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Marine Spatial Planning and Marine Renewable Energy

Marine spatial planning (MSP) is advocated internationally as an improved approach to managing marine activities that addresses competing sectors and balances environmental, social, and economic interests (Ehler 2008; Ehler and Douvere 2009; SCBD 2012). The benefits of MSP are cited as being increased transparency and certainty for industry, improved environmental protection, reduced sectoral conflicts, and providing opportunities for synergies. Approaches to implementation of MSP vary by country and sometimes within countries. As a relatively new and novel approach to managing marine activities, it can be difficult to determine when success has occurred or what might constitute more effective and efficient management systems. The growth of marine renewable energy (MRE) will result in the increasing use of sea space and potential for conflict with existing marine uses, both of which can be addressed, in part, through implementation of MSP.



11.1. BACKGROUND ON MSP

All MSP systems try to reflect key principles that are science- or evidence-based, integrated, adaptive, strategic, and participatory (Figure 11.1). These principles can present challenges for implementation because they necessitate a departure from traditional forms of marine management, whereby activities are managed on a sectoral basis with limited consideration of other activities occurring in the same space or their potential effects on the receiving environment individually or cumulatively. As such, sectoral management has resulted in a somewhat ad hoc approach to planning, that is, allocation of sea space primarily occurs on a case-by-case basis; hence, it lacks an integrated and strategic approach. While definitions of MSP are numerous, the most widely adopted is that of the United Nations Educational, Scientific and Cultural Organization, which defines MSP as “a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that are usually specified through a political process” (Ehler and Douvere 2009; Ehler 2014). MSP is a future-oriented process that can be used to assign space to different uses and manage the location of specific human

activities in time and space, but practical production of marine goods and services will continue to be conducted through the granting of consents/permits (hereafter consents), permissions, and licenses for specific activities. MSP does not always culminate in the allocation of zones for marine activities but could be used to advocate preferred activities or priorities, reflecting national policy objectives, for example. As a future-oriented process, MSP enables decision-makers to plan and take management actions that should lead to some agreed-upon future spatial vision for marine areas and help to manage potential new uses, such as MRE.

This chapter documents how MSP is currently being used to plan and develop MRE in the 15 countries that are currently involved in Ocean Energy Systems (OES)-Environmental. The information presented in this chapter derives from answers to a questionnaire completed by OES-Environmental participant country representatives or their suggested contacts and, where appropriate, supplemented by relevant external sources. The questionnaire, available online as supplementary material (at <https://tethys.pnnl.gov/state-of-the-science-2020-supplementary-marine-spatial-planning>), requested input about the approaches to MSP in each country; if and how MRE policies link to MSP; how scientific information informs the process;

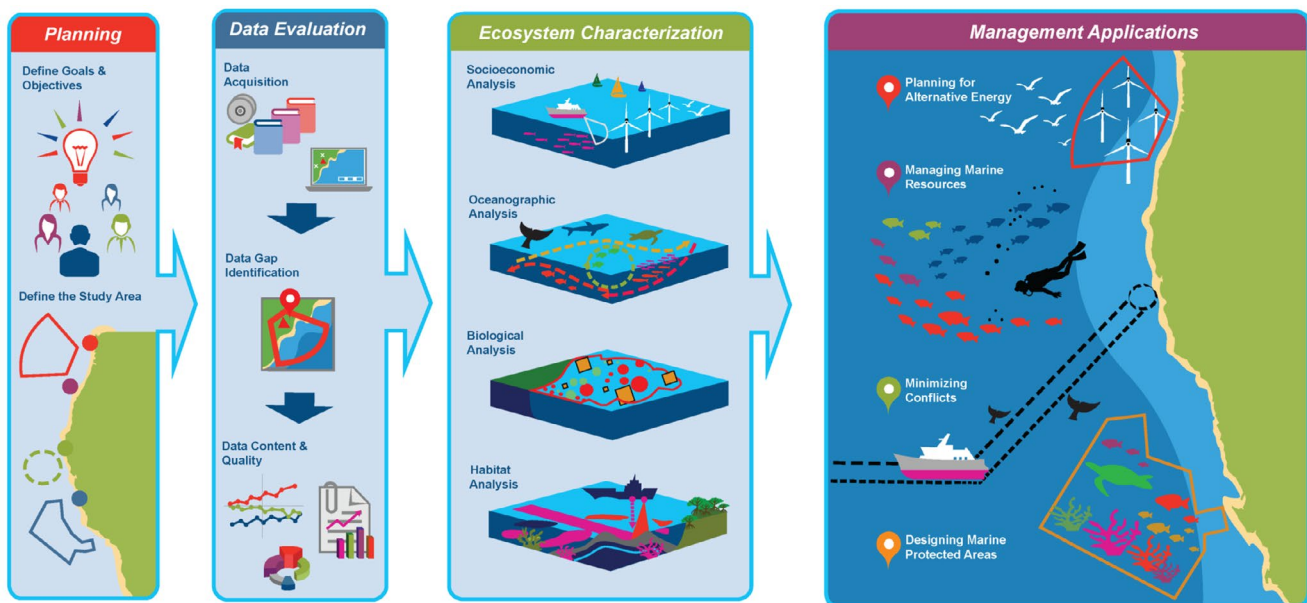


Figure 11.1. Example of a decision support process for marine spatial planning, implemented in a logical sequence of steps in information synthesis: 1) Planning: talking with managers to determine priorities; 2) Data evaluation: assessing the data and identifying data gaps; 3) Ecosystem characterization: describing the ecosystem patterns and processes including human activities across the area of interest; and 4) Management applications: working with managers to support specific management applications. (Image courtesy of the National Oceanic and Atmospheric Administration – National Centers for Coastal Ocean Science)

how potential conflicts are managed; zoning for MRE; tools used to implement MSP; how consenting processes link to MSP; possible challenges to implementation of MSP for MRE; how the public is involved in MSP; and an option to include any further comments.

Each of the questionnaire topic areas is covered thematically in the following sections, closing with a final section about key findings and conclusions derived from questionnaire answers. Given the strong legal basis for MSP in the European Union (EU), findings from participating countries in the EU (Denmark, France, Ireland, Portugal, Spain, and Sweden) are presented first followed by those from the United Kingdom (UK: England, Northern Ireland, Scotland, Wales), Australia, India, Japan, South Africa, and the United States (U.S.). The terminology used reflects that used in the country; for example, certain countries refer to offshore renewable energy in their legislation and policies, covering all forms of marine renewables (wave, tidal, offshore wind, etc.), whereas elsewhere explicit technology types are referred to in policy. In each section, information is given for countries for which respondents provided detailed answers; therefore, not every section addresses each country. For additional details and information about MSP in each of these countries, supplementary information is provided at <https://tethys.pnnl.gov/state-of-the-science-2020-supplementary-marine-spatial-planning>.

11.2.

APPROACHES TO MSP IN OES-ENVIRONMENTAL PARTICIPATING COUNTRIES

Approximately 70 countries worldwide (Marine Spatial Planning Programme 2018) are now estimated to have some form of MSP in varying stages of implementation. Some countries and regions have a legal basis for implementing MSP, whereas others have conducted MSP on a less formal, non-statutory basis. In the EU, MSP has had a basis in law since 2014 because of the adoption of a framework MSP Directive (Directive 2014/89/EU), which requires coastal member states to have maritime spatial plans in place for their waters by March 2021. As a result, all coastal member states are currently at varying stages of progress in implementing MSP. Certain countries had MSP in place before the EU MSP Directive came into force; e.g., Belgium, Scotland, England, the Netherlands, and a number of the Baltic Sea countries. Other EU countries, such as France, Ireland, and Spain, are in the initial stages of plan development. Details about the approaches to MSP for each OES-Environmental country can be found in Table 11.1. More detailed descriptions can be found at <https://tethys.pnnl.gov/state-of-the-science-2020-supplementary-marine-spatial-planning>.



Table 11.1. Marine spatial planning (MSP)-specific approaches for the Ocean Energy Systems (OES)-Environmental (in alphabetical order by European Union [EU] countries first, then by the other countries).

Country	MSP-Specific Information	
EU	Denmark	<ul style="list-style-type: none"> ♦ Legislation mandating MSP has been in place since 2016, but there is no comprehensive plan. ♦ A range of sectoral plans covering energy infrastructure, fisheries, and nature protection will be used to inform the forthcoming national marine plan.
	France	<ul style="list-style-type: none"> ♦ MSP is implemented through “Strategic Façade Planning Documents,” coordinated by the Ministry for the Solidarity and Ecological Transition for each of four national sea basins¹ (Décret n° 2017-724). ♦ Liaison via a national Façade Maritime Council.
	Ireland	<ul style="list-style-type: none"> ♦ The first national marine spatial plan is being developed. ♦ The plan will be implemented via the National Marine Planning Framework (NMPF) (DHPLG 2019a). ♦ A draft version of the plan, the NMPF, was published for consultation in November 2019 (DHPLG 2019a). ♦ Information about the progress of the NMPF is publicly available.
	Portugal	<ul style="list-style-type: none"> ♦ Mechanisms for MSP operate in a complementary manner with strategic mechanisms (such as the National Strategy for the Ocean as the planning and management policy) and operational mechanisms (the Situation Plan [DGRM 2018] and Allocation Plans).
	Spain	<ul style="list-style-type: none"> ♦ No MSP currently exists; the EU MSP Directive (Directive 2014/89/EU) was transposed into Spanish law through Royal Decree 363/2017 (Real Decreto 363/2017). ♦ The Royal Decree specifies management plans for the North Atlantic, South Atlantic, Estrecho and Alboran, Levantine-Balearic, and Canary Islands. ♦ Progress is being made on the development of and agreement about MSP objectives.
	Sweden	<ul style="list-style-type: none"> ♦ The Swedish Planning and Building Act (Plan-och bygglag 2010) preceded the EU MSP Directive (Directive 2014/89/EU). ♦ Municipalities must plan throughout the Swedish territory, land, internal waters, and territorial sea out to 12 nautical miles. ♦ Three draft marine spatial plans covering the Gulf of Bothnia, the Baltic Sea, and Western Waters (Skagerrak/Kattegat) were published in 2019 (Swedish Agency for Marine and Water Management 2018; European MSP Platform 2020). ♦ The marine spatial plans being prepared currently will encompass the area one nautical mile from the baseline seaward and will include the Exclusive Economic Zone, but will not cover privately owned sea areas (private waters).
United Kingdom (UK)		<ul style="list-style-type: none"> ♦ MSP has been in place since 2010 with adoption of the UK Marine and Coastal Access Act 2009. ♦ The Act is complemented by legislation in Scotland and Northern Ireland.
	England	<ul style="list-style-type: none"> ♦ 11 marine plan regions are to be developed by the Marine Management Organisation. ♦ So far, six plans have been published: the East Marine Plan, North East Marine Plan, North West Marine Plan, South Marine Plans, South East Marine Plan, and South West Marine Plan (Department for Environment, Food and Rural Affairs 2014; 2018; Marine Management Organisation 2020a, 2020b; 2020c; 2020d). ♦ Each plan has vision, objectives, and policies.
	Scotland	<ul style="list-style-type: none"> ♦ The Scottish National Marine Plan was published in 2015 (Marine Scotland 2015) identifying Marine Scotland as the responsible body. ♦ The key legislation driving MSP are the Marine (Scotland) Act (2010) and the UK Marine and Coastal Access Act (2009). ♦ Under the 2010 Act, Regional Marine Plans are to be developed for 11 regions. ♦ Only the plan for the Clyde and Shetland Isles region has gone forward; the Orkney plan is in development.
	Wales	<ul style="list-style-type: none"> ♦ The Welsh National Marine Plan (WNMP) was published in 2019 (Welsh Government 2019), developed based on the UK Marine and Coastal Access Act (2009), the UK Marine Policy Statement (HMG 2011), and the EU MSP Directive (Directive 2014/89/EU).
	Northern Ireland	<ul style="list-style-type: none"> ♦ The Draft Marine Plan for Northern Ireland was published in 2018 (DAERA 2018a). The Department of Agriculture, Environment and Rural Affairs is the responsible authority. ♦ However, the lack of a government from 2017–2019 brought progress to a standstill.²

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1. For instance: the North Atlantic – West Channel (Nord Atlantique – Manche Ouest) sea basin, see http://www.dirm.nord-atlantique-manche-ouest.developpement-durable.gouv.fr/IMG/pdf/synthese_vf_cle6e72f2.pdf; or the Mediterranean sea basin <http://www.dirm.mediterranee.developpement-durable.gouv.fr/la-strategie-de-facade-maritime-est-adoptee-a2892.html>

2. The Northern Ireland Executive and Assembly collapsed in January 2017 owing to ongoing disagreements between the two main political parties and all attempts to restore power-sharing had failed until January 2020, when the Government was restored. Formal adoption of the MSP is therefore anticipated to occur later in 2020.

Country	MSP-Specific Information
Australia	<ul style="list-style-type: none"> ◆ Formal MSP processes exist across several jurisdictions. ◆ Ocean policy established in 1998 is driving marine bioregional planning (Department of the Environment and Heritage 2006). ◆ The existing policy balances social, economic, and environmental objectives, but is not implemented (Vince et al. 2015). ◆ South Australia published the Marine Planning Framework in 2006 (Department for Environment and Heritage 2006). ◆ Along with the Marine and Coastal Reforms Final Transition Plan (State of Victoria DELWP 2018), Victoria enacted the Marine and Coastal Act 2018, which requires the development of an MSP Framework. This was published in 2020 as part of a state-wide Marine and Coastal Policy (State of Victoria DELWP 2020).
India	<ul style="list-style-type: none"> ◆ No MSP is in place and there is no use of specific MSP terminology in legislation or policy. ◆ The principles of MSP and environmental impact assessments (EIAs) are required for developing marine projects in India (Dineshbabu et al. 2019). ◆ Several laws and policies for coastal zone management exist.
Japan	<ul style="list-style-type: none"> ◆ Japan has no formal MSP process. ◆ The Basic Act on Ocean Policy (2007) was enacted in 2007 to assist with marine development, security, scientific knowledge, and governance and to develop a comprehensive ocean policy, to be reviewed on a five-year basis. ◆ In 2018, the Third Basic Plan on Ocean Policy was approved with no specific mention of MSP with objectives for industrial ocean uses, maintenance, and conservation.
South Africa	<ul style="list-style-type: none"> ◆ Implementation of the Marine Spatial Planning Act (2018) began in 2019. ◆ The purpose of the Act is to develop an MSP system for all sectors, for sustainable economic opportunities through coordinated and integrated planning and conservation of the marine environment. ◆ The National Framework for MSP provides high-level direction for MSP within other relevant policies, planning regimes, and developing Marine Area Plans (The Republic of South Africa 2017).
United States (U.S.)	<ul style="list-style-type: none"> ◆ There is no formal MSP process nationally. ◆ Some coastal states (Oregon, Massachusetts, Rhode Island and Washington) enacted MSPs to help guide conservation and use of ocean space through marine plans or MSP principles (Rhode Island State 2020; Commonwealth of Massachusetts 2020; State of Washington 2020; Department of Land Conservation and Development 2020). ◆ Executive Order 13547 (2010) called for regional MSP across the U.S. Two plans were created in 2016 the Northeast Ocean Plan (Northeast Regional Planning Body 2016) and the Mid-Atlantic Regional Ocean Action Plan (Mid-Atlantic Regional Planning Body 2016).

11.3. MRE POLICIES AND LINKS TO MSP

MSP tends to be strategic in nature and often contains broad management principles and objectives that apply to multiple marine sectors rather than being prescriptive about what activity can occur where. As such, it is relevant to document whether countries have national MRE strategies or policies and whether the strategies and policies have been explicitly recognized in the MSP process. Beginning with the EU, and possibly as a result of legislation about renewable energy, a number of countries have dedicated policies specific to offshore wind or MRE (wave and tidal) in particular. Details about MRE policies and the link to MSP for the OES-Environmental country can be found in Table 11.2. More detailed descriptions can be found at <https://tethys.pnnl.gov/state-of-the-science-2020-supplementary-marine-spatial-planning>.



Table 11.2. Marine renewable energy (MRE) policies and their links to marine spatial planning (MSP) for the Ocean Energy Systems (OES)-Environmental nations (arranged in alphabetical order by European Union [EU] countries first, then by the other countries).

Country	MSP-Specific Information
EU	<p>Denmark</p> <ul style="list-style-type: none"> ◆ A technical report was published in 2012 focusing on wave energy strategies (Nielsen et al. 2012). ◆ The Danish Wave Power Roadmap was published in 2015 (Nielsen et al. 2015) and produced by a consortium that includes nine Danish wave energy developers. <hr/> <p>France</p> <ul style="list-style-type: none"> ◆ France has defined targets and quantified objectives to add MRE to the national energy mix. ◆ A 2015 law on energy transition, was supplemented by the French Strategy for Energy and Climate Multi-Annual Energy Plan (PPE [Programmations Pluriannuelles de l'Énergie] in French), updated in 2019 for future contribution of bottom-mounted and floating offshore wind (Ministère de la Transition Écologique et Solidaire 2019a). ◆ There has been no explicit call for MRE, while acknowledging tidal development is maturing. <hr/> <p>Ireland</p> <ul style="list-style-type: none"> ◆ No specific plan for MRE but the intention is there will be one (DHPLG 2017); development is guided by the Offshore Renewable Energy Development Plan (DCENR 2014; DCCAE 2018). ◆ In 2019, the Climate Action Plan (DHPLG 2019b), together with the NMPF (DHPLG 2019a) and the marine consenting system, will drive MRE development in coming years. <hr/> <p>Portugal</p> <ul style="list-style-type: none"> ◆ Several strategic government documents since 2007 have highlighted MRE with the intent of optimizing use of available marine space, increasing synergies, and minimizing conflict between all marine activities. ◆ Specific targets for MRE are not included in any of the strategic documents, but the recent MRE roadmap (2017) estimates an installed capacity of 400 MW (260 MW for offshore wind and 140 MW for wave energy) by 2030 (Government of Portugal 2017). ◆ MRE development is reflected in MSP through inclusion of the Aguçadoura test site and designation of a Pilot Zone from San Pedro de Moel to Viana do Castelo. <hr/> <p>Spain</p> <ul style="list-style-type: none"> ◆ The National Renewable Energy Action Plan (NREAP) 2011–2020 (Ministerio de Industria, Turismo y Comercio 2010) has targets for 100 MW of installed power by 2020, but a feed-in tariff has been suspended since January 2012. ◆ The National Integrated Energy and Climate Plan 2021–2030 (Gobierno de España 2020) and the Draft Bill on Climate Change and Energy Transition (Ministry of the Presidency 2019) were updated in 2018 and presented to European Commission, but have not been enacted into law. The Plan aims to achieve up to 42 percent consumption of renewable energies by 2030 with land-based and offshore wind mainly, but it recognizes MRE. ◆ In 2017, the Basque Government approved an Energy Strategy for 2030 (Basque Energy Agency 2017) which includes support for MRE and a target of 60 MW for offshore wind and MRE by 2030. ◆ MRE is taken into account in the MSP process, and representatives from the sector have participated in meetings related to marine plan development. <hr/> <p>Sweden</p> <ul style="list-style-type: none"> ◆ The Government intends to transition to 100 percent renewable energy by 2040 (Swedish Government 2016). ◆ MSP includes offshore wind and wave development (Swedish Agency for Marine and Water Management 2019). ◆ Use of the MSP process helped identify sites for offshore wind and testing and development zones for wave energy development. ◆ MSP states that several municipalities are planning for offshore energy development close to the coast by zoning suitable areas in their comprehensive plans under the Planning and Building Act (Plan-och bygglag 2010).

continued

Country	MSP-Specific Information
United Kingdom (U.K.)	<ul style="list-style-type: none"> There is a 2050 target to reduce carbon emissions by 80 percent, but there are no specific targets for MRE (The Climate Change Act 2008). The UK Government in Westminster makes certain legislation and policy but there are four separate legal systems: England, Scotland, Wales, and Northern Ireland, each with legislation of their own. The Crown Estate manages lands held by the Crown and has legal authority to grant seabed or foreshore rights for uses including MRE.
Scotland	<ul style="list-style-type: none"> There is a Scottish national energy strategy (Scottish Government 2017), but no specific MRE strategy. Energy policy shows the Scottish Government's commitment to developing MRE, including explicit statements that MRE contributes to achieving the 100 percent renewables target by 2020 (Marine Scotland 2015). Scottish MSP does not have specific targets for offshore wind, wave, and tidal energy, but indicates their importance in contributing to renewables and decarbonization targets. MRE is a specific sector in the Scottish National Marine Plan. The Scottish Government is developing plans for offshore wind, wave, and tidal energy in Scottish waters (Scottish Government 2012; 2018).
Wales	<ul style="list-style-type: none"> The Welsh Natural Resources Policy (Welsh Government 2017a), under the Environment (Wales) Act (2016), includes growth in renewables as a priority. Natural Resources Wales has produced a Marine Area Statement (Natural Resources Wales 2020) to include MRE under the Environment (Wales) Act (2016). The draft Welsh National Marine Plan identifies MRE as a priority sector for Wales with focus on tidal stream and wave energy over the next 5–10 years.
Northern Ireland	<ul style="list-style-type: none"> The Offshore Renewable Energy Strategic Action Plan 2012–2020 in place was developed in 2012 (DETI 2012). The initial leasing round has been completed through The Crown Estate for one offshore wind and two tidal projects. One tidal project is proceeding with the licensing process (DFE 2019). Currently, Northern Ireland waters have been excluded from further leasing round (DFE 2019).
Australia	<ul style="list-style-type: none"> There are no specific ocean energy strategy, targets, incentives, or legislation for MRE. Some research funding exists for MRE and demonstration projects; the Australian Renewable Energy Agency funds some research into ocean energy, and several demonstrations deployments (<500 kW) have occurred in Australian waters. The only MRE incorporated into the MSP process is in the Marine and Coastal Policy (State of Victoria DELWP 2020).
India	<ul style="list-style-type: none"> The Draft National Renewable Energy Act 2015 (Ministry of New and Renewable Energy 2015) promotes all forms of renewable energy including ocean energy. Ocean energy is still in demonstration stages in India, but it is now part of the non-solar Renewable Purchase Obligation promoted by the Government of India. No specific targets have been defined for MRE development.
Japan	<ul style="list-style-type: none"> No policies or targets specific to MRE development exist. A Strategic Energy Plan is reviewed every three years. The most recent, the 5th Strategic Energy Plan, addresses the need for more research and development in ocean energy and covers measures to make wind power a major power source (Ministry of Economy, Trade, and Industry 2018). New legislation in 2019 covers use of sea areas for offshore wind.
South Africa	<ul style="list-style-type: none"> No MSP is in place, but it has strong legal and policy bases for marine renewables (Marine Spatial Planning Act, 16 of 2018). There are no targets in place for MRE development.
United States (U.S.)	<ul style="list-style-type: none"> No federal MSP system is in place and MRE is not included as a specific sector. In 2017, the Presidential Executive Order 13783 (Executive Order 13783) established a policy of promoting clean and safe development of domestic energy resources, including renewable energy. In 2018, the Presidential Executive Order 13840 heavily focused on developments of renewable energy industries, predominantly on offshore wind but also MRE and hydrokinetic technologies (Executive Order 13840). In 2019, the Bureau of Ocean Energy Management (BOEM) published a new regional offshore wind leasing strategy (BOEM 2019). Regional ocean partnerships, established in 2016 are heavily focused on developments in renewable energy industries, predominantly offshore wind but also MRE. These partnerships have slowed in recent years.

11.4.

TAKING MRE INTO ACCOUNT IN MSP

MRE has specific requirements from a planning process perspective. For example, MRE needs to link with other infrastructure such as grid provision and access to ports. Any development planning process must be cognizant of the receiving environment. To assure that these aspects are considered before a decision is made, many countries implement some form of environmental assessment (at the strategic or project level) that can then inform future planning processes. As part of environmental assessment requirements, and as a good practice generally, stakeholder consultation is also a fundamental part of the wider planning process. This consultation can occur with the public at large, with individual sectors, or with representative groups and ultimately should lead to a more robust and trusted planning process. These specific requirements of the MRE sector can be taken into account in the development of MSP processes in many ways. Given the implementation status of MSP across the globe, not all countries have addressed these requirements (namely India, South Africa, and the U.S.). In countries and regions where MSP is progressing, specific sectoral requirements are fed into the MSP process, primarily via consultation mechanisms either on an individual sectoral basis or through a dedicated stakeholder mechanism, and are described below. Such consultation is likely to evolve as implementation of MSP begins. The EU countries are most advanced in this respect, probably as a result of the EU MSP Directive (Directive 2014/89/EU) and over-arching climate and energy policies. Under the EU MSP Directive, all marine spatial plans must be subject to a Strategic Environmental Assessment to address environmental impacts at the earliest possible stage in decision-making. The details about each OES-Environmental country can be found in Table 11.3. More detailed descriptions can be found at <https://tethys.pnnl.gov/state-of-the-science-2020-supplementary-marine-spatial-planning>.

11.5.

DEALING WITH POTENTIAL CONFLICTS BETWEEN MARINE SECTORS/USERS

An important consideration for MSP is potential conflicts between different marine sectors and/or users, especially as the demand for marine space increases and, on occasion, because certain sectors will be interested in the same spatial area. As a relatively new sector, MRE in particular has the potential to overlap with more traditional uses such as fishing and navigation. When multiple-use situations like this arise, it can be challenging to address the different interests and needs of multiple users in mutually satisfying ways. Compatibility between uses and activities depends not only on oceanographic conditions (such as sea turbulence, the nature of the seabed, or the size of the water column), but also on the size and characteristics of each project. Compatibility between activities within the same marine space can still be achieved if, for example, the activities can be carried out at different times of the year. This could be the case, for example, for dredging activities in overlying seawater columns where non-metallic resources could be exploited. One of the rationales for MSP is that it can prevent or minimize conflict, because it clarifies who/what activity can operate within particular spatial areas. Such conflicts tend to be resolved on a case-by-case basis with negotiations between the interested parties (Freeman et al. 2016) and sometimes an independent arbiter. Very few MSP systems contain specific provisions or mechanisms related to conflict resolution, despite the recognition of the potential for conflict in light of the increasing use of marine space and associated competition between uses. Details about how each OES-Environmental country deals with these conflicts can be found in Table 11.4. More detailed descriptions can be found at <https://tethys.pnnl.gov/state-of-the-science-2020-supplementary-marine-spatial-planning>.

Table 11.3. Consideration of marine renewable energy (MRE) development within marine spatial planning (MSP) processes for the Ocean Energy Systems (OES)-Environmental nations (arranged alphabetically by European Union [EU] countries first, then by the other countries).

Country	MSP-Specific Information	
EU	France	<ul style="list-style-type: none"> ◆ The Programmes Pluriannuelles de l'Énergie (PPE) Strategic Environmental Assessment underlines the need for coherence and compatibility between MRE projects and those from other sectors (Ministère de la Transition Écologique et Solidaire 2019a). ◆ Coordinating prefectures (maritime, regional, and departmental prefectures) provide a connection between regional and local marine sectors. ◆ Stakeholders from socioeconomic sectors (fisheries, maritime transport, tourism, etc.), environmental sectors (marine protected areas [MPAs], nongovernmental organizations), public authorities, scientific and academic sectors, etc. work together on a common regional approach for MRE development.
	Ireland	<ul style="list-style-type: none"> ◆ Representatives from the MRE sector are part of the National Advisory Board for MSP. ◆ Feedback from the MRE industry helps with development of the policy.
	Portugal	<ul style="list-style-type: none"> ◆ A final Situation Plan (DGRM 2018) has been developed to identify specific areas for MRE development along the coast. ◆ Input is provided by stakeholders from multiple sectors.
	Spain	<ul style="list-style-type: none"> ◆ The MSP process is at too early a stage to determine how sectoral MRE interests will be included.
	Sweden	<ul style="list-style-type: none"> ◆ The presence of a national planning evidence and information system allows sectors to provide input to national government agencies to identify areas of national interest, including MRE.
United Kingdom (UK)	Scotland	<ul style="list-style-type: none"> ◆ A strong heritage of research and development exists in MRE technologies and associated infrastructure and experience in testing these devices in Scottish waters. ◆ The European Marine Energy Centre, based in Orkney, allows for testing and a pathway to commercialization for tidal and wave devices. ◆ Orkney was selected as location for a Pilot Marine Spatial Plan Case Study (Marine Scotland 2016), including stakeholder engagement to inform Marine Scotland, Council Planners, and the marine community of knowledge regarding requirements for MRE development within a planning construct (Aquaterra Ltd. 2015).
	Wales	<ul style="list-style-type: none"> ◆ During 2017 and 2018, the Welsh National Marine Plan (Welsh Government 2019) was informed by a Stakeholder Reference Group that provided an opportunity for all stakeholders to comment on development of the final plan.
Australia	<ul style="list-style-type: none"> ◆ The draft MSP framework for Victoria was developed collaboratively with stakeholders using a co-designing process. 	
Japan	<ul style="list-style-type: none"> ◆ Environmental Impact Assessments drive consents for MRE. ◆ The Japanese Ministry of Environment has been zoning areas for offshore wind energy development, and takes input from key energy industry players as well as stakeholders, including local fishermen. 	

11.6. AREAS AVAILABLE FOR MRE DEVELOPMENT

MSP is often interpreted to be synonymous with ocean zoning. Ocean zoning designates a specific space to marine uses and can be used to limit an area to a single activity or to accommodate multiple uses.

While zoning approaches can be used to implement MSP, it is just one tool for delivering the objectives of the MSP process. Some countries have zoned areas of their marine space for specific sectors, activities, and uses. The details about these areas of MRE development as defined for each OES-Environmental country can be found in Table 11.5 (also see Figures 11.2 and 11.3). More detailed descriptions can be found at <https://tethys.pnnl.gov/state-of-the-science-2020-supplementary-marine-spatial-planning>.

Table 11.4. Information about how the Ocean Energy Systems (OES)-Environmental nations deal with conflicts that often arise during the marine spatial planning (MSP) process (arranged alphabetically by European Union [EU] countries first, then by the other countries).

Country		MSP-Specific Information
EU	France	<ul style="list-style-type: none"> Early consultation with marine users and activities in the MSP process and mapping of existing uses of space help reduce and manage potential conflicts. Strategic phases of MSP implementation rely heavily on mapping specific uses of marine space. The fisheries sector provides information about fishing areas using geographic information systems to avoid conflicts (Université de Nantes 2019).
	Ireland	<ul style="list-style-type: none"> Conflicts between marine users are most likely to be addressed on a case-by-case basis rather than by MSP.
	Portugal	<ul style="list-style-type: none"> The Situation Plan (DGRM 2018) favors the multi-use of marine space and compatibility between uses, especially because it enables optimization of the economic potential of a space. The Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos (DGRM [Directorate-General for Natural Resources, Safety and Maritime Services]) manages use conflicts for marine activities through the consenting process.
	Spain	<ul style="list-style-type: none"> Conflicts between marine users are most likely to be addressed on a case-by-case basis rather than by MSP.
	Sweden	<ul style="list-style-type: none"> Activities related to defense and security have priority under Swedish legislation as part of their marine spatial plans (Swedish Agency for Marine and Water Management 2018; European MSP Platform 2020), thereby restricting development of some offshore renewables. In certain locations, nature conservation has been given priority over other activities as well, while coexistence is promoted in other areas such as some Natura 2000 sites (network of nature protection), with appropriate permits.
United Kingdom	Scotland	<ul style="list-style-type: none"> The National Marine Planning system identifies potential conflicts and addresses and reduces these conflicts before they arise. With only two of several planned Marine Planning Partnerships developed (Clyde and the Shetland Isles), the default is a highly communicative system with different sectors engaging in the planning process, assuring their voices are heard, and incorporating their thoughts in the plan to help reduce conflict.
	Wales	<ul style="list-style-type: none"> The Welsh National Marine Plan (WNMP) (Welsh Government 2019) is to be accompanied by implementation guidance, which will include conflict resolution procedures. The WNMP encourages measures to reduce conflict, such as co-location of activities and sectors.
Australia		<ul style="list-style-type: none"> Victoria's draft MSP Framework provides high-level guidance for considering conflicts between sectors when completing a MSP process.
India		<ul style="list-style-type: none"> This situation has not yet been considered
Japan		<ul style="list-style-type: none"> Stakeholder consultation is fundamental to minimizing conflict and critical to the successful zoning of marine activities. When siting MRE developments, conservation areas, shipping routes, and emergency access routes are avoided. Coexistence with fishing activity is regarded as the most important issue and accordingly, there are frequent meetings with these representatives when carrying out planning.
South Africa		<ul style="list-style-type: none"> Addressing conflict between marine users is one of the main drivers of MSP. Development of marine plans is conducted specifically for the purpose of addressing known and anticipated future conflicts between sectors.
United States (U.S.)		<ul style="list-style-type: none"> This situation has not yet been considered

Table 11.5. Areas available for marine renewable energy (MRE) development for the Ocean Energy Systems (OES)-Environmental nations (arranged alphabetically by European Union [EU] countries first, then by the other countries).

Country		Marine Spatial Planning (MSP)-Specific Information
EU	France	<ul style="list-style-type: none"> ♦ MRE projects are strongly excluded from military zones (for training, navigation, or security operations). Marine protected areas (MPAs) are also heavily protected. ♦ For sea basins under the supervision of the Ministry for the Ecological and Inclusive Transition, macro-zones that could potentially host MRE projects have been identified, based largely on physical environmental conditions, geomorphology, risks to maritime security, etc. ♦ Within the macro-zones, stakeholders provide input for siting specific projects.
	Ireland	<ul style="list-style-type: none"> ♦ No areas have been identified as being prohibited for MRE activities. ♦ It is likely that the new consenting system in the form of the Marine Planning and Development Management Bill (DHPLG 2019c) will enable zoning for different uses in the future.
	Portugal	<ul style="list-style-type: none"> ♦ Areas are allocated in the marine spatial plan for MRE but require a Title for the Private Use of the Maritime Space. ♦ Other uses are also allowed in this space, based on their compatibility. Compatible uses are illustrated in Figure 11.2. ♦ MRE development approved outside the designated areas will be incorporated into the Situation Plan (DGRM 2018). ♦ Regulations for certain activities create exclusion areas and safety zones.
	Spain	<ul style="list-style-type: none"> ♦ No areas prohibit wave or tidal energy, nor are there preferred deployment areas.
	Sweden	<ul style="list-style-type: none"> ♦ No areas are fully prohibited for MRE development, but additional licensing requirements may be needed in areas designated for conservation purposes.
United Kingdom (UK)	Scotland	<ul style="list-style-type: none"> ♦ Some areas are generally prohibited for MRE development and require consenting requirements that effectively make development impossible. ♦ MRE projects are prohibited from areas designated as firing ranges used by the Ministry of Defence. ♦ Preferred zones and locations for MRE are under development as part of the Sectoral Plans put together by Marine Scotland (Scottish Government 2020; Marine Scotland 2014). ♦ “Preferred areas” will become clearer as more Scottish Marine Regions develop their Regional Marine Plans.
	Wales	<ul style="list-style-type: none"> ♦ MRE development is constrained in areas used by the Ministry of Defence, as shipping lanes, and designated as safety zones around existing infrastructure, and potential development is managed on a case-by-case basis. ♦ The Welsh National Marine Plan (Welsh Government 2019) identifies Strategic Resource Areas for MRE, based on available energy resources. Consultation on the plan focused on lack of clarity about intended uses. The final marine spatial plan did not include the Strategic Resource Areas but have retained an ambition to move towards spatial specificity within future iterations of the plan.
Australia	<ul style="list-style-type: none"> ♦ No preferred locations for ocean energy have been designated, even with one of the most mature examples of zoning in marine waters (Great Barrier Reef Marine Park Act 1975). ♦ Several existing uses of the marine space are managed by leasing (e.g., petroleum and greenhouse gas titles, aquaculture leases). ♦ In the state of Victoria, MPAs consist of no-take and multiple-use areas. 	
India	<ul style="list-style-type: none"> ♦ No preferred areas or zones exist for ocean energy. ♦ MRE and other ocean energy development are prohibited in protected areas around islands as well as coastal areas that feature mangroves, national parks, sanctuaries, and naval bases. 	
Japan	<ul style="list-style-type: none"> ♦ MRE development is not prohibited in any area, but development is very challenging in Natural Parks, tidal flats, seaweed beds, coral reefs, and fish spawning grounds. ♦ Reversing past practice, 2016 legislation now allows for future energy developments in ports and harbors. ♦ Designated demonstration sites for MRE research and development have been selected by local governments proposing a demonstration site (see Figure 11.3). 	
South Africa	<ul style="list-style-type: none"> ♦ There are no prohibited areas for MRE or preferred locations for its deployment. ♦ The South African National Working Group on MSP is finalizing the Current Status Report, which will provide information about locations for MRE development and other ocean activities. 	
United States (U.S.)	<ul style="list-style-type: none"> ♦ No areas have been designated for MRE development, but preferred areas for offshore wind development have been designated in the Atlantic by the Bureau of Ocean Energy Management. ♦ Prohibitions are in place for National Marine Sanctuaries, National Parks, National Monuments, shipping lanes, and MPAs (National Marine Sanctuaries Act of 2000). ♦ Areas identified by the U.S. Department of Defense as critical to their activities require additional layers of consultation and review. 	

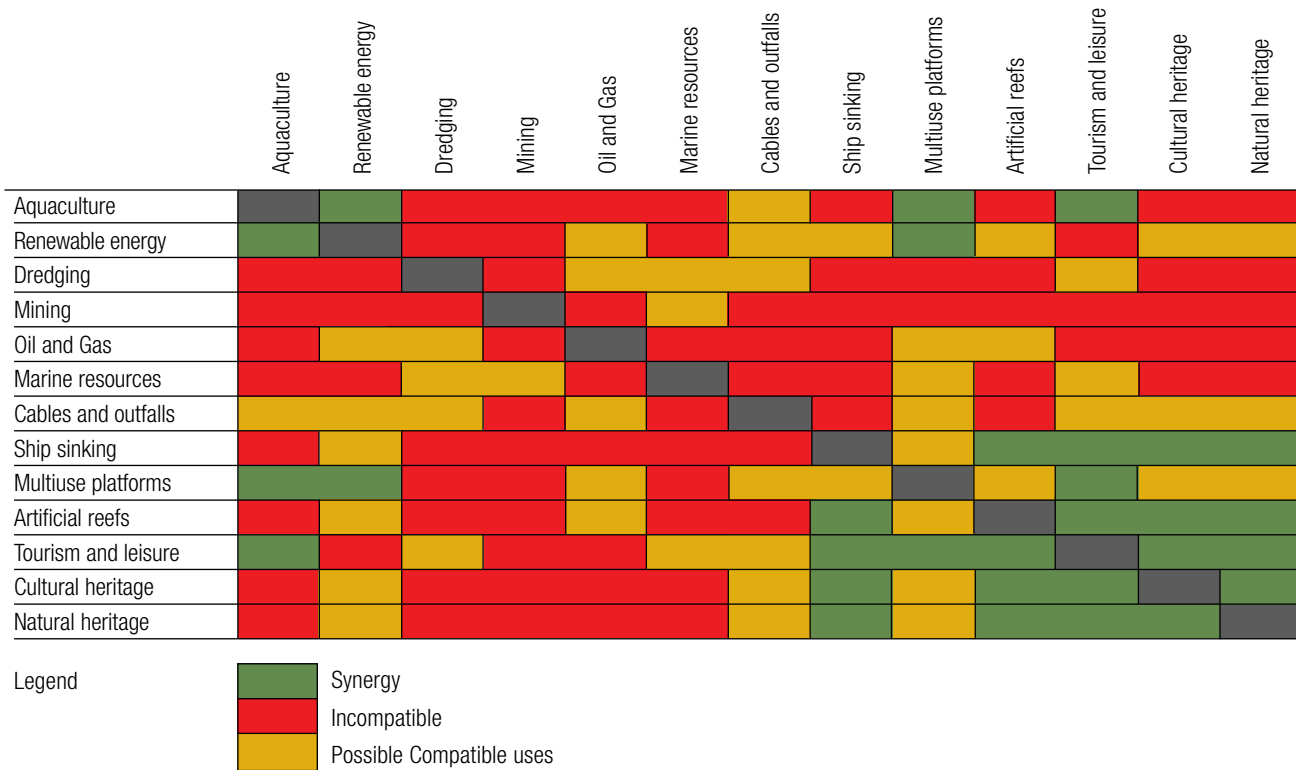


Figure 11.2. Compatible, incompatible, and synergistic marine sectors, as identified in the Portuguese Situation Plan. This figure is theoretical and the fact that two activities are indicated as compatible does not mean that this happens in practice or out of necessity. (Adapted and translated from DGRM 2018)

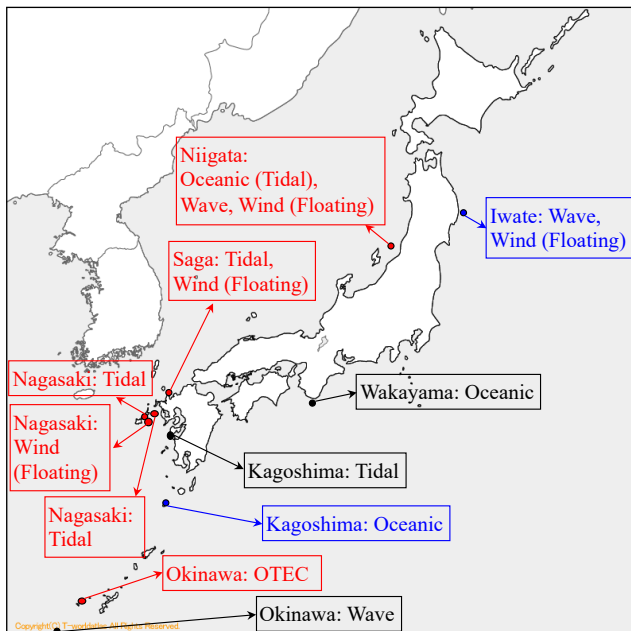


Figure 11.3. Selected demonstration sites for wind, wave, and tidal energy in Japan. Sites shown in red were selected in 2014; the Iwate site, in blue, in 2015; and the Kagoshima site, also in blue, in 2017 as demonstration sites. Sites shown in black text were proposed but not selected. (Image courtesy of Daisuke Kiazawa)

11.7. TOOLS THAT SUPPORT MSP IMPLEMENTATION

Many tools can be used to assist in the implementation of MSP at a variety of scales. These include different spatial management tools such as designated sites and zones (see Section 11.6), as well as more technology-based tools like a dedicated marine atlas or cadastre based on geographic information systems (GISs). In the EU, marine GIS tools are an increasingly popular method of making marine-related information accessible to the public, and a convenient way of illustrating complex data derived from a wide variety of sources. For more details about specific OES-Environmental countries' MSP tools, see Table 11.6 (also see Tables 11.7 and 11.8). More detailed descriptions can be found at <https://tethys.pnnl.gov/state-of-the-science-2020-supplementary-marine-spatial-planning>.

Table 11.6. Tools that have been developed in the Ocean Energy Systems (OES)-Environmental nations to assist in marine spatial planning (MSP) implementation (arranged alphabetically by European Union [EU] countries first, then by the other countries).

Country	MSP-Specific Information	
EU	France	<ul style="list-style-type: none"> Implementation of MSP uses geographic information related to marine activities, land-sea interactions, and spatial demands and trends for future maritime activities. Challenges have arisen related to the appropriate scale at which to operate, how to assess and convey stakeholder perceptions, how to improve coordination on sectoral policies, and how to select available data and to deal with data gaps.
	Ireland	<ul style="list-style-type: none"> To fulfill EU Marine Strategy Framework Directive (Directive 2008/56/EC) requirements, the nation's marine atlas is being expanded to support MSP implementation, including tools and data management systems
	Portugal	<ul style="list-style-type: none"> A dedicated geoportal was developed and reflects the planning of the national maritime space with a view to private use for the establishment of economic activities (DGRM 2020).
	Spain	<ul style="list-style-type: none"> Information about the environment, maritime uses, existing aquaculture zones, anchoring areas, areas for military use, sand extraction zones, and MPAs are being collected into a GIS. The geographic information system (GIS) will support MSP, as well as the examination of cumulative impacts.
	Sweden	<ul style="list-style-type: none"> Uses GIS for MSP purposes as well as the Symphony process (Swedish Agency for Marine and Water Management 2020), a model-based tool developed to support the implementation of ecosystem based maritime spatial planning, to assess cumulative impacts of the plans.
United Kingdom (UK)	England	<ul style="list-style-type: none"> The existing Marine Information System, which contained information about plans and policies, supporting data, and information, was replaced with the Explore Marine Plans digital service (Marine Management Organisation 2020e) to improve functionality when using spatial data and information.
	Scotland	<ul style="list-style-type: none"> A number of tools are used to implement MSP, as detailed in Table 11.7.
	Wales	<ul style="list-style-type: none"> A Marine Planning Portal (Welsh Government 2020a) provides access to the evidence base for MSP in GIS format; an online video provides guidance on the content and its use (Welsh Government 2017b).
	Northern Ireland	<ul style="list-style-type: none"> A publicly accessible Marine Mapviewer was developed to show the existing uses and activities in the Northern Ireland Marine Area (DAERA 2018b).
Australia	<ul style="list-style-type: none"> Many spatial (GIS-based) mapping tools have been developed to support MSP, as listed in Table 11.8. Its Assessment of Victoria's Marine Environment report (VEAC 2019) identify current environmental, economic, social, and cultural values of the marine environment and their spatial distribution. Victoria has also developed a Marine Knowledge Framework to facilitate integrated approaches to research and monitoring efforts in all marine environments across the state (State of Victoria DELWP 2018). In addition to these GIS-based resources, many other studies have been completed in Australia to assess marine values associated with industries and trends. 	
India	<ul style="list-style-type: none"> No tools have been produced to aid ocean energy development. 	
Japan	<ul style="list-style-type: none"> Layers of information have been organized into a GIS to assist with the zoning that will be used to assess and identify suitable areas for MRE development. 	
South Africa	<ul style="list-style-type: none"> A National Ocean and Coastal Information Management System with accompanying Decision Support Tools is being developed and will be instrumental during the implementation phase of the MSP process and will aid in displaying MSP data and maps (DEFF & DSI 2020). 	
United States (U.S.)	<ul style="list-style-type: none"> The Marine Cadastre website compiles spatial data and information in a user-friendly format throughout U.S. waters to support MSP, MRE siting, and the siting of other ocean-related efforts on the U.S. Outer Continental Shelf (NOAA Office for Coastal Management 2020). Regional programs are able to use and incorporate data from the Marine Cadastre and apply it to their region of interest (NROC 2020; Mid-Atlantic Ocean Data Portal 2020; West Coast Ocean Partnership 2020). 	

Table 11.7. Tools that support marine spatial planning implementation in Scotland.

Tool	Contents
Marine Scotland MAPS NMPI https://marinescotland.atkinsgeospatial.com/nmpi/	National Marine Plan interactive
Scotland's Marine Atlas: Information for The National Marine Plan https://www2.gov.scot/Publications/2011/03/16182005/0	An assessment of the condition of Scotland's seas, based on scientific evidence from data and analysis and supported by expert judgment
Marine Scotland's Regional Locational Guidance http://marine.gov.scot/information/regional-locational-guidance	Information related to the search areas for future offshore wind, wave, and tidal energy plan options
Regional Marine Plans https://www2.gov.scot/Topics/marine/seamanagement/regional/Boundaries	Only Clyde and Shetland Marine regions have taken this forward to date.
Sectoral Planning https://www2.gov.scot/Topics/marine/marineenergy/Planning	Specifically for offshore wind, wave, and tidal energy
Environmental Impact Assessment Regulations https://www2.gov.scot/Topics/marine/Licensing/marine/guidance/EIARegulations	Different regulations are used depending on the location of the marine development and the installed capacity of the development. These determine which marine developments are required to undertake production of an Environmental Impact Assessment Report prior to obtaining planning permission and the necessary consents.

Table 11.8. Tools for implementing marine spatial planning (MSP) in Australia.

Mapping Tool	Contents
http://www.nationalmap.gov.au	A spatial database of Australian data, including marine spatial layers in support of MSP at Commonwealth level.
http://www.nationalmap.gov.au/renewables	Spatial information specific to Australia's energy resources and infrastructure.
http://aodn.org.au	Australia's Ocean Data Network, providing Australian marine and climate science data, including spatial layers.
http://www.nespmarine.edu.au/maps	Maps from Australian National Environmental Science Program Marine Biodiversity hub, including maps of pressures on the marine environment and species maps amongst others.
https://marine.ga.gov.au/	Geoscience Australia AusSeabed Marine Data Discovery, providing bathymetry and backscatter data access.
https://www.operations.amsa.gov.au/Spatial/	Includes a spatial database for use in GIS associated with Australia's shipping and maritime safety.
http://maps.ga.gov.au/interactive-maps/#/theme/amsis	The Australian Marine Spatial Information System is a web-based interactive mapping and decision support system that improves access to integrated government and non-government information in Australian marine Jurisdictions.
https://data.marinemammals.gov.au/	National Marine mammal database.
http://seamapaustralia.org	Includes, for example, national marine habitat maps.
https://research.csiro.au/atlantist/home/about-atlantist/	The Atlantis model, used internationally as a decision support tool for MSP.

11.8. THE CONSENTING PROCESS AND MSP

MSP is both strategic and anticipatory. To achieve the objectives of MSP there must be clear links to the project level. All MRE projects will require some form of consent to occupy sea space and generate electricity from natural marine resources. It is therefore imperative that MSP aid decision-making for consenting processes. Every country has a different method of consenting development in their marine space, but the method should align with higher, national-level policy objectives reflected in MSP. In the EU, there is a legal requirement for MSP with a set of common minimum requirements that plans must contain, but there is no similar system for development in marine areas. This remains a member state competence, although requirements of other EU legislation must be adhered to in state practices. In the case of MRE development, for example, depending on the size, location, and nature of the proposed development, most proposed projects will require an environmental impact assessment (EIA) (Commission of the European Communities 2009) based on over-arching EU law on this topic (European Commission – Environment 2009). EU conservation legislation (Habitats and Birds Directives) must also be complied with and such compliance regularly involves the completion of an Appropriate Assessment (Council Directive 92/43/EEC; Directive 2009/147/EC). This interaction of consenting and MSP is not applicable to the current situations in India, South Africa, or the U.S., where consent is granted on a case-by-case basis because there is no over-arching MSP process in place. Details of the interactions of MSP and consenting for MRE are shown for each OES-Environmental country in Table 11.9. More detailed descriptions can be found at <https://tethys.pnnl.gov/state-of-the-science-2020-supplementary-marine-spatial-planning>.

11.9. FACTORS LIMITING IMPLEMENTATION OF MSP FOR MRE

Across countries, a multitude of factors lead to challenges in implementing MSP. It is important to understand these key challenges in order to provide lessons for other countries to learn from when developing MSP and to tackle challenges that may arise across MSP implementations. Only certain countries, primarily those in the EU that have MSP already in place or are working toward its implementation, were in a position to discuss their limiting factors and challenges. For factors limiting implementation of MSP for MRE in OES-Environmental specific countries, see Table 11.10. More detailed descriptions can be found at <https://tethys.pnnl.gov/state-of-the-science-2020-supplementary-marine-spatial-planning>.

11.10. PUBLIC INVOLVEMENT IN MSP

It is widely accepted that transparency, accountability, and openness are key principles for successful planning and decision-making processes. Therefore, to achieve the desired planning objectives, it is essential that the parties whose interests may be affected, or who have a role to play, should take part in the design and operation of the planning process. Public and stakeholder involvement can help responsible authorities carry out their responsibilities, set appropriate priorities, and balance environmental, economic, and social objectives. Having contributed to the process, the public and stakeholders are more likely to have a sense of ownership for it and thus be more committed to its successful implementation. Aside from these factors, public participation is regularly a legal requirement in policy- and decision-making processes. The EU MSP Directive (Directive 2014/89/EU) requires member states to create means of public participation by informing all interested parties and consulting with relevant stakeholders, authorities, and the public at an early stage in the development of their marine spatial plans. Public involvement in MSP for MRE in OES-Environmental countries is summarized in Table 11.11. More detailed descriptions can be found at <https://tethys.pnnl.gov/state-of-the-science-2020-supplementary-marine-spatial-planning>.

Table 11.9. Consenting processes that have been developed in the Ocean Energy Systems (OES)-Environmental nations to assist in marine spatial planning (MSP) implementation (arranged alphabetically by European Union [EU] countries first, then the other countries).

Country	MSP-Specific Information	
EU	France	<ul style="list-style-type: none"> Consenting decisions to deploy MRE devices are granted by the Coordinating Prefectures, which are also responsible for the MSP consultation for their sea basins. Consenting decisions are based on coherence between the MRE project and <ul style="list-style-type: none"> macro-zones identified by the French public authority; existing marine uses as mapped and defined in the Strategic Façade Planning Documents (Décret n° 2017-724); the results of an environmental impact assessment clarifying environmental impacts of the project and measures to avoid, reduce, or compensate these impacts, and; stakeholders providing input on social, economic, and cultural challenges to the MRE project.
	Ireland	<ul style="list-style-type: none"> The existing consenting system for MRE development is limited to licenses for site investigation, research, or testing facilities. Legislation has been proposed to modernize the consenting system, including the need to take into account objectives of the National Marine Planning Framework when developing MRE.
	Portugal	<ul style="list-style-type: none"> The Directorate-General for Natural Resources, Safety and Maritime Services oversees MSP, is responsible for allocation of marine spatial use, and granting a Title for the Private Use of the Maritime Space for licensing any activity that requires a specific spatial area at sea. The Title for the Private Use of the Maritime Space can only be issued if it is in accordance with the Situation Plan (DGRM 2018).
	Spain	<ul style="list-style-type: none"> There is no strategic plan in place for MRE, and licensing is done on a case-by-case basis. Currently, a number of consents are needed to deploy an MRE device, taking into account environmental aspects, use of the sea space, and energy production. Consents need to be approved by the Ministry for Ecological Transition.
	Sweden	<ul style="list-style-type: none"> The Environment Court is responsible for licensing decisions with guidance from the marine spatial plan, but the plan is not binding
United Kingdom (UK)		<ul style="list-style-type: none"> All planning decisions must align with UK Government policy, specifically the Marine Policy Statement (HMG 2011), as well as applicable legislation such as the UK Marine and Coastal Access Act (2009). All licensing applications must take into account the adopted marine plan or the Marine Policy Statement.
	Scotland	<ul style="list-style-type: none"> A complete review of all the MRE licensing decisions in Scotland has not yet been conducted. The planning and consenting authorities will consider the objectives and planning recommendations of the Scottish National Marine Plan (Marine Scotland 2015) and the associated Sectoral and Regional Marine Plans (Marine Scotland 2014).
	Wales	<ul style="list-style-type: none"> All licensing and consenting decisions need to demonstrate compliance with the policies in the Welsh National Marine Plan (Welsh Government 2019). Implementation guidance is expected from the Welsh Government.
	Northern Ireland	<ul style="list-style-type: none"> When the Marine Plan is adopted, it will be used by public authorities when making decisions that affect the marine area.
	Australia	<ul style="list-style-type: none"> Any MRE development has to comply with the federal Environment Protection and Biodiversity Conservation Act (1999) requirements. Consent is required for MRE development from the Minister responsible for the Marine and Coastal Act (2018) for Victoria. Ocean energy developments will also be subject to consent conditions, which are site-specific. In issuing a consent, the policies and MSP Framework in the Marine and Coastal Policy (State of Victoria DELWP 2020) must be taken into account, as well as other considerations included in the Marine and Coastal Act (2018).
Japan	<ul style="list-style-type: none"> MRE consenting gives priority to the acceptability of other stakeholders, with no involvement of other regulatory authorities in individual project consents. 	

Table 11.10. Factors that limit the implementation of marine spatial planning (MSP) as it affects marine renewable energy (MRE) development in the Ocean Energy Systems (OES)-Environmental nations (arranged alphabetically by European Union [EU] countries first, then by the other countries).

Country	MSP-Specific Information	
EU	France	<ul style="list-style-type: none"> ◆ Data are needed to improve the knowledge of the environmental impacts of MRE technologies, MRE impacts on the economy, and on social and political interactions. ◆ MSP implementation is limited by the availability of comprehensive marine data, particularly in light of the potential impacts of climate change.
	Ireland	<ul style="list-style-type: none"> ◆ No commercial-scale MRE can be consented in Irish waters until the National Marine Planning Framework is completed, which is anticipated to occur in 2021. Legislation will be needed to put the plan into effect and provide for a new consenting system.
	Portugal	<ul style="list-style-type: none"> ◆ The lack of marine data poses a significant challenge to implementing MSP.
	Spain	<ul style="list-style-type: none"> ◆ Implementation of MSP and its application to MRE development is limited by the lack of human resources.
	Sweden	<ul style="list-style-type: none"> ◆ Lack of data for some specific aspects of the marine environment hampers implementation of MSP. ◆ A new planning system is under development that could pose challenges because new requirements for MSP and MRE development may be written.
United Kingdom	Scotland	<ul style="list-style-type: none"> ◆ MSP implementation is limited by financial resources and the willingness of stakeholders to support it.
	Wales	<ul style="list-style-type: none"> ◆ Applying the marine spatial plan to MRE consenting requires that practical measures be developed to streamline consenting with a proportionate, risk-based approach.
Australia	<ul style="list-style-type: none"> ◆ Although Australia was an early adopter of MSP, it appears that the ocean policy was too ambitious, suffered from a lack of jurisdictional ownership, lacked sufficient clarity of objectives and integration, lacked sufficient scientific understanding, and had inadequate tools for implementation (Vince et al. 2015). ◆ The focus has turned to making progress in increasing scientific understanding and developing tools, but jurisdictional complexity remains a limitation. 	
India	<ul style="list-style-type: none"> ◆ No strong priority is given to ocean energy in the country. 	
Japan	<ul style="list-style-type: none"> ◆ MSP implementation to support MSP consenting has been limited by the lack of available data. ◆ Lower technology readiness levels for MRE devices have led to a lack of planning priority, limited financial resources being made available, lack of acceptance by fishermen, and barriers to grid connection. 	
United States	<ul style="list-style-type: none"> ◆ The lack of a formal national MSP process, legal framework, or founding legislation limits the effectiveness of MRE consenting. 	



Table 11.11. Public involvement in marine spatial planning (MSP) processes by the Ocean Energy Systems (OES)-Environmental nations (arranged alphabetically by European Union [EU] countries first, then by the other countries).

Country	MSP-Specific Information
EU	France <ul style="list-style-type: none"> ♦ The French Code for the Environment requires public consultation on the Strategic Façade Planning Document (Décret n° 2017-724) prior to the commencement of marine renewable energy (MRE) projects. ♦ The EU MSP Directive (Directive 2014/89/EU) demands a greater degree of public consultation, which necessitates earlier public involvement. ♦ Based on these regulatory obligations, there have been two rounds of public consultation on the MSP process for the French North Atlantic sea basin area (Décret n° 2017-724; Ministère de la Transition Écologique et Solidaire 2018; 2019b).
	Ireland <ul style="list-style-type: none"> ♦ There is a strong focus on public engagement in the national MSP process, including formal public consultation processes and environmental assessments (DHPLG 2019d). ♦ In addition, a number of public regional workshops, seminars, and interactive web-based workshops have been held (DHPLG 2019d).
	Portugal <ul style="list-style-type: none"> ♦ Two consultation periods and a number of public meetings were held during development of the preliminary and draft versions of the Situation Plan (DGRM 2018).
	Spain <ul style="list-style-type: none"> ♦ Because of the early stage of MSP implementation, no public involvement has occurred.
	Sweden <ul style="list-style-type: none"> ♦ Four rounds of public consultation have been held, in addition to dialog at the outset of the MSP process. ♦ Although invited, the general public has only participated to a limited degree, but most coastal municipalities have participated and been represented.
United Kingdom (UK)	England <ul style="list-style-type: none"> ♦ The Marine Management Organisation is responsible for public participation, the agency's engagement with stakeholders, and what to do with the outcomes of any views and opinions received. ♦ This involvement is detailed in a Statement of Public Participation for each marine plan area. ♦ Stakeholder responses are compiled and, where possible, integrated into the plan, provided they align with other laws and policy, and a summary is published (Marine Management Organisation 2019a; 2019b; 2019c; 2019d).
	Scotland <ul style="list-style-type: none"> ♦ Marine Scotland and the Scottish Government have a commitment to "[involve] all relevant stakeholders and members of the public in the development of policies that will impact upon them", which is detailed in a Statement of Public Participation (Marine Scotland 2015).
	Wales <ul style="list-style-type: none"> ♦ Public consultation on the marine spatial plan, specified in a Statement of Public Participation (Welsh Government 2018), was carried out in 2017 and 2018, but it was largely limited to representatives from environmental nongovernmental organizations. ♦ The Welsh Government produces regular newsletters to provide updates on progress.
	Northern Ireland <ul style="list-style-type: none"> ♦ A Statement of Public Participation lays out the public engagement process for the Marine Plan for Northern Ireland (DAERA 2018c). ♦ 12 public information events were held in coastal locations, as well as engagement with primary and secondary school students, six sectoral workshops, and continued engagement with Northern Ireland and UK departments with responsibilities in the Northern Ireland marine areas (DOENI 2012). ♦ Northern Ireland officials meet regularly with officials responsible for MSP in the Republic of Ireland, because they share a marine border.
Australia	<ul style="list-style-type: none"> ♦ In Victoria, the draft MSP Framework was developed collaboratively using a co-designing process that involved government and partner agencies (such as the Victorian Fisheries Authority) and marine stakeholders (including fishing and boating representative bodies), the resources sector (including the ocean energy sector), environment groups, and academics. ♦ A draft Victorian policy was made available for public comment in 2019.
Japan	<ul style="list-style-type: none"> ♦ Although there is no formal MSP process, the public is generally involved at the stage of consensus building and environmental impact assessment development when licensing a project.
South Africa	<ul style="list-style-type: none"> ♦ Stakeholder engagement sessions were held during the initial stages of the MSP process and further stakeholder engagement is planned for other phases. ♦ Once the Current Status Report has been finalized, there will be stakeholder engagement to communicate the progress in the process and to fill gaps in the available information.

continued

Country	MSP-Specific Information
United States (U.S.)	<ul style="list-style-type: none"> ◆ Executive Order 13840 (Executive Order 13840) supports federal agency engagement with stakeholders, including Regional Ocean Partnerships, under existing laws and regulations to address ocean-related matters that may require interagency or intergovernmental solutions. ◆ Regional Ocean Partnerships provide a public forum at which to discuss ocean planning issues in the U.S. The partnerships generally host discussions with members, stakeholders, and the public; provide a shared regional vision; identify regional goals and objectives; analyze data, uses, services, concurrent uses, potential threats, and impacts; and provide work plans and collaborative products for public comment. ◆ Engagement with stakeholders has also been incorporated at multiple points in the Bureau of Ocean Energy Management (BOEM)'s MRE authorization process for leasing on the U.S. Outer Continental Shelf. Through mechanisms like BOEM's Intergovernmental Renewable Energy Task Forces, BOEM carries out its mandate to consult with relevant federal agencies, the Governor of any affected state, the executive of any affected local government, and any affected Tribal Nation within the U.S.

11.11. KEY FINDINGS AND CONCLUSIONS

MSP is an approach that can be used locally, regionally, and nationally as a way of improving marine governance and achieving sustainable development. It is clear from the preceding sections that almost all the countries surveyed are advancing some form of MSP. This progress varies by country and can be attributed to a wide range of factors. In the EU, for example, countries are legally mandated to have maritime spatial plans in place by March 2021 (Directive 2014/89/EU), yet some member states are still at the early stages of plan development, whereas others are already reviewing and adapting their plans. This variability in progress can be attributed to a variety of reasons such as different policy drivers, government priorities, and more operational-level challenges related to human and financial resources. Scale can also be an issue because a number of EU member states have huge maritime jurisdictional areas.

While good practice guidance about how to implement and evaluate MSP exists, it is possibly too early to successfully evaluate the impacts of MSP on any one sector, because of the status of MRE in the studied countries. A number of country respondents stated that marine renewables, and MRE specifically, are still very much a developing sector in their country. The difference in the development of MSP for MRE is probably a reflection of how much importance is placed on the growth of the sector in different administrations and countries. Few countries have allocated zones for MRE development, despite acknowledgment in national and regional energy policies of the potentially transformative role MRE could have in their energy futures. This could be a result of the difficulties involved in spatially zoning areas and the need to avoid conflict with

existing users. Often it is more appropriate and easier to have supporting policies and financial assistance.

Once MSP is further along in the implementation process, it would be interesting to look at precisely how, in what way, and at what point MRE and its related infrastructural requirements are incorporated into marine spatial plans. Currently, this seems to occur primarily via stakeholder engagement mechanisms and dedicated meetings with sectoral representatives or their organizations. Development of MSP systems appear to have driven data and information collection and collation in almost every country. This can be motivated by policy requirements, but interestingly can come about as a result of a realization that such data will support other law and policy objectives, putting the principle of “collect data once and use many times” into practice. In the EU, this is particularly the case where implementation of the Marine Strategy Framework Directive (Directive 2008/56/EC) necessitates data collection and environmental monitoring. Research projects, both in terms of funded MSP research projects as well as trial MRE demonstrations and deployments, also act as a scientific data source that can be used in MSP design and implementation. Generation of data and often the requirement to make the data publicly accessible have also driven the development of various web portals and repositories, some of which have been further advanced and refined to become tools to assist in implementing MSP. Such tools are wide-ranging in that, in some cases, their aim is to increase public knowledge about the marine environment and activities that occur there. Elsewhere, these dedicated web tools are designed for use by regulatory authorities when they are making decisions about applications related to developments in the marine space. In the UK, for example, advances have already been made in their online data system to make it more iterative, user-centered, and streamlined.

In terms of moving MSP forward, there is a need to assure that planners and policy-makers are aware of the needs of MRE. This includes up-to-date information from experiences with deployments and their interactions with the marine environment, but also their requirements in terms of supporting infrastructure such as access to ports, transport routes, energy storage options, and grid connections. As the MRE industry looks to both the commercialization and development of large arrays as well as smaller deployments that serve remote or off-grid communities, these needs may vary and MSP will need to address differences such as the appropriate scale for planning processes. Such alignment would assure that key land-based measures to support the MRE sector could be identified at a national, regional, or local scales, and targeted to align with, and support, areas or zones of sectoral potential. If these types of needs are better understood and recognized by planners, they may help to frame MSP going forward. Developing knowledge about environmental interactions could also assist in minimizing the spatial areas where MRE is prohibited or where there are more consenting and licensing obligations. As more and more countries recognize the potentials presented by MRE in meeting renewable energy targets and reducing greenhouse gas emissions, demands on maritime space are likely to increase. To minimize impacts and maximize sustainable development opportunities, it is critical to have a forward-planning process, such as MSP, supported by an efficient and effective development consenting/licensing system and enforcement regime.

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