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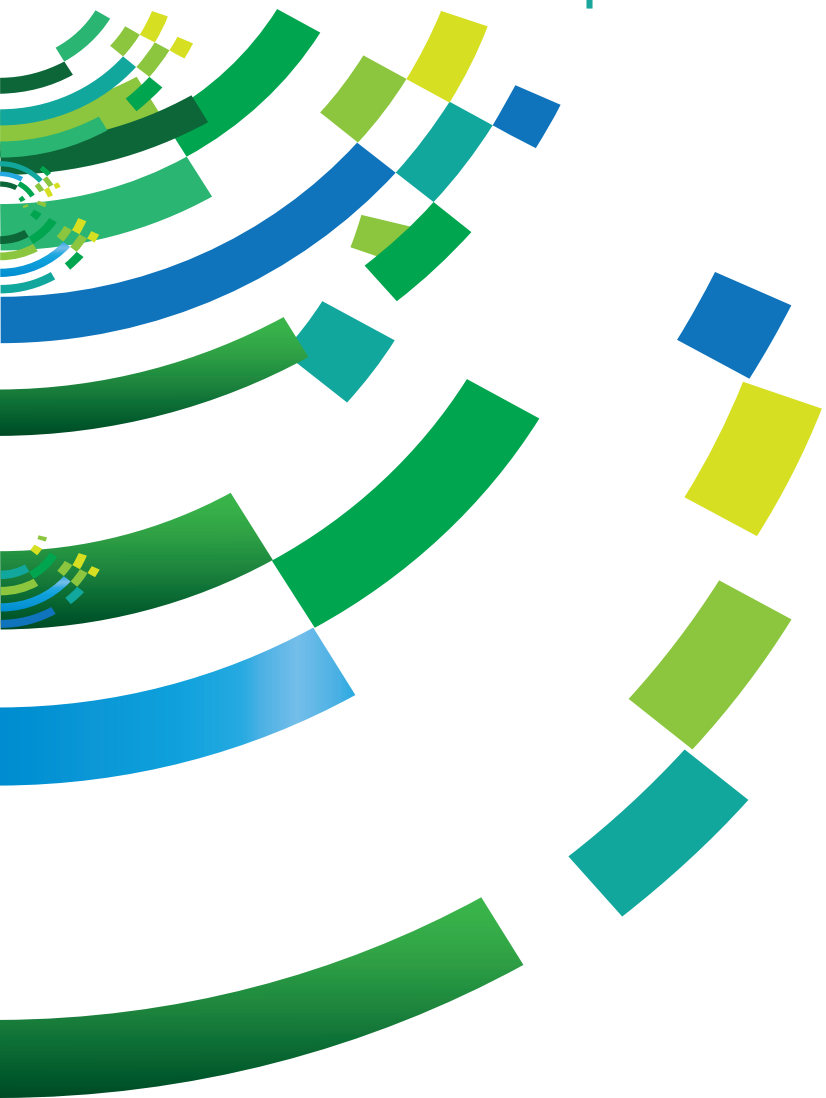
Issue Paper

Marine Spatial Planning

Assessing net benefits and improving effectiveness



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The GGSD Forum is an OECD initiative aimed at providing a dedicated space for multi-disciplinary dialogue on green growth and sustainable development. It brings together experts from different policy fields and disciplines and provides them with an interactive platform to encourage discussion, facilitate the exchange of knowledge and ease the exploitation of potential synergies. By specifically addressing the horizontal, multi-disciplinary aspects of green growth and sustainable development, the GGSD Forum constitutes a valuable supplement to the work undertaken in individual government ministries. The GGSD Forum also enables knowledge gaps to be identified and facilitates the design of new works streams to address them.

Authorship & Acknowledgements

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Abbreviations

CBA	Cost-Benefit Analysis
CEC	Commission of the European Communities
EC	European Commission
EEZ	Exclusive Economic Zone
EU	European Union
GIS	Geographic Information System
GVA	Gross Value Added
ICZM	Integrated Coastal Zone Management
IOC	Intergovernmental Oceanographic Commission
MPA	Marine Protected Area
MSP	Marine Spatial Planning
UK	United Kingdom
UNESCO	United Nations Educational, Scientific, and Cultural Organization

Executive Summary

Marine spatial planning (MSP) is becoming established globally as an approach by which coastal nations can better manage their internal and territorial waters. This is in the interests of the more sustainable use of marine resources and the better arrangement and management of maritime activities, both existing and new.

Experience has been growing in several parts of the world, through both pilot projects and official processes. MSP is developing partly in conjunction with the establishment of marine protected areas (MPA) and integrated coastal zone management (ICZM), and is also being connected to other spatial planning frameworks. There are established principles and recommended processes for MSP. However, it is being carried out in a variety of ways, reflecting different legal and administrative frameworks, as well as local characteristics of the marine environment and maritime activities.

Attention is now turning to the evaluation of MSP, to assess whether or not it is achieving desired outputs. Evaluation frameworks are being developed, though practice in this regard varies considerably between different contexts. Within this, some attention has also been given to assessing the socio-economic benefits, with some efforts being made in assessing the benefits of individual marine spatial plans. There is scope here for learning from the longer-standing experience of the evaluation of MPA and ICZM programmes.

A number of key issues can be identified for improving the effectiveness of MSP. These include:

- Gaining resources and political support: responsible bodies for MSP should ensure adequate financial and skills resourcing and support:
- Data–gathering: data should be gathered in order to support the monitoring and evaluation of the implementation of marine spatial plans;
- Addressing key priorities: focusing the marine spatial plan on achievable, clearly stated objectives, reflecting wider policy goals;
- Ensuring integration with other planning frameworks: there should be coordination across land and sea, in cross-border areas and with sectoral plans;
- Gaining meaningful stakeholder participation: ensuring that MSP is conducted in an inclusive and culturally sensitive manner;
- Maintaining flexibility in MSP practice: the planning measures that are used should reflect the context and needs of the plan area and bodies affected;
- Committing to plan implementation: consideration should be given from the outset to how a plan's proposals are going to be put into practice;
- Giving greater consideration to costs and benefits of MSP: a more systematic approach to economic valuation should be developed, as well as integrating economic analysis of trade-offs, and building into the MSP cycle.

1. Marine Spatial Planning: concepts, process, and implementation

1.1 Concepts

MSP (also known as maritime spatial planning, ocean planning and similar terms) is becoming established globally as an approach by which coastal nations can better manage their internal and territorial waters and in many cases, their extensive Exclusive Economic Zones (EEZ) and continental shelf areas (Schaefer & Barale, 2011).

MSP has been defined as:

> *An integrated, policy-based approach to the regulation, management and protection of the marine environment, including the allocation of space that addresses the multiple, cumulative and potentially conflicting uses of the sea and thereby facilitates sustainable development (MSPP Consortium, 2006).*

However, MSP is being carried out in a variety of ways, reflecting different legal and administrative frameworks, as well as the particular characteristics of the marine environment and maritime activities. This has come to light through comparative studies of MSP processes around the world, revealing significant differences of implementation (Jay, 2010).

It should also be recognised that related processes are developing that may not be referred to as MSP or one of its variants, such as integrated management planning and ocean zoning. There have also been localised initiatives, developing from ICZM and other ecosystem-based approaches, such as conservation programmes (IOC-UNESCO, 2017a). Indeed, MPAs provided the foundation for MSP in some contexts, sometimes with a strong zoning approach (Agostini et al, 2010). It should also be noted that the EU refers to maritime, rather than marine, spatial planning, placing greater emphasis on socio-economic activities. It is therefore more meaningful to refer to a family of MSP-type approaches than to set down a strict definition.

The proponents of MSP argue that existing approaches to managing the world's seas and oceans are inadequate for meeting current challenges. Demands upon marine resources and for the use of the seas are increasing significantly, both for traditional maritime uses (such as shipping and fishing) and new uses (such as offshore wind energy and aquaculture). This is reaching the point that uses are coming into conflict with each other. They are also adding to the damage done to the marine environment. There is insufficient coordination of these activities and too little consideration of their environmental effects, especially of the cumulative effects of multiple activities (both from the coast to the high seas and throughout the water column).

It is argued that a better approach to managing the conservation and sustainable use of the seas could be achieved by a system of spatial planning. This includes the allocation of defined areas for fixed activities (such as offshore wind farms, pipelines and aquaculture), also to some extent for mobile activities (such as shipping and fishing) and for marine nature conservation. A 'place-based' approach of this kind has advantages over the more ad hoc regulation of individual sectors that has predominated so far (Gilliland

& Laffoley, 2008). This 'spatial turn' in marine management could optimise the use of the seas (Jay, 2010) by:

- giving all marine activities a fair share of space and time;
- protecting ecologically-sensitive areas from harmful intervention;
- separating uses that would otherwise conflict with each other;
- combining uses that are compatible with each other;
- facilitating the sustainable exploitation of marine resources;
- enabling greater integration of marine and terrestrial activities;
- encouraging investment by providing a stronger regulatory framework;
- reducing regulatory and compliance costs;
- providing a process for stakeholder interests to be represented and reconciled;
- improving information provision about the use of the seas.

It is generally considered that the following interests should be considered in MSP:

- marine conservation and sustainable use;
- fishing, of all types, and aquaculture;
- shipping, including commercial goods and passengers;
- offshore oil and gas exploration and exploitation;
- aggregate extraction (sand and gravel) and mining for minerals;
- seabed cables and pipelines;
- military activities;
- marine renewable energy: wind, wave and tidal;
- tourism and recreation, including coastal tourism and water-based activities;
- cultural assets, including underwater archaeology and seascape.

1.2 Early experience and policy uptake

Apart from the official processes of some leader nations, MSP was initially taken up through research projects and pilot studies, many of which have been funded by the European Union (EU) (EC, 2017). These helped to develop the principles and methods of MSP, but did not have full official backing and the marine plans produced did not carry legal weight. However, MSP has been gaining policy support from government and inter-governmental bodies, who see MSP also as a means of achieving wider societal aims, including opportunities for growth of maritime economic activities. For example, in the United Kingdom (UK), a series of policy documents led to the legislation providing for a statutory system of MSP

(Defra, 2002, 2006). The EU embarked on a series of initiatives exploring its potential, culminating in a Directive requiring all coastal Member States to implement MSP by 2021 ('MSP Directive') (1.7). In the USA, during the previous administration, the National Ocean Council promoted the uptake of MSP (NOC, 2013). As statutory systems of MSP have been introduced in some jurisdictions, the marine plans have had greater legal recognition and have been binding on sea users.

MSP can be linked to other planning processes. Firstly, it may work alongside the longer-standing process of ICZM and extend out to sea, whereby authorities and stakeholders with coastal interests collaborate in addressing common issues such as nature conservation, coastal flooding and defence and local economic development (Allmendinger et al, 2002; CEC, 2000). There are differences of emphasis between the two processes; for example, ICZM has been focusing on environmental policies, trying to find participative solutions that may result in strategies and management plans to steer collaborative working and good practice, but it does not generally result in the allocation/designation of space to particular maritime activities, in the way that MSP does. Overlapping with the land and drawing in terrestrially-focused bodies, ICZM presents the coastal policy framework with which MSP might be integrated. MSP and ICZM should therefore be linked, as they both seek to address the problems of fragmented governance in marine settings, and have similar principles, such as the importance of stakeholder participation (Smith et al, 2011; Douvere & Maes, 2009).

Secondly, MSP should be integrated to the terrestrial (land-use) planning system for the adjacent land area. This is because of the physical interaction between land and sea; for example, much marine pollution such as eutrophication originates on land, whilst conversely the coastal environment is sensitive to maritime activities such as aquaculture. Also, maritime activities rely upon and benefit terrestrial communities; for instance, ports and associated industries require considerable land for their development and provide employment and other socio-economic benefits. Hence the EU's MSP Directive, for example, specifically requires land-sea interactions to be taken into account. Institutional links should be made between the authorities responsible for planning in the two domains, with cross-reference between their planning processes.

Thirdly, MSP may be linked to processes for designating and managing MPAs which are coastal and marine areas managed primarily for conservation. This may be an integral part of the MSP processes itself, or there may be a parallel MPA process, possibly with different institutional arrangements. MPAs can be considered a subset of MSP (OECD, 2017). If the latter, the proposals for MPAs should be taken into account when preparing a marine spatial plan for the area concerned, so that the plan can contribute to achieving the objectives of the MPAs, for instance by avoiding harmful activities nearby. This is especially so if MPA designation precedes the MSP process, in which case they represent one of the structuring components. Similarly, the objectives of the marine spatial plan should be considered when designating MPAs (Agardy et al, 2011).

1.3 The process of MSP

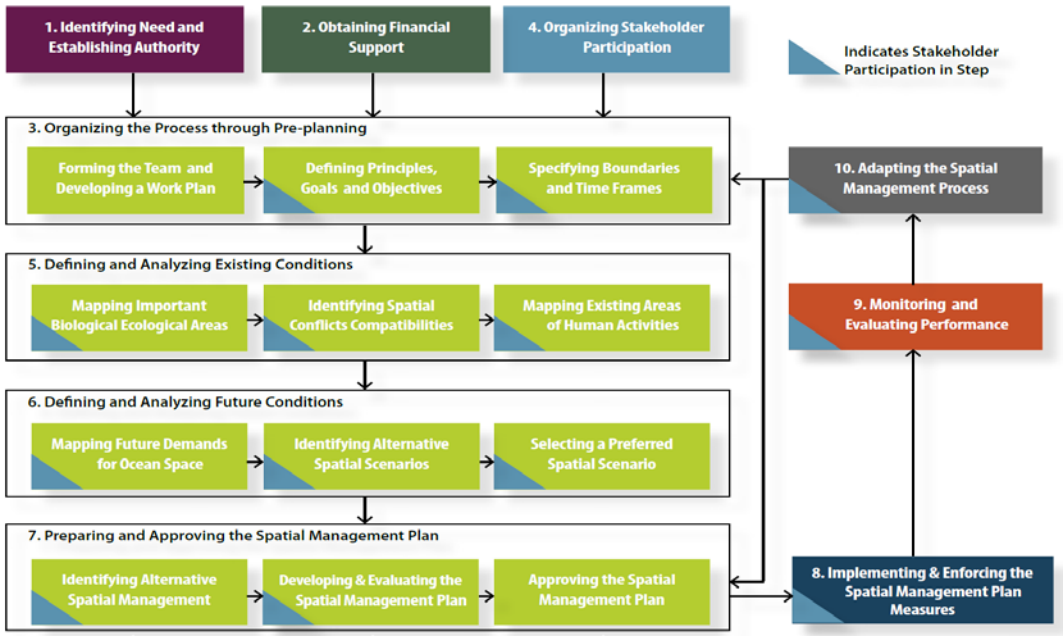
In general terms, MSP is intended to follow the methods of terrestrial, or land-use, planning, adapted to recognise the sea's particularities, such as its three dimensions and predominance of public property. MSP is thus a process that leads to the production of a plan, for a given marine area. The plan will usually

consist of maps showing the marine conditions and activities for the area. Including intended future activities and text giving information and explanation about the area and their programme of implementation. The plan may also include policy statements about future uses.

However, there is not a single, recognised process for carrying out MSP; practice varies from place to place, due to different geographies, marine pressures, legal requirements, planning cultures, and so on. This reflects the practice of terrestrial planning, which also differs from one country to another. Though, in contrast to land use spatial planning and to some extent siting decisions for MPAs (see OECD, 2017), economic principles have not yet permeated MSP.

There are broadly accepted elements, as illustrated in a guide published by the Intergovernmental Oceanographic Commission (IOC) of UNESCO in 2009 (Figure 1). Similar to the ICZM approach and principles, this shows a systematic process, beginning with preparatory steps, such as defining the objectives of a marine plan, analysing existing conditions, including the mapping of maritime activities, deciding on a preferred spatial scenario, and approving the final plan. It should be noted that stakeholder engagement is integrated into the overall process. More recently, UNESCO has published a guide for MSP (2.1), which is a tool towards more sustainable coastal and maritime activities.

Figure 1: A step-by-step approach to MSP

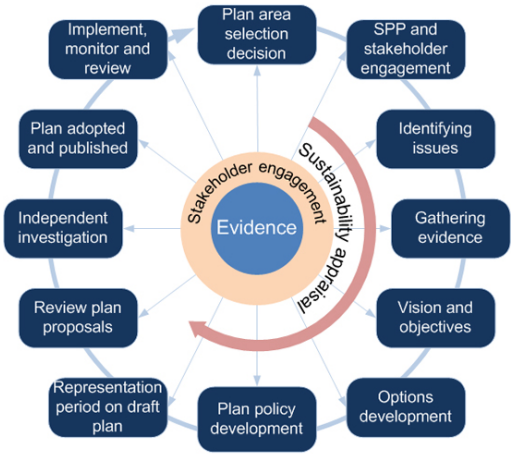


Source: *Ehler & Douvere, 2009*

1.4 MSP in practice

Real-life examples of MSP generally follow a similar process, though are likely to differ in some respects. For example, the UK's Marine Management Organisation has developed its own 12-step approach (Figure 2) under the framework of the UK Marine Policy Statement.

Figure 2: The Marine Management Organisation's MSP process



Source: *MMO, 2014a*

Many MSP processes place emphasis on analysing existing conditions and activities, which are represented in maps of the marine area in question. Intended maritime development is also often shown for certain sectors, such as offshore energy infrastructure. This may be in the form of zones allocated for priority sectors, or less strictly-defined areas of preference. Alternatively, development criteria or policies may be set down, providing guidance for future development, such as environmental considerations that should be taken into account.

MSP processes are generally carried out by government authorities, such as ministerial departments or government agencies. Plans that cover EEZs are usually prepared by national-level authorities; plans for territorial and coastal waters may be prepared by sub-national authorities. Much depends on the constitutional make-up of the nation concerned; for example, federally-constituted nations may devolve powers for MSP to sub-national states or regions (Drankier, 2012; MRAG, 2008). The policy framework is also key. For example, the EU MSP Directive has been adopted in the context of its Integrated Maritime Policy and as one of the elements to implement it. Similarly, MSP will increasingly contribute to national marine and maritime policies.

1.5 Early implementation of MSP

Australia is generally considered to be the first nation to have practiced a form of MSP, with the introduction of a zoning plan for the Great Barrier Reef Marine Park in the early 1980s. This was primarily with marine nature conservation in mind, and involved the definition of zones that were protected from harmful activities, including certain types of fishing activity (Day, 2002). This has since been updated in

the light of experience and to reflect changing physical conditions and patterns of activity (Figure 3). It should be noted, however, that zoning is only one method used in MSP and other approaches are used in the Great Barrier Reef Marine Park as well.

Figure 3: Zoning map for part of the Great Barrier Reef Marine Park

Source: *GBRMPA, 2017a*

The People's Republic of China also gave a lead with its system of marine functional zoning, practiced in some Chinese waters since the late 1980s. This also classifies sea areas into zones, but of a much wider range than that for the Great Barrier Reef, including ports and shipping, fisheries, mining, tourism, energy, construction and MPAs. All marine development must respect the zoning scheme, in the interests of avoidance of conflict (Fang et al, 2011). One recent study assessed the relative economic value of different maritime sectors, concluding that waterfront tourism is preferable to marine transportation in terms of it benefits (Huang et al, 2015).

Other early experience was gained in North America, with environmentally-led initiatives. Canada developed Large Ocean Management Areas, including the Eastern Scotian Shelf Integrated Management Initiative, considered to be a good example of ecosystem-based ocean management. However, policy momentum in MSP has not since been maintained in Canada (Flannery & Ó Cinnéide, 2012). In the USA, a number of States have taken initiatives for their coastal waters, 3 nautical miles out to sea, such as Rhode Island (McCann & Schumann, 2013). Federal support has been given to the states through the National Oceanic and Atmospheric Administration (NOOA, 2015).

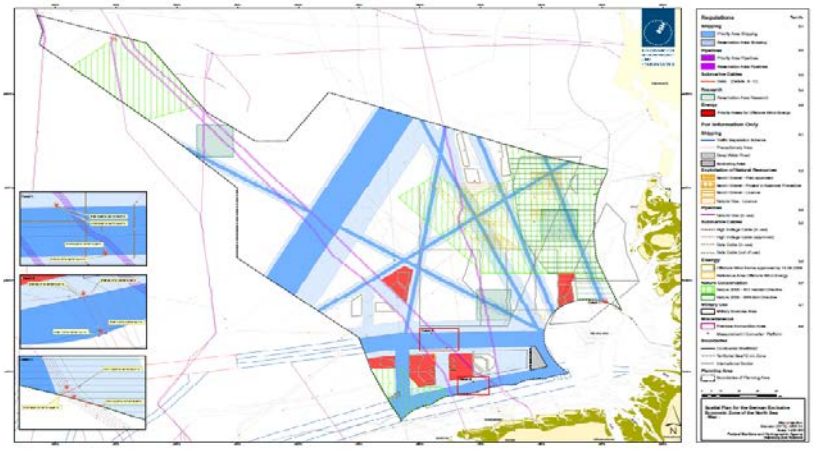
1.6 Current uptake of MSP

The state-of-play of implementation around the world is being documented by the MSP programme of IOC of UNESCO which reports that about 60 countries now have MSP initiatives, ranging from early stages to plan revisions (IOC-UNESCO, 2017a).

The greatest concentration of activity is currently in Europe, partly due to the EU's policy drive (1.7). For example, Germany completed spatial plans for its EEZ in the form of legal ordinances in 2009, and is now revising these (Figure 4). The Netherlands also took an early lead in Europe, beginning with the inclusion of the Dutch section of the North Sea in national spatial planning policy, now culminating in a National Water Plan 2015, coordinated by an interdepartmental committee (Government of the Netherlands, 2015). Planning concerns have included offshore wind energy, sand extraction needed to strengthen coastal defences, designation of MPAs and inshore fisheries management.

Other European nations are following on, such as Portugal, which is the leading nation for MSP in Southern Europe (Calado et al, 2010), Poland, which has been a leader in Eastern Europe (Zaucha, 2012), and several other Baltic Sea nations, working partly in the context of regional sea institutions (HELCOM, 2017). Previous ICZM-related experience is also coming into play, such as France's 'sea enhancement plans' which aimed to develop coastal activities in selected locations (Trouillet et al, 2011).

Figure 4: Spatial plan for German EEZ of the North Sea



Source: *BSH, 2016*

In other parts of the world, MSP tends to be at an earlier stage of development, and is often focused on environmental concerns. For example, in the Middle East, Abu Dhabi is finalising a plan for its coastal and marine area to provide strategic guidance for future sustainable development that protects valuable habitats. In Central America, Belize has developed a plan which covers the country's entire marine area and addresses all coastal and maritime uses with the overall goal of sustainable use (CZMAI, 2016). In Africa, Namibia, Angola and South Africa are working towards MSP implementation in the context of a regional initiative (Benguela Current Commission, 2013).

1.7 European Union initiatives

The EU has made MSP a key element of its wider integrated maritime policy (CEC, 2007). It is also seen as a tool that can help achieve good environmental status (EPC, 2008), and it is integral to its blue growth strategy (CEC, 2012). The European Commission (EC) set out an MSP Roadmap to encourage its uptake by member states (CEC, 2008). It has also provided funding for cross-border MSP pilot projects throughout

Europe's seas and a series of European workshops and undertaken studies on various aspects of MSP (EC, 2017).

Most significantly, 2014 saw the adoption of the MSP Directive, which requires all coastal Member States to prepare cross-sectoral maritime spatial plans by 2021 (EPC, 2014). The plans should:

- apply the ecosystem-based approach;
- contribute to the preservation, protection and improvement of the environment;
- contribute to the sustainable development of energy sectors, maritime transport, and fisheries and aquaculture and additional objectives such as sustainable tourism or the extraction of raw materials;
- take into account land-sea interactions and promote coherence between MSP and ICZM;
- involve cross-border cooperation;
- involve participation of relevant stakeholders, authorities, and public concerned;
- make use of best available data and sharing of information.

The EC has set up a mechanism for supporting implementation of the Directive, providing information on progress and good practice (European MSP Platform, 2017). Recently (March 2017), it co-organised an international MSP conference with IOC-UNESCO (IOC -UNESCO, 2017b).

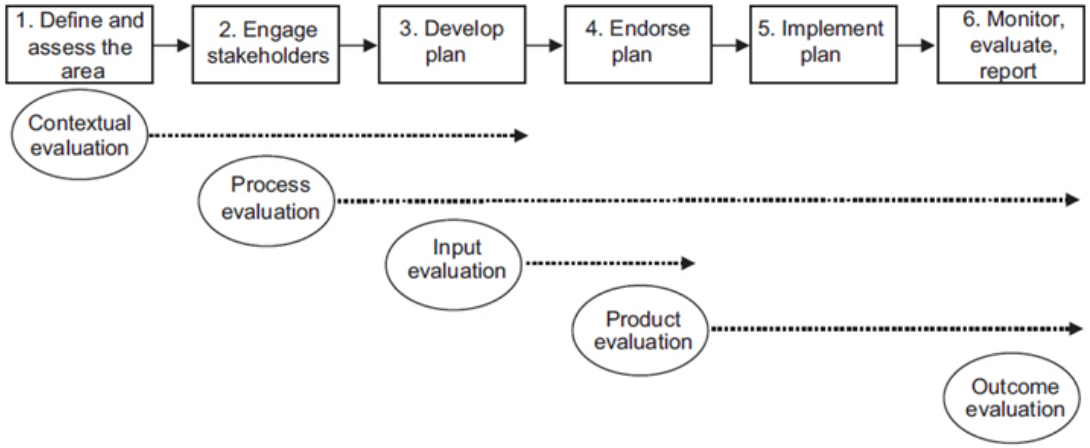
2. Evaluating the Performance of MSP

2.1 Evaluation frameworks for MSP

Monitoring and evaluation should be carried out once a plan has been finalised (Douvere & Ehler, 2011). Evaluation is an assessment of the extent to which a plan is achieving its aims; monitoring provides the evidence needed to support the evaluation (monitoring may also be carried out at an earlier stage to provide a baseline for the plan). For example, if one objective of a plan is to facilitate the development of offshore wind arrays, monitoring their development over a period of time will allow the plan's success in this regard to be evaluated. This can help to secure continued support for MSP. Evaluation can also facilitate adaptive management, whereby adjustments can be made to a plan to allow for changing circumstances or for any shortcomings, such as insufficient representation of certain interests.

Evaluation should be based on clear criteria that will help assess the effectiveness of the MSP process. This could be with regard to the MSP process itself (such as the degree of stakeholder input), the achievement of overarching goals (such as improved environmental quality) or more precise outcomes of the plan (such as the creation of maritime-related jobs) (Figure 5). Ideally, measurable objectives of the plan should be linked to distinct targets and indicators at each step of the MSP process.

Figure 5: Different types of evaluation throughout the MSP process

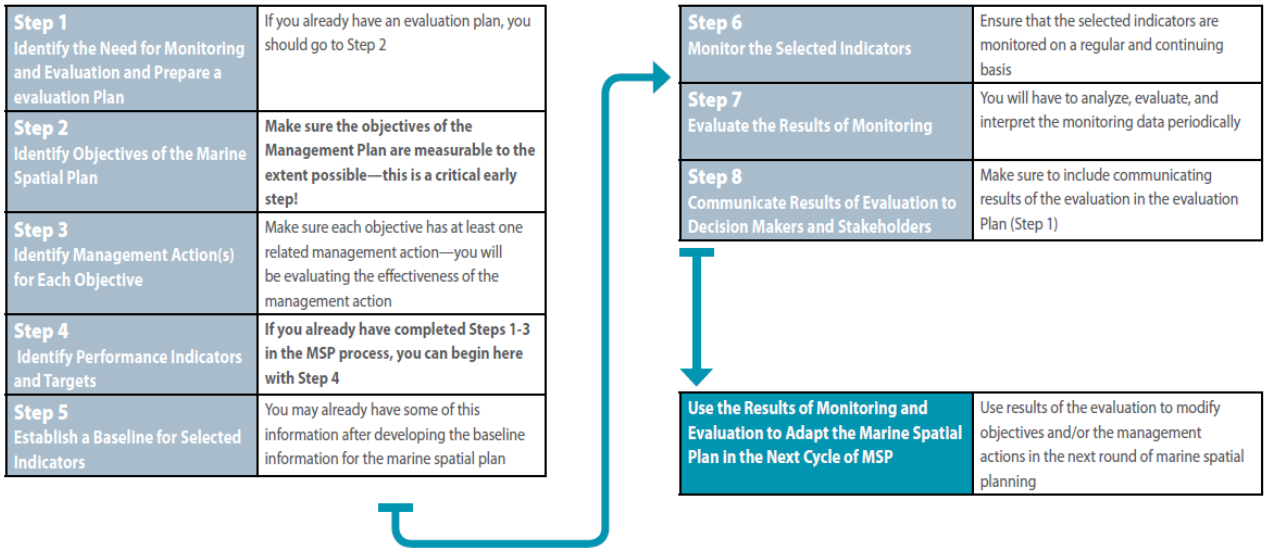


Source: *Carneiro, 2013*

Inputs from stakeholders can enrich evaluations by identifying gaps in monitoring, confirming the usefulness of indicators, refining evaluation questions and reviewing the adequacy of the original objectives (Carneiro, 2013). However, it is important that the final evaluation is carried out independently, either by government or a commissioned body.

Various evaluation frameworks have been developed through MSP pilot projects (Stelzenmueller et al, 2013). This includes a comprehensive checklist for evaluating plans in transboundary contexts (Jay & Gee, 2014). UNESCO has also published a guide to monitoring and evaluating MSP (Figure 6).

Figure 6: UNESCO MSP evaluation steps



Source: *Ehler, 2014, p.xi*

2.2 Status of evaluation practice for MSP

Given its longer history, evaluation practice has advanced most for the Great Barrier Reef Marine Park in Australia (1.5). This led to a re-zoning of the Park in 2004 in the light of the experience gained; this introduced a more comprehensive system of control over its use, such as more stringent zoning measures, including a substantial increase in no-take zones (where no fishing or extractive activities are allowed). This exercise also led to a wider range of measures being introduced in order to meet the objectives of the Park; for example, measures for managing specific recreational activities, such as diving and angling, were introduced (Day, 2008).

Elsewhere, relatively little actual evaluation of marine plans has been carried out. This is partly because MSP is still an emerging practice and the importance of evaluation is not yet well understood. As MSP cycles enter their second and subsequent rounds, it is to be expected that evaluation processes will develop.

One example is a progress report for the first marine spatial plans to be completed in the UK (Defra, 2017). Here, the performance of the plans against their overall objectives was assessed, based upon a programme of monitoring both the process of preparing the plans and the actual outcomes of the plans (Figure 7). It was found that the plans were being used and integrated into a range of marine management processes, such as those of inshore fisheries management. There was also evidence of increasing integration between land and marine planning systems. Importantly, the experience gained during this first MSP process was used to improve the preparation of plans for the other marine areas.

Figure 7: Objectives, outputs and indicators for England's East Plans

Plan objective	Output indicators	Outcome indicators
1.Sustainable economic production	• 1.1. GVA increase by marine sector across the East plan areas and Local authority areas bordering them (Source: Office for National Statistics)' • 1.2. Decision makers' report an improved consideration of economic productivity in applications (Source: East Marine Plans monitoring survey)	• 1A Total GVA change across all marine sectors, across the East plan areas and Local authority areas bordering them (Source: Office for National Statistics)
2. Sustainable Employment and skill levels	• 2.1. Employment change by marine sector across all Local authority areas bordering the East marine plan areas (Source: Office for National Statistics) • 2.2. Decision makers' report an improved consideration of employment in applications (Source: East Marine Plans monitoring survey)	• 2A Change in Gross Domestic Household Income across all Local authority areas bordering the East marine plan areas (Source: Office for National Statistics)
3. Sustainable renewable energy potential	• 3.1. Gross Value Added change in relevant sectors (ports, shipping, renewable energy, cabling (Source: Office for National Statistics) • 3.2 Jobs created in renewables GVA and employment increase or decrease in relevant sectors (ports, shipping, wind) (Source: Office for National Statistics)	• 3A GW installed capacity in East plan areas (Source: Department for Energy and Climate Change)
4 – Health and well being	• 4.1. Decision makers report improved consideration within applications of provision for access to marine-related recreational activities. (Source: East Marine Plans monitoring survey). • 4.2. Increased numbers of people engaged with the marine/coastal natural environment (Source: Natural England Monitor of Engagement with the Natural Environment (MENE) Survey)	• 4A Increase in the numbers of people with medium – high measures of personal well-being. (Source: Office for National Statistics)

Source: *MMO, 2014a*

2.3 The socio-economic dimension of MSP

Following its initial emphasis on environmental priorities, the scope of MSP has broadened to include stronger socio-economic objectives. For example, MSP is a means of supporting the maritime economy in China (1.5). Within the EU, the MSP Directive is intended to contribute to a wider Blue Growth strategy (which is under the Integrated Maritime Strategy), which states:

> The EU's blue economy represents 5.4 million jobs and a gross added value of just under €500 billion per year. In all, 75% of Europe's external trade and 37% of trade within the EU is seaborne (CEC, 2012).

There is relatively little evidence yet to support these intentions. Data-gathering for MSP has tended to focus on spatial information about environmental conditions and maritime activities; little data has been gathered on the actual or potential economic value of these activities in specific contexts.

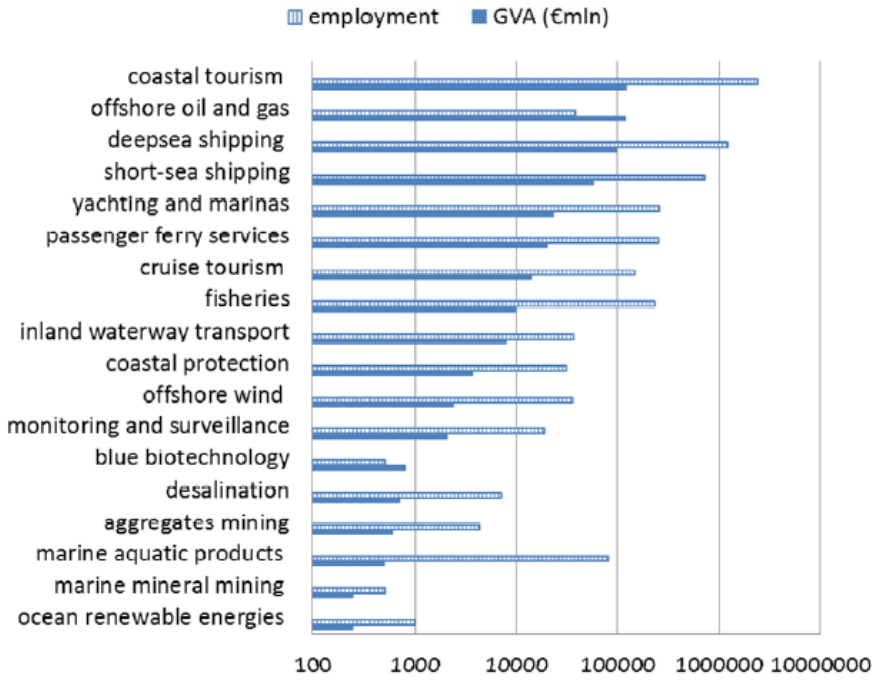
However, work is developing on marine economics. For example, a recent study sets out the methodologies available to analyse the economic value of the marine sector, such as descriptive statistics, input-output tables and location quotients (Morrissey, 2017). These can be applied at various spatial scales, including small area methods to measure the economic impact of marine resource use at a local level. These methods might be used in support of assessing the economic impacts and benefits of MSP.

2.4 Assessing the socio-economic benefits of MSP

Some broad estimates of the socio-economic benefits arising from MSP have been made, such as those of an early UK study on the potential benefits of introducing MSP. This indicated the national turnover and added value of key sectors, and concluded that MSP would facilitate sector growth, optimise the use of the sea, and reduce the costs of information, regulation, planning and decision-making (GHK Consulting, 2004).

A more recent EC study summarised the economic importance and potential value added of maritime sectors (Figures 8 and 9). It also estimated that MSP could contribute further by creating lower coordination and transaction costs (search, legal, administrative, and conflict) and an enhanced investment climate (EC, 2011).

Figure 8: Employment and economic size of European marine and maritime economic activities



Note: GVA = global value added

Source: EC, 2011, p.3

Figure 9: Value added of maritime activities in the European Union

€ million	Shipping	Cruise tourism	Dredging	Oil and gas	CCS	Offshore wind energy	Wave and tidal energy	Fishing	Aqua-culture	Marine tourism	Total
2010	26 477	938	558	64 220	n.a.	238	4	6 992	1 246	2 868	103 541
2020	30 727	1 457	714	74 530	n.a	15 334	5	5 428	1 674	3 855	133 724
2030	36 195	2 138	936	87 793	n.a.	39 495	12	4 109	2 317	5 336	178 331

Source: EC, 2011, p.3

2.5 Assessing the benefits of individual plans

Attention is now turning to the assessment of specific marine spatial plans. For example, one study carried out an evaluation of five plans from different regions, looking at their economic, environmental and social benefits, reaching generally favourable conclusions (Blau & Green, 2015).

This study estimated that economic benefits were to be found, firstly, in new value created. For example, Belgium's Master Plan for its section of the North Sea designated a suitable wind energy development zone, and in doing so, allowed developers to avoid public opposition and lost planning costs that had beset previous projects; the new zone amounted to USD 230m in annual gross revenue. Similar experiences were recounted in the USA.

Secondly, plans helped in further protecting the existing value of incumbent industries. For example, Norway's plan for the Barents Sea protected fishing grounds, worth USD 1.25 billion per annum and 11,000 jobs, from harmful activities such as seismic exploration. Australia's Great Barrier Reef zoning scheme helped to protect tourism revenue worth USD 1.5 billion by creating no-take zones for fisheries and through marketing.

Finally, there were also instances where plans helped to address economic losses; for example, fishermen excluded from the Great Barrier Reef's no-take zones were offered compensation worth USD 210 million. However, it should be noted that this scheme has been heavily criticised for over-compensating the sector, because of loose and changing criteria for eligibility and entitlement, partly due to political pressures (Gunn et al, 2010; Macintosh et al, 2010). This suggests that such schemes are in their infancy in the context of MSP, and that there is scope for more targeted and rigorously-applied approaches to be developed, aiming at restructuring maritime activities in such a way that they align more closely with the purposes of the marine spatial plan in question.

A scientific study developed a framework for considering potential trade-offs between offshore wind energy, commercial fishing, and whale-watching sectors in Massachusetts; this led to a proposed optimum arrangement with associated value, calculated at preventing > USD 1 million in losses to the incumbent fishery and whale-watching sectors and generating > USD 10 billion in extra value to the energy sector (White et al, 2012).

2.6 Assessment of MPAs and ICZM

Related experience is to be found in evaluation of the effects of MPAs, particularly their impact on fisheries. OECD has compiled information on a number of evaluation exercises of MPAs, based on Cost-Benefit Analysis (CBA). For example, net present value of an Indonesian MPA was estimated as USD 3.5-5.0 million, assuming recovery of fish stocks. Other, partial estimates have been made of the costs and benefits associated with MPA designation in Sweden and Canada. Global estimates have also been made of the ecosystem services associated with particular habitat types, such as food provision, raw materials, gas and climate regulation, and leisure and recreation (OECD, 2017).

In addition, a recent study investigated the economic impacts of a series of MPAs in the Philippines, established in the interests of protecting coastal and marine habitats and also to sustain fish stocks. This took into account the direct losses, relocation efforts and gains for a sample of local fishing communities. The study concluded that income decreased significantly during the period of MPA establishment, and that this was not compensated by any spill-over effect from the MPAs (Figure 10). However, this provided the basis for determining what would be appropriate levels of compensation through conditional cash transfers for coastal communities highly dependent on this resource (Samonte et al, 2016).

Figure 10: Full-time fishers' income at various stages of the Philippines' MPAs (n= 350)

Fulltime fishers	Before marine protected area (MPA)	Between 1to 3 years after MPA established	More than 4 years after MPA established
Gross revenue from fishing (Php[a] /day)			
Gill Net	200	138	150
Hook and Line	200	120	100
Spear Gun	170	158	174
Number of fishing days /month			
Gill Net	20	16	16
Hook and Line	20	16	16
Spear Gun	17	16	15
Gross earnings from fishing per month (Php[a]/month)			
Gill Net	4,500	1,800	2,250
Hook and Line	3,000	2,000	1,600
Spear Gun	2,100	2,100	2,252

Source: *Samonte et al, 2016*

In another study, the economic and social benefits associated with the designation of MPAs in the UK were outlined, comparing the relative effects of different levels of protection within the MPAs (ABPmer, 2015). This took into account:

- potential costs for industries such as aggregates and fisheries;
- public sector costs of establishing and managing MPAs;
- social impacts such as on people's way of life and communities;
- benefits expressed in terms of ecosystem services.

Quantified costs impacts for the proposed MPAs were calculated where possible. It was also possible to indicate the most significant social risks and draw the broad conclusion that they would have a positive recreational and non-use benefit to people in the UK. However, the available evidence did not allow a monetary value for these risks and benefits to be estimated. See OECD (2017) for further discussion, including on the costs and benefits of MPA and using economic analysis to inform MPA decision-making.

There have also been some attempts to quantify the benefits of ICZM. For example, one study found that there were considerable net benefits arising from ICZM initiatives in a range of EU countries in terms of habitat protection, local infrastructure and business, and tourism with a benefit: cost ratio of the order of 10:1 (Firn Crichton Roberts, 2000). Another study developed a Total Economic Value approach to the assessment of ICZM initiatives, using contingent valuation to calculate direct and indirect use values and non-use values in a variety of settings (Salomons et al, 1999).

2.7 Use of cost-benefit analysis

There are a few examples of the application of CBA within MSP. One study was carried out in Xiamen, China (Peng et al, 2006). This exercise compared the regulatory cost of carrying out MSP with the benefits accruing from the process in terms of revenue from maritime industries (ports and shipping, fisheries and aquaculture, tourism) and environmental gains resulting from management of coastal erosion, etc. Data spanning a decade was used to quantify these aspects and arrive at an aggregate measure of ICZM benefit, namely that the ICZM program led to a significant increase (over 40%) in annual socioeconomic benefit from its maritime activities. Calculating an aggregate value was reckoned to be a considerable advance on individual sectoral figures, as it gave a measure of the overall benefit of a cross-cutting management process and could be used as an indication of the expected return from other similar processes. Another study is currently underway for the Marine Functional Zoning scheme in the same region (Fang, Q., 2017, personal communication).

Also, the BaltSpace project is currently developing a spatial CBA tool that will enable analysis of the distribution of economic costs and benefits associated with a given set of maritime uses. This will focus on monetary costs and benefits, but also allow for non-monetary costs and benefits to be taken into consideration (Kannen et al, 2016).

However, caution should be urged in seeking to apply CBA to a full MSP process, as the issues typically covered by a marine spatial plan are wide-ranging and complex, and valuation of all possible costs and benefits is unlikely to be practical. CBA may be best reserved for studies of discrete elements of plans, such as a renewable energy initiative or activities proposed for a relatively small-scale area.

2.8 A national experience: the United Kingdom

Authorities in the UK have started to draw together socio-economic data and carry out analysis in order to support MSP. For example, an economic baseline assessment has been carried out to inform the development of marine spatial plans (MMO, 2016). This study assessed employment, business and Gross Value Added (GVA) information for a wide variety of marine sectors. It concluded that, for one UK plan area, for instance, the economic contribution of the marine sectors was 343,000 direct and indirect jobs and £24.7 billion GVA. The largest contributing sectors in terms of employment and GVA were coastal tourism, nuclear power, ports and shipping, oil and gas and defence. However, the report does not consider how to assess the impact of the plans once completed.

Similarly, the Scottish Government commissioned reports on the socio-economic evidence base for key activities, including offshore renewable energy. This involved an appraisal of the likely costs to other sectors arising from development of this industry (ABPmer, 2013).

This study assumed that offshore renewables development (wind, wave and tidal energy) would impact on other sectors due to their displacement by renewable energy infrastructure and associated cable routes. The main sectors likely to be affected were commercial fisheries (reduction of landings due to loss of fishing grounds), shipping (additional fuel costs due to longer routes to avoid infrastructure) and tourism (reduction in tourist expenditure due to harm to coastal scenery). Three different scenarios were considered, relating to low, central and high levels of offshore renewables development covering a period

of 22 years. The potential economic impacts on other sectors were then quantified (eg. Figure 11). Shipping was the sector most significantly affected, and this would be most likely from offshore wind arrays, because of their greater spatial footprint than the other renewables considered.

No attempt was made to quantify benefits to other sectors, but it was noted some activities, such as ports and harbours, shipping and tourism, would benefit from the supply chain associated with expenditure.

Figure 11: Present value costs (GVA for fisheries) in £millions for Offshore Wind in a Scottish region

Activity	Description of Measurement	Scenarios		
		Low	Central	High
Commercial Fisheries	Value of potentially lost landings	0.13	0.31	0.67
Shipping	Additional fuel costs	-	3.80	7.88
Tourism	Reduction in expenditure	-	0.01	0.06
Total costs		**0.13**	**4.12**	**8.61**

Source: ABPmer, 2013

The study also considered social impacts, which were quantified where possible. It was concluded that there could be local effects on employment, access to services, health, culture and heritage and the environment, with the largest impacts likely to be associated with commercial fisheries, and on marinas if boat users choose to visit other areas of the coast or move their boats to marinas away from the search areas. It was considered that any such impacts may be balanced by benefits elsewhere, though with the danger of distributional effects if an area that is already deprived is further disadvantaged.

Consideration has also been given to the potential use of official and publicly-available statistical data to support MSP (MMO, 2014b).

3. Key Issues in Improving the Effectiveness of MSP

3.1 Addressing key priorities

There has been a tendency in the early experience of MSP to try to take into consideration as many issues as possible, and for resources to be directed towards gathering and mapping all the data that is available. Whilst it is important to have a thorough understanding of the planning context and to consider the needs of all interests, it is unlikely that a single plan will be able to address all concerns fully. It may be that certain interests should be given priority, because they have been previously neglected or require additional support, especially in a start-up phase. This highlights the need for scientific information to be targeted to policy needs; the MSP authority may therefore commission scientific studies on particular maritime sectors to support plan-making.

A marine spatial plan should therefore focus on achievable and measurable goals, which should be clearly stated (Ehler & Douvere, 2009). Establishing these will be a matter of good governance, involving reference to wider policy frameworks, stakeholder engagement and political priorities. They should be given expression in an aim and objectives for the plan, possibly with associated indicators and targets. These can subsequently be the focus of plan implementation and monitoring and evaluation.

For example, Germany's first plans for its EEZ gave priority to nationally-important shipping interests and the newly-established offshore wind energy industry, making specific provision for them. Although this was contested, it was justified with reference to wider economic policy, and the plans still sought to ensure that the needs of other sectors and environmental interests were met (Figure 4) (Jay et al, 2012).

3.2 Giving greater consideration to costs and benefits of MSP

There have been some efforts to determine the costs and benefits associated with MSP. However, with the exception of the UK example (2.8), these have relied on scientific studies which have not been part of the official MSP processes themselves. Also, there has been no consistent methodology adopted and not all studies have attempted quantification of costs and benefits.

There is an urgent need to introduce a more systematic approach to economic valuation of MSP. This should be built into the MSP cycle as approved by the authority in question (1.2). For example, a cost-benefit analysis of a draft marine spatial plan could be carried out prior to its adoption, and the plan amended as necessary in line with the results, to reduce any excessive costs and maximise benefits. For instance, the costs associated with proposed rerouting of shipping to avoid a sensitive area should be set alongside the ecological benefits, as determined through a contingent valuation method. CBA should take account of as many costs and benefits associated with the plan as possible, though it should be recognised that it will not always be possible to quantify these, especially where a plan takes the form of general guidance rather than specific spatial proposals. Wider work in establishing ecosystem service values should also be drawn upon (Lester et al, 2013; Lopes & Videira, 2013).

3.3 Ensuring integration with other planning frameworks

MSP does not take place in isolation from other initiatives that cover terrestrial and marine areas and operate at various scales. **There should be coordination with other planning frameworks, so that a marine spatial plan contributes to other planning efforts and receives support from them** (Cicin-Sain & Belfiore, 2005). When a marine spatial plan is being prepared, there should be integration with other plans such as:

- adjoining marine spatial plans within the jurisdiction in question;
- adjoining trans-jurisdictional marine spatial plans;
- adjoining terrestrial (land-use) spatial plans, including for coastal municipalities;
- broader spatial strategies for the region, such as for a wider land-sea area or a sea-basin;
- strategies for MPAs and large-scale MPA networks, possibly overlapping with MSP areas;
- relevant sectoral plans and strategies, such as for maritime transport or energy supply;
- other coastal planning and management plans, such as ICZM or coastal defence initiatives.

There will need to be communication and collaboration with the authorities responsible for all other relevant plans from an early stage and throughout the marine spatial plan-making process. This should help with aligning the objectives of the various plans and avoiding conflict between them. For instance, it may avoid the siting of incompatible uses on different sides of a plan boundary. Transnational cooperation may be particularly important in this regard (Hassan et al, 2015).

Cooperation is also particularly necessary between MSP authorities, which generally work at a large geographical scale, and coastal municipalities, covering much smaller territories. There should be regular consultation with municipalities and their representatives should participate in relevant MSP working groups.

3.4 Gaining meaningful stakeholder participation

It is widely recognised that including those groups who are most affected by a planning process will produce an outcome that better addresses their concerns and gains their support, and is therefore likely to achieve desired results. In the context of MSP, it is reckoned that stakeholders can:

- provide knowledge of ecosystems and human activities, with valuable local perspectives;
- generate new options and solutions not previously considered;
- help in exploring conflicts and working towards solutions;
- lead to greater legitimacy and ownership of MSP (Ehler & Douvere, 2009; Pentz, 2012; Pomeroy & Douvere, 2008).

Stakeholder participation in MSP can take many forms, from providing information to fully collaborative processes. It is generally agreed that involvement should be more than consultation, implying active

participation from an early stage and direct co-operation of relevant stakeholders with the MSP authority (Pentz, 2012). Experience of participatory management in other fields has shown that gaining stakeholders' trust is key to implementation.

This can build upon the experience of public participation and local involvement in ICZM, where non-governmental organisations (NGOs) and community organizations are playing a major role, typically through public meetings, hearings and inquiries, and as representatives on advisory groups. **An MSP process should be designed in an inclusive, voluntary and culturally sensitive manner**, with regard to historically disadvantaged individuals, groups and communities. The process should be managed in an innovative, reflective and deliberative manner that is responsive to changing circumstances and stakeholder interests.

Stakeholder participation is linked to issues of entitlement, fairness and the equitable involvement of interests and jurisdictions. Active facilitation may be required to involve stakeholders who lack the skills or resources to engage as much as others (OECD, 2014). Much depends on identifying relevant stakeholders. It may be helpful to conduct a stakeholder analysis exercise, in order to ensure a full and fair representation of interests (Flannery & Ó Cinnéide, 2008). Experience in related fields, such as water governance, should also be drawn upon (OECD, 2015).

3.5 Maintaining flexibility in MSP practice

Some MSP processes make use of a very limited number of planning tools, especially zoning. **A flexible approach should be taken to the planning measures that are used, to reflect the context and needs of the marine spatial plan**. These include:

- zoning, whereby uses in a defined area are prescribed and other activities are prohibited;
- priority areas, whereby certain uses are given precedence, but not to the exclusion of others;
- guidance to sectoral interests regarding suitable locations for their activities;
- development criteria, indicating conditions that should be respected by particular activities;
- information regarding the marine conditions and uses, including data portals;
- fees for use of marine resources;
- voluntary agreements for particular uses.

Selecting the means that are most suitable for the governance, cultural and geographical context in question is likely to lead to a higher rate of compliance and hence achievement of MSP objectives.

3.6 Committing to plan implementation

A marine spatial plan will only be effective if its proposals are implemented as intended. The nature of implementation will depend on the type of measures that are outlined in the plan. **Careful consideration should be given to how a plan's proposals are going to be put into practice.**

A plan that sets out precise areas for development or protection, such as aquaculture zones or MPAs, will be implemented when those areas are developed or protected in the manner specified. In the case of development, this may occur due to demand, or further negotiation or incentivisation may need to take place to encourage investment. The MSP authority may need to engage with the industry in question to this end.

If a plan's proposals are less spatially prescriptive, such as by providing policy direction or targets for development and protection, or setting down guidance or criteria for development, implementation will take on a different form. The issue then will ensure that targets are met, or criteria are respected, through the licensing of individual activities, for example.

Implementation is closely linked to continued monitoring of a plan area and the activities taking place within it (Mesma, 2017). This will involve data collection, possibly of key indicator information. For example, the production of marine renewable energy may be monitored over time, to examine whether or not this is meeting the plan's intentions. Similarly, environmental conditions may be monitored, to see whether certain objectives of the plan are being met.

Enforcement is also a component of plan implementation, especially in relation to use restrictions and conditions (Douvere & Ehler, 2011). For example, it may be necessary to enforce restrictions on fishing activity in protected areas, using statutory powers of verification and penalties, or to require conditions of infrastructure development to be met, again through regulatory means.

3.7 Gaining resources and political support

It is important that an MSP is adequately resourced for it to achieve its aims. Sufficient financing needs to be secured, probably through a government department mandated to implement MSP. This may be supported with revenue from marine licencing activities in some contexts, as exemplified by MSP in China (1.5).

Financing will generally support the human and other resources needed to develop marine spatial plans. A multi-disciplinary team will generally be needed, with knowledge and skills in spatial planning, data management and GIS, marine science, marine law and licencing, stakeholder engagement, and so on.

It is also important that MSP gains political support. MSP should be established as a statutory process where possible, so that responsibility for MSP is clearly located within government and so that plans have a regulatory standing and are, in some manner, legally enforceable. There should also be broader political acceptance and backing of the process, including from other government departments concerned with marine affairs and from different levels of government, including local government, especially in coastal areas. **Government bodies responsible for MSP should ensure adequate resourcing and support for MSP.**

3.8 Assessing the benefits of MSP

Apart from experience in a small number of pioneer nations (1.5), MSP is still at an early stage of development, and most countries are still in their first round of producing marine spatial plans (1.6).

Attention has been focused on setting up legal and administrative frameworks, establishing capacity for MSP and networks of stakeholders, data-gathering and spatial analysis. Relatively little work has been done on reviewing the effectiveness of MSP, such as the extent to which it is achieving its own objectives. However, some attention is now being given to this, including some attempts at valuation of benefits and impacts of plans (2.5, 2.7). This follows on from longer-standing experience of MPAs and ICZM. There is also growing appreciation of the broader benefits that might be expected of MSP, including its socio-economic gains (2.4).

As an integrated planning tool, usually set within a statutory framework, MSP generally has a stronger procedural basis than ICZM and MPA initiatives (1.2). This includes a formal evaluation stage, during which the MSP process undertaken and the marine spatial plan itself and its outcomes can be reviewed (2.1). This involves reflection on the strengths and weaknesses of the process, and monitoring of key aspects of the marine area and activities, in order to assess the plan's performance against its objectives. Experience in this ex-post assessment is starting to develop (2.2).

This feature of MSP holds the potential for a more systematic analysis of the benefits being accrued from developing and implementing any given marine spatial plan. This should cover environmental, social and economic dimensions, setting out the gains, but also any losses, for each sector, leading to an understanding of the areas where there are the greatest benefits. This should be set against the costs involved in producing the plan, and should also reveal any shortcomings of the plan that need to be addressed in the following round of MSP.

This should include detailed valuation of benefits as far as possible. Quantitative assessment may be carried out, of, for example, the take-up of spatial allocations or improvement in environmental quality; there may also be valuation with regard to, for instance, energy production or jobs created. **Methods of socio-economic and ecosystem service valuation of MSP should be further developed, possibly beginning with discrete elements of marine spatial plans.**

It should also be noted that parallel processes of evaluation can inform MSP performance. In particular, strategic environmental assessment or sustainability appraisal of an MSP process may be carried out as part of regulatory requirements. For example, a strategic assessment of the Great Barrier Reef Marine Park supplements the MSP exercise (GBRMPA, 2017); also, in the EU, plans prepared under the MSP Directive must undergo strategic environmental assessment.

Given the difficulties of carrying out a comprehensive evaluation of a marine spatial plan, it is suggested that an incremental approach is taken to introducing a more quantitative approach to assessing its benefits. This could involve selecting certain aspects of a plan for more rigorous assessment, especially those which are the focus of key priorities for the plan (3.1). Where there are clear targets for certain sectors, these should be carefully monitored and data gathered in order to inform a detailed assessment. Current experience could be built upon, in relation, for example, to the added value of incorporating marine renewables into marine spatial plans, such as reduced planning and development costs and potential for coordinated grid connections from neighbouring schemes (2.5, 2.8).

It should also be recognised that different forms of assessment may be appropriate for different aspects of a plan. For example, environmental gains may not be easily monetised, but may be expressed in more general terms, such as the provision of ecosystem services, as is already done in relation to MPAs (2.8). It may be possible to extend this approach to other aspects of a plan, such as measures to reduce the spread of non-native invasive species from shipping adding to ecosystem regulation services. This approach has the advantage of incorporating non-material as well as material benefits, such as the aesthetic and educational (Valmer, 2017).

3.9 Data-gathering

Data should be gathered to support the monitoring and evaluation of the implementation of marine spatial plans. This should include baseline data, indicating the conditions that are likely to be the case in the absence of a plan, and impact data, indicating the conditions directly resulting from implementation of the plan.

Baseline data should be gathered as part of the plan-making process itself, especially if strategic environmental assessment or sustainability appraisal is carried out during plan-making; this is a regulatory requirement in some contexts. Impact data should be gathered as part of a monitoring programme, feeding into a formal review of the plan's performance after a pre-determined period of time, typically 3-5 years after the plan has been approved.

Rather than attempt to gather data on every aspect of a plan, data should relate to a range of factors, preferably focusing on selected indicators that are representative of wider trends. These should give particular attention to the plan's main priorities (3.1). Data sources are likely to include:

- Information gathered by national agencies as part of their regulatory responsibilities, especially environmental information and figures for sectoral activities, such as shipping;
- Information provided by commercial organisations, relating to industrial sectors such as energy production, though this is likely to require a payment;
- Information commissioned by the MSP authority to support plan-making and monitoring, such as socio-economic information requiring analysis of secondary data;
- Information provided by stakeholders, communities and NGOs relating to local activities, such as wildlife and fishing.

Data may be most available in relation to environmental conditions and specific sectoral activities, as it is likely to be gathered for other regulatory purposes. Broader socio-economic and cultural data may be less readily available ('the missing layer' (St. Martin & Hall-Arber, 2008)) and require extra effort on the part of the MSP authority. For example, it may be useful to gather together information on income, education and employment for coastal communities likely to be affected by a marine spatial plan with a view to targeting the plan's proposals at areas with greatest socio-economic need. Of equal importance are systems for the management, analysis and representation of spatial data, typically making use of a geodatabase, a geographic information system and a web portal (Stamoulis & Delevaux, 2015). These require specialist technical skills and adequate resources.

4. Conclusions

MSP is increasingly being recognised as a more systematic approach for managing the world's seas and oceans through the application and adaptation of the principles of spatial planning as practiced on land. A growing number of nations are trialling MSP and putting in place official processes for the production of marine spatial plans. This is with the intention of ensuring the more sustainable use of marine resources at a time when those resources and the marine environment as a whole are under growing pressure.

Processes and methods for implementing MSP have been put forward and are continuing to develop, recognising the very different characteristics of the marine setting and of maritime activities. MSP is also being practiced in a variety of ways in order to reflect national and local contexts, including administrative and legal frameworks, geographical and environmental conditions, stakeholder concerns and policy priorities.

MSP processes are generally making good use of available data and are, in many cases, leading to clear spatial proposals for marine areas. Stakeholder engagement is also being integrated into processes, in a variety of ways. However, the evaluation of MSP outputs and outcomes remains at an early stage of development. Evaluation frameworks have been proposed, to help measure the effectiveness of MSP processes and of the resulting plans, though they have not generally been fully applied. As, in most contexts, the first generation of plans comes to completion, attention should turn to review and evaluation of those MSP processes.

A particular need with regard to evaluation is the assessment of the socio-economic benefits of MSP processes. There is only very limited experience of applying methods of valuation to the outcomes of MSP. This reflects the more general difficulties being encountered in gathering suitable socio-economic data for MSP purposes. Nonetheless, there is experience from related fields, such as MPA and ICZM programmes, that could be built upon. For example, estimating the added value of implemented plan proposals, ecosystem service valuation and cost-benefit analysis methods might be conducted. Initially, such approaches might usefully focus on discrete elements of a marine spatial plan rather than the whole range of a plan's proposals. As MSP increasingly focuses on sustainable blue growth objectives, more rigorous analysis of the extent to which they are being achieved is called for.

The following recommendations are directed towards the further development of MSP.

1. Clearly-stated, achievable and measurable goals should be established at the outset of an MSP process.
2. Methods for evaluating the economic benefits of MSP processes, especially any clearly-defined spatial proposals, should be developed, building on experience in related fields.
3. MSP processes should be coordinated with other planning frameworks, so that a marine spatial plan contributes to other planning efforts and receives support from them.
4. MSP processes should be designed in an inclusive, voluntary and culturally sensitive manner.

5. A flexible approach should be taken to the planning measures that are used in MSP, to reflect the local or national context and needs.
6. Marine spatial plans should be prepared with the practical implementation of its proposals in mind throughout the process.
7. Government bodies responsible for MSP should ensure adequate resourcing and administrative support for implementing bodies.
8. Methods of socio-economic and ecosystem service valuation of MSP should be further developed, initially being applied to discrete elements of marine spatial plans.
9. Data gathering for the preparation of marine spatial plans should also be directed to the monitoring and evaluation of plan implementation.

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