ■ Fishing ■ Transportation ■ Energy	Spatial Management Implemented Results measured	Protects the environment from and for heavy tourism.	
China	■ Conservation ■ Marine development	Spatial Management Implemented	Controlling development and use of marine resources.	Li (2006)