

Chapter 5

Marine planning

An ocean energy perspective

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I Introduction

It was long thought that the marine environment was not amenable to planning. Property rights, the core of the terrestrial planning system, were virtually non-existent in the marine environment, jurisdictions were vague, and the whole maritime area appeared as a single homogeneous mass of unstable waters without boundaries. The dominant and traditional maritime industries, fishing and shipping, had managed to coexist in relative peace for hundreds of years without formal planning processes to guide them.

However, technological innovation and the potential economic value of marine resources have created ambition for new industries, such as ocean energy (OE), aquaculture and seabed mining. Demands on marine space and ecosystems are expected to increase significantly as existing industries intensify and new industries enter the water. Fixed marine installations and users will ultimately be required to coexist with free-roaming industries like fisheries,¹ while vulnerable environmental and social systems increasingly demand greater control and planning. At the same time, advances in marine survey and spatial monitoring make planning marine space increasingly feasible and cost-effective.

While the future of these potential industries and their environmental impact is highly uncertain and too little is known at present to foster ideal policy responses, there is nonetheless a clear need for a pragmatic and flexible approach to marine management and planning. A range of spatial measures and sectoral policies have long been in place, but marine spatial planning (MSP) has more recently emerged as the leading concept for integrated marine planning in a modernised system of governance. A widely accepted definition is set out by Ehler and Douvère in the UNESCO guide to MSP:

Marine spatial planning is a public process of analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic and social objectives that are usually specified through a political process.²

There is now a keen interest in MSP, but the practice is fledgling and the challenges are significant. Data on the marine environment and its users is often still insufficient to properly inform policymaking, and there remain complex questions of process, jurisdiction, governance and property rights. The discussion of the role and place of OE in MSP processes to date has generally been limited to calls for MSP to better advance and integrate OE,³ assertions that MSP is crucial for the development of the OE industry⁴ and consideration of how MSP applies to OE projects on a practical level.⁵ There is also a growing thread of critical discussion in the literature relating to MSP in general⁶ and to the challenges in relation to OE in particular.⁷

This chapter therefore provides a deeper discussion of the potential benefits and challenges for MSP in the OE context. Section 2 sets out the concept of marine planning, from its early origins in sectoral planning to the modern development of MSP. Marine planning is also considered in light of its more developed terrestrial counterpart. Section 3 considers the potential benefits of MSP for the OE industry, while Section 4 provides some brief case studies of MSP efforts, three of which have been driven by OE developments. Section 5 discusses the challenges of integrating OE into MSP processes, and Section 6 offers some concluding thoughts.

2 Marine planning

2.1 *The genesis of marine planning*

Despite its recent emergence, MSP is built on centuries of sectoral planning and zoning. Collisions at sea and the frequency of wrecks in the nineteenth century led shipping companies to define safe routes and shipping lanes for the use of their own captains, and these were ultimately codified by the Safety of Life at Sea (SOLAS) Convention of 1914. Additional shipping rules followed and were subsequently modified and incorporated into a 1960 version of the SOLAS Convention, administered by the International Maritime Organization (IMO). In the fisheries context, the International Council for the Exploration of the Seas (ICES), which came into being in 1902 after growing concern about the well-being of fish stocks in the North Sea, researches and provides statistics on spatially defined sea areas, an integral part of the management and planning of international fisheries.

Early initial steps towards increased planning were greatly accelerated with the advent of the offshore oil and gas industry in the 1940s, which, along with expanding fisheries, spurred enhanced claims for marine jurisdiction. For the first time, spatially defined platforms were fixed in the sea on a large scale, extending into deeper and more remote waters as the technology developed.⁸ International concern about marine pollution and dumping introduced further elements to this emerging planning framework. For example, the OSPAR Commission

works to develop policy and management for the protection and conservation of the marine environment in the North-East Atlantic,⁹ and similar anti-pollution and -dumping conventions apply in several regions.

Nature conservation and ecosystem protection also began to play a more visible role in the development of planning and spatial definition at sea. Early large-scale marine reserves¹⁰ led to the development of more modest networks of marine protected areas (MPAs) and marine conservation zones (MCZs), often targeted at specific habitats, species or features.

The need to mitigate climate change and the growing momentum of the so-called Blue Economy have brought new activities and complexities to this mix. Much of the new industrial development of the marine environment is close to shore and requires large areas of marine space. These industries introduce change of use (displacement or interaction with other activities) and change of non-use (destruction or modification of habitats and ecosystem services). This has provided a strong stimulus to move towards a more integrated and spatial approach to marine planning.

2.2 The emergence of contemporary marine planning

The multi-objective integrative process of MSP is a relatively recent development, having started in Europe around the turn of the century. It aims to answer three sets of questions:¹¹

- 1 Where are we today? What are the baseline conditions?
- 2 Where do we want to be? What are the alternative spatial scenarios of the future? What is the desired vision?
- 3 How do we get there? What spatial management measures move us towards the desired future?

MSP aims to mitigate conflicts, assign priorities and promote cooperation and coexistence in pursuit of sustainable development. The movement towards MSP gained particular importance in Europe,¹² having started in the Benelux countries, Germany and Denmark. It has “rapidly become the most commonly endorsed management regime for sustainable development in the marine environment”.¹³ There is, as yet, limited practical experience with MSP. Functioning examples are sparse, and approaches are diverse in relation to national priorities.

The planning of marine space has been made technically possible by the development of geographic information systems and all the modern paraphernalia of marine survey. Data about oceanography, sub-sea topography, geology and marine biology are being gathered at unprecedented rates. Yet our knowledge of the sea remains patchy and incomplete. Scientific understanding of new maritime industries and their potential interactions with one another and the environment is quite poor, and this is especially true of OE, where the technology remains at the early stages of development and there is no commercial experience to call upon.

Emerging marine plans have therefore to deal with a great deal of uncertainty and a wide variety of base conditions.

2.3 From land to sea

Marine planning is compared to its more developed terrestrial counterpart, and integration of the two systems is an oft stated aim. Urban and city planning dates back millennia, but comprehensive and integrated national terrestrial planning systems are a product of the latter half of the twentieth century. In the UK, for example, land planning has its foundations in the social contract established between government and people after the ravages of World War II. Large swathes of British industry were nationalised at this time but land was not;¹⁴ instead, a planning system was introduced for “subordination to the public good of the personal wishes and interests of private landowners”.¹⁵ In other words, the law would restrict the private rights of individual landowners for public benefit. The first UK Town and Country Planning Act was introduced in 1948. The original elements of this system remain:

- 1 Regional/local development plans setting priorities for the economy and community well-being
- 2 Spatial zoning with preferred patterns of land use
- 3 Development control requiring permissions for change of land use

Marine planning shares much in common with these ideas, but the basic tenets that influence their introduction are fundamentally different (Table 5.1).¹⁶

While the terrestrial planning system was developed to restrict the rights of private owners in an environment where nearly everything is owned by someone (*res privata*), marine planning addresses a space where there are no private owners. Marine space is largely either *res nullius* (owned by no one) or *res communis* (owned by the community). The UN Law of the Sea Convention (1982) assigns national jurisdictions and rights over certain resources in the exclusive economic zone (EEZ),¹⁷ but at the national level, public and community rights are retained in these areas, most notably the right to navigate and the right to fish.¹⁸ This question of ownership and rights is one of the key challenges to planning at sea (see Chapters 5 and 7).

Rights long exercised under regimes of *nullius* or *communis* have to be curtailed or reallocated if spatially defined new maritime industries are to thrive or if designated conservation areas are to be closed or partially closed to economic activities. Investors in spatially defined industries require a long-term right to occupy that space, often to the exclusion of others. While traditional industries like fishing and shipping are transient, many of the new wave of ocean industries are fixed. The terrestrial commons have long been enclosed, enabling the terrestrial planning system to control the actions of named individual owners, whereas the marine commons remains open, and a process of enclosure has barely begun.

Table 5.1 Key characteristics of terrestrial and marine environments

<i>Terrestrial Environment</i>	<i>Marine Environment</i>
<i>Building blocks:</i> • Individual locations dominated by single land uses • Absolute land ownership supported by law • Little public land • Enclosure of common land a historic fact • Private property rights held by individuals • Highly man modified <i>Development control:</i> • 1943 origins of modern planning • Roots in modernist scientific approach • Recent shift towards planning through debate • Development plans with zoning supported by planning permission and development control as the planning key tools • Planning control limits the private rights of individual landowners • Significant role for local authorities and local priorities to influence decisions • Emerging mechanism for leveraging community benefits from renewable energy developments <i>Conservation:</i> • Traditionally urban and rural planning treated separately • Traditional conservation focuses on designation of small number of remaining sites that have high level of naturalness • Well established network of conservation designations and sites • Conservation designations driven by science • Relatively well understood environment • EU legislation increasingly important	<i>Building blocks:</i> • Multi-user environment • Important common rights (e.g. fish, navigation) • Seabed managed by state on behalf of the public • High level of wildness • Quasi property rights being created <i>Development control:</i> • MSP a recent phenomenon • MSP driven by competing interests of environmental protection and economic development • Extreme reluctance to zone areas for specific uses (in UK and US), creating case-by-case decision making • EIA key to decision-making process • Decision-making power will be centrally driven by national priorities. • Limited scope for public involvement • Less opportunity to leverage community benefits <i>Conservation:</i> • Environment and development tension • Difficulty identifying MPAs in environment with high degree of naturalness • Conservation interests often highly mobile or dispersed • Specific locations of conservation value often impacted by off-site or transient pressures (e.g. pollution) • High levels of uncertainty in, distribution of habitats, nature of physical processes, and the extent and impact of human activity. • EU legislation increasingly important

The MESMA research project¹⁹ examined conditions for MSP across 13 European countries with the aim of identifying the generic factors that could help build a common planning framework. The resulting framework was tested through 13 case studies,²⁰ and one important common factor that emerged in all areas was the presence of some existing policy and/or institution that could provide a starting point for an MSP process. Whether this was local fisheries plans or discrete MPAs, the basis for plans that could be developed through a series of iterations existed everywhere. A series of measures to deal with uncertainty are described in Section 5, but at its core lies a so-called Adaptive Planning Cycle that builds upon a starting point for a plan, however small.

2.4 Early MSP efforts

The Australian Great Barrier Reef Marine Park (GBRMP) and the Belgian EEZ are emblematic examples of the development of MSP. The GBRMP covers 344,400 km² and was created in 1975 by an act of the Australian Parliament to support the maintenance of ecosystems and biodiversity and the management of tourism, fishing and pollution. Concerns about potential phosphate mining, offshore oil, fishing, port developments and climate change were key drivers. The Park is managed by the GBRMP Authority, which with a current annual budget of approximately AUS\$50 million (US\$38 million). The GBRMP employs a zoning system, with the eight zones ranging from general use to preservation. A re-zoning exercise completed in 2004 resulted in the designation of so-called no-take areas covering about a third of the total area. Other changes over time have resulted in significant stakeholder participation and a recent Strategic Environmental Assessment (SEA) exercise initiated by UNESCO.²¹ A feature of the GBRMP plans is continuous monitoring, evaluation and adaptation to changing circumstances.

In contrast to the GBRMP, the Belgian MSP was an early example of an attempt to implement multi-objective marine planning in an exceptionally crowded marine space. The Belgian coastline extends to a little over 80 km, with a marine area of only 3,600 km² to the limit of the EEZ. Work started on a non-statutory master plan around the turn of the millennium, resulting, after several iterations, in a statutory MSP promulgated by Royal Decree in March 2014. The plan was developed largely under the provisions of the Marine Protection Act 1999 led by the Ministry of the Environment, but a diverse range of responsibilities among government ministries led to the appointment of a Minister for the North Sea to coordinate government action. Existing uses included offshore gas, aggregates mining, shipping, fisheries, pipelines and aquaculture, and the main driver for the plan was the need to incorporate offshore wind energy and increased aggregates mining into this crowded space, while also meeting EU requirements for conservation. The small size of the marine area and the density of use lent itself to a completely zoned solution, such that in the resulting MSP, each activity is allocated a place.

3 The potential roles for MSP in the development of OE

Marine space planning has the potential to play up to five roles in developing OE: finding space for OE, reducing fragmentation, promoting sustainable development, easing conflicts, and providing information.

3.1 Finding space for OE

MSP may ensure that all marine activities, including new and developing sectors, are fairly allocated space to develop. Assuming that the process is holistic and inclusive, allowing trade-offs to be made between different ocean users, MSP has the potential to facilitate the integration of OE into a crowded marine environment. In addition, MSP may help policymakers to consider the variety of uses appropriate to the particular sea area in question, the relative values of different activities, the potential conflicts, and the suitability and sustainability of using different areas for different activities. In doing so, MSP should help to promote a mix of marine uses that are compatible with one another and the environment.

3.2 Reducing fragmentation

Marine governance arrangements are often characterised as fragmented, and nowhere is this clearer than in relation to OE. In most jurisdictions, OE is currently regulated through an array of pre-existing national, regional and international laws governing marine spaces (e.g. see Chapters 8–10 on consenting and environmental impact assessment processes). In this context, MSP has been promoted as a tool for both rationalisation and unification. MSP can, in theory, bring together existing governance instruments and bodies under the auspices of one process. Evidence from early national MSP efforts shows such an emphasis on MSP as a process aimed at increasing dialogue and understanding.²² In order to combat fragmentation, integration would have to take place on several different levels, such as between legal instruments, different branches of government and different sectoral interests.²³ MSP may function as an umbrella under which different instruments of governance can be organised, thereby contributing to the achievement of a ‘one-stop shop’ or a similarly streamlined mechanism for adjudication and consent.

In a similar fashion, MSP may be able to alleviate issues relating to EIA and consenting, in particular by taking a future-oriented and strategic approach to balancing precaution and risk, providing flexibility and lending a level of predictability and consistency to the overall governance framework.²⁴ The geographical proximity of OE devices and the attendant onshore infrastructure raise the possibility that MSP may also be an appropriate mechanism to link emerging marine governance systems with terrestrial planning.²⁵ This will be increasingly important as OE projects begin to drive the development of additional harbour and port infrastructure, onshore facilities and grid extensions.

3.3 Promoting sustainable development

A sustainability-oriented process can ensure that OE development is done in a manner sensitive to the environment, while also acknowledging the environmental benefits of increased renewable energy deployment.²⁶

3.4 Easing conflicts

MSP can improve stakeholder involvement by providing an open and transparent mechanism through which the interests of different sectors can be heard and reconciled.

3.5 Providing information

MSP may reduce costs of information, regulation, planning and decision making. MSP can improve efficiency, in terms of cost, by developing common approaches to the acquisition and dissemination of information, improving information provision and reducing duplication of effort. MSP can also provide regulatory efficiency by improving information exchange and providing a more certain environment in which regulatory decisions are made. MSP may be also expected to reduce regulatory and compliance costs.

4 Case studies in marine planning for ocean energy

Given that marine planning is an emerging discipline, there are not yet many well developed marine plans in existence, and few that have explicitly been driven by or have accounted for the development of a commercial OE sector.²⁷ This is changing in parts of Europe,²⁸ where many key jurisdictions now have programmes in place for the implementation of MSP. The promotion of offshore wind energy has been a strong driving force behind the development of national MSP frameworks in Belgium, Germany, the Netherlands and the UK.²⁹ However, a recent survey conducted for the International Energy Agency OE Systems programme (IEA-OES) found that of the 11 countries that participate, only four have formal MSP in place, three have no MSP and four have coastal management plans that can include marine and coastal uses such as shipping, fisheries and conservation.³⁰

OE has nonetheless been a major driver of the development of marine planning in Scotland (UK), Oregon (US) and Nova Scotia (Canada). Scotland in particular has undertaken an extensive and ambitious programme of MSP driven in large part by OE.³¹ The Pentland Firth and Orkney Waters (PFOW) plan in Scotland covers a region considered to be the most advanced testing ground for OE in the world and one of very few areas where advanced preparations are underway to support the commercial deployment of large-scale arrays of OE devices. It therefore forms the main case study in this chapter.

4.1 Oregon and Washington State, United States

The neighbouring states of Oregon and Washington lie on the Pacific coast of the United States, where a strong wave regime from the Pacific offers good prospects for the development of wave energy projects. The territorial seas of individual states in the United States extend to 3 nm from shore, giving Oregon and Washington marine areas of 2,600 km² and 5,200 km² respectively. Oregon established an Ocean Task Force to develop a Resources Management Plan (RMP) in 1990, and in 2008 work started on a Territorial Sea Plan (TSP), which aims to find suitable sites for the deployment of OE devices, protect fisheries, reduce conflicts and preserve ecological values. Washington State introduced specific legislation for MSP in 2010, driven by the prospects of offshore renewable energy and specifically wave energy. It is further supported by the federal Coastal Zone Management Act (CZMA) of 1972, which aims to preserve, protect, develop and, where possible, restore or enhance the resources of the coastal zone.

Oregon has amended its TSP to guide the siting of ocean renewable energy facilities. The relevant agencies conducted a spatial analysis of ocean uses and ecological resources through a public process to identify and allocate areas within the territorial sea that are appropriate for renewable energy development. In contrast to the Scottish MSP process, Oregon's Plan zones for different uses, ultimately designating 74% of Oregon's territorial sea as incompatible with OE and roughly 2% as "Renewable Energy Facility Suitability Study Areas".³² The industry has expressed concern at what it sees as a 'negative approach' to MSP, excluding OE deployment where existing uses exist and focusing on constraints rather than on opportunities. Indeed, excluding areas from consideration for MRE development undermines one of the core benefits of MSP, which is that it allows for strategic planning and explicit trade-offs between uses, whether new or pre-existing.³³

4.2 Nova Scotia, Canada

Canada holds considerable potential for the development of OE, especially in the Bay of Fundy (tidal) and the west coast of Vancouver Island (wave and tidal). Nova Scotia and the Bay of Fundy in particular appear to be best placed, with one study showing that 2.5 GW could be extracted from the most attractive site, the Minas Passage.³⁴

The Nova Scotia Marine Renewable Energy Strategy is driven by this opportunity and need to develop renewable energy.³⁵ The strategy forms an integral part of the Province's clean energy framework, setting out the policy, economic and legal conditions for renewable energy projects in anticipation of commercial development and the establishment of a new industry. The objectives include delivering cost-competitive renewable energy to meet the need for more diversified and stable energy sources and developing an industry to provide opportunities to apply local knowledge and skills to serve global export markets. It sets out

the elements for a phased and progressive approach to achieving a long-term goal of producing 300 MW of power from tidal stream projects. It includes initiatives for research, development assistance and regulation.

Comprehensive MSP is not yet under preparation in Canada, but key elements such as the creation of an integrated regulatory and consent regime is underway. The open ocean area adjacent to the Bay of Fundy, but not the Bay itself, is subject to the Eastern Scotian Shelf Integrated Management Plan (ESSIMP), which was completed in 2008 under the authority of the Canada Oceans Act of 1997. It is driven by increased competition for ocean space from sectors including shipping, offshore oil, wind energy, pipelines fishing, aquaculture and the military.³⁶ The Government of Nova Scotia has also conducted an SEA process in relation to OE development (further discussed in Chapter 10).

4.3 Orkney and Shetland, Scotland

The Northern Isles of Scotland (Orkney and Shetland) feature strongly in the emergence of OE technologies and advanced marine planning efforts. Orkney in particular is home to the European Marine Energy Centre (EMEC), which has become established as a global centre for the testing of full-scale prototype OE devices. Orkney was selected as the site for EMEC in 2002 because of the proximity of strong wave and tidal stream regimes combined with accessibility to sheltered port facilities and support services.

In 2008, The Crown Estate (TCE), the UK authority that manages the seabed, issued an invitation to companies to tender for seabed leases for wave and tidal energy developments in the area of the PFOW. The results were announced in 2010, and the spatial boundaries for development were established under this market process. At the same time a number of government actions were taking place, including the following:

- The enactment of the Marine (Scotland) Act 2010, which introduced statutory marine spatial planning, streamlined consenting procedures and powers to declare marine protected areas (MPAs).³⁷ The Act also created Marine Scotland as the government department responsible for marine affairs.
- The publication of a renewable energy road map establishing a target for all Scottish electricity to be generated from renewable sources by 2020, including 1.6G W of wave and tidal capacity installed in the PFOW.
- The creation of a Pilot Marine Spatial Plan for the PFOW region designed to test the MSP procedures under the new Act prior to roll-out to all the marine regions of Scotland. The PFOW was also designated as one of two Marine Energy Parks in the UK.

These were significant and ambitious changes, driven by optimism for a new industry and underpinned by the provision of considerable funding. The Scottish marine planning framework comprises a National Marine Plan (published

in 2014), supporting an eventual suite of 11 regional marine plans, for which the PFOW plan is the pilot.³⁸ Regional plan drafting is to be delegated to local marine planning partnerships (MPPs).

The PFOW lies to the far north of Scotland, at the boundary between the Atlantic Ocean and the North Sea and is the primary shipping route between them. The Plan area measures about 12,000 km² and extends to the limit of the UK territorial sea around the Orkney Islands. The Plan boundary is at the limit of the territorial sea, which is also the jurisdictional boundary between Scotland and the United Kingdom as a whole. In general, the territorial sea around Scotland falls under the jurisdiction of the Scottish Government, although there are sectoral exceptions (e.g. offshore oil). The offshore area beyond the 12-nm territorial sea limit but within the exclusive economic zone falls under the jurisdiction of the UK Government but is administered by Scotland under a cooperation agreement.³⁹ The PFOW environment is relatively pristine and the subject of several environmental designations. The main traditional activities are community-based fisheries, shipping and ecotourism. In common with small islands everywhere, the sense of community 'ownership' of the seas around them is very strong. In practice, they have few maritime rights or control.

The Scottish Government had two main aims for the PFOW MSP:⁴⁰

- 1 To facilitate sustainable development with strategic vision, policies and information; and
- 2 To develop a framework for integrating marine planning with terrestrial planning.

Work on the PFOW marine plan was started in 2009 and was divided into three stages: review of known data, a research programme to identify the most critical missing data, and preparation of the plan itself. The completed plan was finally published for consultation in March 2016, some four years later than initially intended.⁴¹ The active OE operations and proposals in the area set the context for the plan. The awarding of seabed leases for OE in advance of MSP essentially defined the spatial boundaries, though the sites were still subject to the consenting process. It was decided early in the PFOW plan process that zoning was not possible. A similar conclusion was reached in the case of the Shetland plan and can be expected to apply across Scotland. The main reason for this is uncertainty about what the OE devices will actually look like, how they will work and their impacts.

The Marine Scotland planning team concentrated on a policy-based plan and guidance to prospective operators about possibly suitable areas for OE but without more detailed evaluation. The plan is policy based in that it sets general and sectoral policies about the criteria against which applications for development consent will be judged. It retains flexibility and options to face a number of scenarios. It supports the government's multi-use policy, even in protected areas. In other words, anybody can apply to do any activity in any part of the PFOW, but

they know in advance what hurdles and requirements they are likely to face in gaining consent.⁴² The completed Shetland MSP adopts a similar approach but goes a step further in evaluating possible development areas into a graded 'heat-map' (though there are no hard boundaries, such that this might be called soft zoning).

The three Scottish plans completed so far (PFOW, Clyde and Shetland) are all non-statutory pilots having the status of policy guidance to the statutory terrestrial local plan. These marine plans therefore have some level of enforceability and are considered material considerations in any development proposal. Clyde and Shetland are expected to be made statutory, while the PFOW will be divided into two regions, Orkney and North Scottish Coast, before final publication as statutory plans.

5 The challenges of planning for OE

There are social, cultural and economic impacts to be assessed in the introduction of these new industries. The demand for private or quasi-private rights in previously open and often relatively pristine areas of the marine commons is politically challenging. Planning and management are therefore an essential component of development.⁴³ The central challenge for the future of the OE industry is to move from this early developmental stage to a mature activity in a measured and sustainable way.

5.1 Uncertain outlook for the industry

Planning for OE is currently constrained by the uncertainty surrounding the ultimate shape of the industry. The timescale for commercial launch has slipped significantly, but much has been learned from the research and testing of the last ten years. OE technologies have yet to emerge as a commercial-scale industry, but so large is the prize and so consistent the ambition that an industry is likely to emerge. MSP processes will need to have a well balanced mix of certainty and flexibility in order to be able to support OE development and to adapt as the industry evolves.

5.2 Large demands for space

All maritime renewable energy installations require large areas of space. As the offshore wind industry has matured, the high output of individual turbines (now up to 10 MW) has led to increased spacing between adjacent towers in relatively remote locations, often outside 12 nm from the coast. This wide spacing has bolstered optimism that coexistence with fisheries, tourism and other activities is possible and may at some stage be agreed to. However, OE installations, as currently envisaged, differ substantially in character and location. The relatively small output of the first devices suggests that early commercial-scale projects will

be fairly dense arrays in areas close to shore. Floating devices are further complicated by a network of mooring lines and anchors. Visual impact for wave and some tidal devices is therefore high, and coexistence with other existing activities is likely to be considerably more difficult.

This unprecedented demand for the exclusive use of large areas of marine space necessitates a more strategic approach to governance. OE devices enter an already crowded seascape, yet companies and investors need clear and long-term permission to occupy the space. Such enclosure of the marine commons is controversial and far from resolved (see Chapter 8).⁴⁴ Agreement and participation among stakeholders is one way forward (Chapter 13), but everyone is potentially a stakeholder in the marine environment, making the issue of occupation of marine space an issue of political significance.

5.3 Uncertain impacts and interactions

While considerable scientific research has been conducted into the potential environmental interactions of OE devices, there is still much uncertainty (see Chapter 9). This makes integrating environmental assessments and MSP processes difficult and requires MSP processes to remain flexible and adaptive as scientific knowledge matures.

5.4 Uncertain MSP processes

The nascent nature of MSP itself also presents challenges; it can be seen as all things to all people. For some, MSP is a broad planning instrument with little direct legal significance, while for others it is seen as a network of legally binding zones where only specified activities are permissible. The aims MSP should serve are also still controversial, with some agitating for the primacy of environmental protection and others arguing for MSP as a reconciliatory tool. Early experience with MSP suggest that so-called soft sustainability currently prevails, despite references to ecosystem-based management and the ecosystem approach.⁴⁵ For example, it has been argued that the EU has adopted a weak view towards sustainability and that MSP is, in fact, eroding existing environmental protections.⁴⁶ The development of MSP in practice has been far from homogeneous. EU efforts have been motivated in large part by economic goals, such as renewable energy targets, while much of the early support for MSP in the United States was generated by the academic and environmental advocacy communities, who saw MSP primarily in terms of marine conservation.⁴⁷

5.5 Prioritisation of uses and coexistence

In Oregon, the MSP process excluded OE deployment in areas with existing users and focused on constraints rather than opportunities.⁴⁸ In contrast, Scotland's

approach has been inclusive, developing separate policies for each existing activity in order to make considered trade-offs between users. However, to enable these trade-offs and to establish effective MSP, accurate and comprehensive data on the existing uses of the marine areas, their interactions and the condition of the environment is required. Prior to establishing priorities between uses, there has to be a clear view of how and to what extent different marine interests collide and how they might be alleviated by temporal and spatial allocation.⁴⁹

The potential for coexistence of OE and other marine uses has been much discussed, particularly in relation to fisheries⁵⁰ and the potential for *de facto* marine protected areas.⁵¹ However, successful coexistence is likely to be site specific,⁵² and it is far from clear that OE devices, densely sited in nearshore areas, will ever be amenable to coexistence. As OE by its nature requires exclusive occupation of a specific marine space with particular resources, it may instead be preferable to 'zone' such uses, either within MSP processes or outside of them.⁵³ In most jurisdictions, consents are limited to a single use in a single location, so the possibility of multi-use licenses for larger areas would need to be considered.⁵⁴

5.6 Resource allocation

There will be some difficulties in allocating resource access under MSP because developments may affect the availability of resources downstream. Unfortunately, the physics of wave/tidal resources and their interactions with devices are not well enough understood at present to factor this into planning. Flexibility will be needed to integrate additional knowledge as our understanding advances.

5.7 Sustainable development

It is important that the sustainability dimension of MSP is not lost in the rush to develop new resources. Sustainability criteria for MSP could be developed, possibly using similar criteria from other environmental governance instruments as a model.⁵⁵ This could be a step towards recognising the environmental benefits of renewable energies within legal processes and levelling the playing field with established marine activities.

6 Conclusion

The notion that the sea cannot be planned is looking increasingly outdated in the face of rapid technological developments. The push for a Blue Economy and plans for increasing industrial activities in the seas are bringing new spatially defined industries into close proximity with traditional free flowing activities such as fisheries and shipping, while enhanced knowledge of marine ecosystems and the services they provide implore policymakers to ensure sustainable development of these bountiful resources.

Several issues related to the management of marine space can be identified for further investigation:

- 1 A foundational question is whether the development of MSP is the best available option for integrating OE development into an increasingly crowded marine environment. Despite the rapid advancement of MSP, other tools, such as zoning, may be able to achieve the same aims in relation to OE and perhaps other unique cases. In Europe, pursuant to the MSP directive, states are obliged to pass MSP legislation and draft plans, though there are no strict substantive requirements. In other jurisdictions, there may remain substantial latitude to implement specific measures for OE where appropriate.
- 2 Assuming that MSP continues to develop as the preferred response, there are questions as to how best to integrate OE and other industrial uses into MSP processes. In any MSP process, the key concern will be how different activities will be prioritised. In the OE context, this has been achieved in different cases through an exclusionary approach and a plan-/policy-based approach. Further research is needed to develop good practice for MSP, particularly in relation to new and emerging industries. Regardless of the approach taken, issues regarding conflict resolution, coexistence and compensation will likely still arise.
- 3 Related to prioritisation is the question of coexistence. Clearly, further research is needed into a range of non-legal questions regarding feasibility of this, though subsequently there will be a need to develop appropriate legal and regulatory mechanisms to establish multi-use of sites.

Notes

- 1 Though note that Smith et al. (2012) argue that, although some industries are “mobile”, in reality they are somewhat fixed through a range of existing sectoral spatial measures (e.g. shipping lanes for navigation). See Smith, H. D., Ballinger, R. C., and Stojanovic, T. A. (2012) The Spatial Development Basis of Marine Spatial Planning in the United Kingdom. *Journal of Environmental Policy & Planning*, 14(February 2015), pp. 29–47.
- 2 Ehler, C., and Douvère, F. (2009) *Marine Spatial Planning: A Step-by-Step Approach Toward Ecosystem-based Management*. UNESCO/IOC.
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