Planning and Management Frameworks for Renewable Ocean Energy

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Introduction

Maritime Spatial Planning (MSP) is a relatively new approach to planning where and when human activities occur in marine spaces. Countries are at differing stages of implementing MSP: in some places, this is a response to competition for space, and in other cases, it is a legal requirement. In the European Union (EU), a Directive establishing a framework for MSP (2014/89/EU) was adopted in July 2014 requiring Member States to have maritime spatial plan(s) in place by 2021 at the latest.

MSP can cover specific uses or more strategic objectives in order to achieve ecological, economic, and social objectives. There are many definitions of MSP, and the terms "marine" and "maritime" spatial planning appear to be used synonymously (see Hildebrand and Schröder-Hinrichs 2014). One of the most widely cited definitions of MSP is that of UNESCO (2009), which defines MSP as "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 usually have been specified through a political process. Characteristics of MSP include ecosystem-based, area-based, integrated, adaptive, strategic, and participatory". The United Kingdom's Department of Environment, Food and Rural Affairs describes MSP as "strategic, forward-looking planning for regulating, managing, and protecting the marine environment, including through allocation of space, that addresses the multiple, cumulative, and potentially conflicting uses of the sea" (Tyldesley 2004; Meaden et al. 2016). For the purposes of this chapter, MSP is taken to be a strategic planning process, carried out through a consistent and agreed-upon framework, which may or may not be legally binding, that enables

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integrated, future-looking, sustainable, and consistent decision-making on spatial uses of the sea.

The desire to develop a clean, secure, and indigenous energy supply has prompted governments to publish dedicated marine renewable and/or ocean energy strategies mapping out the potential development path for the sector in their countries. Other actors, such as the European Commission together with Ocean Energy Europe, the European trade association, have also been in the vanguard of promoting ocean energy. In 2014, the European Commission published a two-phase action plan. The first phase saw the creation of a dedicated Ocean Energy Forum comprised of three work streams focusing on environment and consenting, finance, and technology. The three work streams work to build consensus on specific topics and enable pragmatic solutions to the identified issues to be developed. This culminated in the publication of an Ocean Energy Strategic Roadmap (Ocean Energy Forum 2016); which forms the second phase of the action plan. Such initiatives and strategies represent an important policy context and can prompt further development and growth. Planning, regulatory, and management systems which apply to ocean energy can derive from several sources. National, or domestic, legislation incorporates broader international obligations and, in the EU, also includes EU objectives—all of which reflect the rights and duties of coastal States as recognised by international law. Because the wave and tidal energy sector is still at a pre-commercial stage of development, the consenting of such projects tends to be subject to the same legislation and administrative procedures governing other forms of marine development, though in many countries this situation is evolving as experience grows. The term "consenting" is used generically in this chapter to capture the various consents, permissions, licences, concessions, and leases necessary to undertake development. Consenting processes reflect numerous aspects of development, including the occupation of sea space (seabed leasing), environmental impacts, terrestrial planning, grid/electrical connection, and decommissioning (O'Hagan 2012, 2015). As more integrated marine governance continues to be advocated by a wide diversity of international and regional sources, MSP is continually promoted as one of the cross-cutting tools that is capable of delivering integrated governance.

MSP does not replace single-sector planning or management but has a number of advantages that may benefit the development of the renewable ocean energy sector. In this context, "ocean energy" is taken to include wave and tidal energy sources. The term "marine renewable energy" (MRE) is more expansive and includes ocean energy and offshore wind. MSP can provide greater certainty to the private sector in planning new investments and should reduce conflicts between incompatible users and activities. It should also promote more efficient use of marine resources and space, indicate opportunities for coexistence of activities, and facilitate the implementation of a streamlined permitting process for marine activities. In some locations around the world, the development of offshore wind energy in particular has driven the development and subsequent implementation of MSP. In many northern

European countries, such as Germany, the Netherlands, and Belgium, specific zones have been allocated for offshore wind development. Similarly, in other locations worldwide, specific ocean energy test sites have been established for the testing and demonstration of those technologies. Whilst such sites do not represent marine planning zones, they operate with some of the same features; for example, they can be planned through a participatory process, operated with and through exclusion zones (where necessary), and have environmental monitoring programmes in place to minimise negative environmental effects and be adapted accordingly if required. MSP should ideally set the framework for planning decisions, which become operational through the granting of various consents. Under EU law and the recently adopted EU MSP Directive, all maritime spatial plans developed will be subject to a Strategic Environmental Assessment (SEA) because they may have significant environmental effects. Environmental Impact Assessment (EIA) applies at the site/project level.

This chapter presents descriptions of consenting systems for ocean renewable energy in countries around the world. Consenting is one of the most important, time-consuming, and resource-intensive category of legal considerations encountered by a project developer. It is also one of the most significant threats to the financial viability of a project because of the inherent "regulatory risk" (O'Hagan 2014). Given the development status of these technologies, which ranges from research and development to the prototype stage and to the pre-commercial stage, it is not possible to define what constitutes "best practice" in terms of consenting. A key focus is placed on MSP systems in this chapter in an effort to highlight how this new approach to managing marine activities may influence the development of offshore renewable energy both currently and in the future. The content is derived from relevant external documentary sources and supplemented with findings from a questionnaire completed by all International Energy Agency–Ocean Energy Systems (IEA-OES) Annex IV participant countries for the OES Annex IV State of the Science report (Copping et al. 2016). In the IEA-OES, each country is represented by a Contracting Party, which nominates participants that can be from government departments, national energy agencies, research or scientific bodies, and academia. Currently, there are 13 participating countries in Annex IV.[1] The questionnaire was conducted with the Contracting Party representatives. It included questions about whether the needs of the ocean renewable energy sector were included in MSP, how this was achieved, how scientific information is used, how cumulative impacts are addressed, how conflicts are managed, how other stakeholders are involved, and if there are limitations to implementing MSP currently or likely to be as the sector becomes more established. The information is presented alphabetically by country.

[1]The Annex IV participant countries are Canada, China, Ireland, Japan, New Zealand, Nigeria, Norway, Portugal, South Africa, Spain, Sweden, the UK, and the USA.

Canada

The Department of Natural Resources Canada leads a Marine Renewable Energy Enabling Measures programme that is active in developing a policy framework for administering MRE activities in the federal offshore. Maritime jurisdiction in Canada is complex: under the Constitution, provincial jurisdiction generally ends at the low-water mark, but in Newfoundland and Labrador, it extends to the 3-mile territorial sea limit, and in British Columbia, the waters between Vancouver Island and the mainland are considered provincial waters. Consents required before a MRE project is approved involve those related to land use, project operation, electricity transmission, health and safety, environmental protection, and navigation. A Marine Renewable Energy Technology Roadmap was prepared by Natural Resources Canada with industry collaboration through the Ocean Renewable Energy Group and outlines a technology development strategy to facilitate progress (Natural Resources Canada 2011). This prioritised Environmental Assessment (EA) with the intention of streamlining permitting procedures in the longer term. Whilst there is no one legislative instrument at the federal level that applies to marine energy, certain provinces have been active in better tailoring their legislation to the requirements of marine energy. Nova Scotia, for example, has been particularly progressive in this regard, given the huge potential for tidal energy in the Bay of Fundy and consequent publication of the province's Marine Renewable Energy Strategy in 2012, which contained broad policy, economic, and legal conditions for MRE projects and technologies in expectation of commercial-scale development (Province of Nova Scotia 2012). The legal aspects of the Strategy have since been taken forward via the enactment of a dedicated Marine Renewable Energy Act in 2015. This covers wave, tidal range, in-stream tidal, ocean currents, and offshore wind technologies in designated areas of the Nova Scotia offshore.

The priority areas designated under the Act are the Bay of Fundy and Cape Breton Island's Bras d'Or Lakes. The effect of this is that MRE projects cannot be permitted in these areas without approval from the Nova Scotia Minister of Energy. The Act defines "marine renewable energy resources" as "ocean waves, tides and currents and winds blowing over marine waters, and any other source prescribed by the regulations" (Section 3(1)(n), Marine Renewable Energy Act of 2015). Within these priority areas, the province may designate smaller areas for project development known as "Marine Renewable Electricity Areas" (MREAs). The purpose of an MREA is to identify the best possible locations to develop MRE projects and to provide clarity about the use of this marine space. MREAs will only be identified after significant research and consultation has taken place, and under the 2015 Act four of these have been designated—namely the Fundy Ocean Research Center for Energy site, Digby Gut, Grand Passage, and Petit Passage MREAs—for in-stream tidal energy converter deployments. Any developer proceeding in a priority area without an approval will be in violation of the Act. A licence will allow a project developer to carry out the business of extracting energy within an MREA using a single device or an array of multiple devices. A permit will be issued for the

temporary deployment of a device for the purposes of testing and demonstration. This system will ensure projects proceed only after undergoing a thorough review by Government and subject to effective Government oversight and monitoring. The creation of MREAs must be completed in consultation with the province's Department of Natural Resources and the Department of Fisheries and Aquaculture. The federal Government must also be consulted in relation to commercial fisheries and maritime transportation concerns. There is also the duty to consult the Aboriginal community about the designation process, but they do not hold any veto power.

A second aspect of the Marine Renewable Energy Strategy was the establishment of a Statement of Best Practices for In-Stream Tidal Energy Development (Nova Scotia Department of Energy 2014), which provides guidance for the development and operations of in-stream tidal energy. The Statement is a tool that can be used by industry, Government, and other key stakeholders to harmonise development with environmental interests and ensure that the industry grows in an environmentally and socially responsible manner. It follows a sequence of essential steps in planning, deployment, operation, and decommissioning of an in-stream tidal energy project. This also covers the regulatory aspects of in-stream tidal energy development and establishes a hierarchy of federal and provincial environmental regulatory review requirements according to three different generation outputs of devices: 50 MW or more; 2–50 MW; and less than 2 MW (Nova Scotia Department of Energy 2014). As a result of the need for multiple consents administered by both the federal and provincial governance levels, the province of Nova Scotia has established a Federal/Provincial One-Window Standing Committee for Tidal Power projects (OWC). This is broadly similar to the "one-stop-shop" approach popular in parts of Europe, the rational being that it can streamline and more effectively coordinate developer applications and associated consents for in-stream tidal energy projects in Nova Scotia.

Strategic planning approaches have also implemented in Canada. In Nova Scotia, for example, an SEA for tidal energy was conducted in 2008 of the Bay of Fundy area (OEER 2008). This was forward-looking and highly participatory, and it culminated in a number of recommendations related to the creation of more specific policies and legislation on tidal energy, the promotion of demonstration projects, continuing engagement and participation, and an incremental approach to tidal energy development based on adaptive management. The Statement of Best Practices captures many of these recommendations and contains principles to be applied in their application (Nova Scotia Department of Energy 2014). Canada has a comprehensive framework for oceans management through the Oceans Act (1997), complemented by Canada's Oceans Strategy in 2002. The country's approach to ocean management is based on the principle of integrated management (IM), which seeks to establish decision-making structures that consider both the conservation and protection of ecosystems, whilst at the same time providing opportunities for creating wealth in oceans-related economies and communities. The IM planning process is described in the Policy and Operational Framework for

Integrated Management of Estuarine, Coastal and Marine Environments in Canada and involves six interrelated stages (Fisheries and Oceans Canada 2002):

- defining and assessing a management area;
- engaging affected interests;
- developing an Integrated Management Plan;
- endorsement of plan by decision-making authorities;
- implementing the plan; and
- monitoring and evaluating outcomes.

The implementation of the above framework has occurred since 2005 through a Large Ocean Management Areas (LOMA) pilot-based approach. Whilst these are not strictly maritime spatial plans per se, the impacts are broadly similar. Currently, there are Integrated Management Plans for five areas: Placenta Bay and Grand Banks, the Scotian Shelf, the Gulf of St Lawrence, the Beaufort Sea, and the Pacific North Coast. The plans take a risk-based management approach to identifying and prioritising key management themes derived from the interactions of marine activities with the ecosystems. The plans operate within existing jurisdictional landscapes and regulatory authorities at different levels of governance and are responsible for implementation of plan goals through management policies and measures under their remit. The creation of the LOMAs began with an assessment of the biophysical elements within each planning area, but the need to understand and incorporate social, economic, and cultural aspects to inform sound management decisions has since been brought into the planning process through a Social, Economic and Cultural Overview and Assessment (SECOA) carried out for a defined area. The Eastern Scotian Shelf Integrated Management Plan, for example, was one of the first large plans to be developed though it focuses entirely on offshore areas, beyond 12 nautical miles, and is not formally linked with any adjoining terrestrial plans (Fisheries and Oceans Canada 2007). The LOMAs are hundreds of square kilometres in size and typically host a range of marine activities. Each LOMA identifies management objectives to ensure the health of the ecosystem, and these are accompanied with socioeconomic objectives, based on the SECOA.

MRE is not mentioned in the majority of the LOMA plan areas. The Pacific North Coast Integrated Management Area Plan (Fisheries and Oceans Canada 2013), which incorporates waters from the north Canadian border with Alaska to Vancouver Island where there is a MRE resource, has representatives from both the wind energy representative group and ocean energy sector representatives on its Integrated Oceans Advisory Committee. On the East Coast, the Eastern Scotian Shelf Integrated Management Plan, published in 2008, was evaluated in 2013 and recognised the opportunities for new marine activities within that LOMA (McCuaig and Herbert 2013). The Eastern Scotian Shelf LOMA includes Nova Scotia, where the Department of Energy has designated areas for tidal energy development. This enables the designation of consecutively smaller areas where development may occur until the individual site licence level is reached, as mentioned above.

The effectiveness of the LOMA plans is monitored and evaluated over time and can be adapted to reflect new scientific information or changing circumstances. The evaluation of the Eastern Scotian Shelf Integrated Ocean Management Plan in 2013 identified limitations in relation to boundaries, whereby coastal regions of Nova Scotia were excluded from the plan and this limited the involvement of certain other relevant sectors. Strategic management objectives in the plan were not always accompanied by explicit timelines and commitments for implementation, and this resulted in inaction on plan implementation and loss of trust amongst stakeholders (McCuaig and Herbert 2013).

Provincially, Nova Scotia is relatively data-rich with respect to marine activities and environments. No singular coordinating body is driving the development of MSP which could be a limitation to its implementation. Most would consider the Department of Fisheries and Oceans Canada the lead for MSP, but that Department is currently resource strained. To date, in Nova Scotia, scientific information about where and how to site MRE projects is largely directed by the Department of Fisheries and Oceans Canada, the Canadian Hydrographic Service, and the Geological Survey of Canada. Data are based on surveys and information collected from fisheries activities.

China

The National Energy Administration is developing a Renewable Energy Development Plan that will cover the period from 2016 to 2020 and include an Ocean Energy Development Strategy developed by the National Ocean Technology Centre and the State Oceanic Administration (SOA). This follows the amendment and subsequent enactment of legislation in 2010 on Renewable Energy in the People's Republic of China, which sought to accelerate and promote the development of renewable energy projects. Contemporaneously, a special funding programme for MRE projects was launched by the Ministry of Finance and is now in its third round. The programme is intended to support the demonstration of key technologies and their progress in reaching industrial scale, the construction of platforms, scaled development, and integrated utilisation of renewable energy and new energy technologies. There appears to be some inconsistencies surrounding what the term "marine renewable energy" comprises in Chinese policy. Xu et al. (2014) quoted an MRE survey organised by the SOA, as encompassing wind, tidal current, and wave resources. Earlier marine energy utilisation zones covered only wave and tidal resources. The terms utilised in this section are taken directly from the overarching policies, unless otherwise stated. Feng et al. (2016) state that by the end of 2011, China had five operational offshore wind farms and 14 more under construction. One tidal energy plant is in operation (Jiangxia Experimental Tide Power Plant). Two wave energy plants are in operation (Xiaomaidao 8 kW Pendulum Wave Power Plant and Daguandao 30 kW Pendulum Wave Power Plant), as well as two tidal projects (Daishan Guishan Waterway Experimental 70 kW-floatage Tidal

Current Power Plant and Daishan Gaoting "WANXIANG-II" Experimental 40 kW Tidal Current Power Plant), but all of these are at the demonstration and pilot stages, so they are not commercial ventures (Feng et al. 2016).

In terms of planning and consenting, China has been implementing the Marine Functional Zoning (MFZ) since it was proposed in 1988. This involved a nationwide, comprehensive investigation of China's coastal zone and tidal flat resources to help develop a zoning plan for those areas in terms of their future utilisation. This comprises the development of an all-inclusive and binding document covering marine development and its regulation and management. The zoning plan is the basis for marine management and divides the sea space into different types of functional zones according to criteria related to geographical and ecological features, natural resources, current usage, and socioeconomic development needs. The Law on the Management of Sea Use, enacted in 2001, requires that all uses of sea areas must comply with approved MFZ schemes (Fang et al. 2011). MFZ covers marine development planning, marine resource management, and the establishment of marine nature reserves. Accordingly, marine activities occur in a series of "rounds" determined by the SOA for coastal provinces, autonomous regions, and municipalities. The national MFZ scheme in 2002 divided sea areas under national jurisdiction into 10 types of functional zones: 941 port and shipping zones, 1,888 fishing and fishery resource conservation zones, 202 mining zones, 452 tourism and recreation zones, 319 sea water use zones, 60 ocean energy use zones, 449 construction use zones (the subzone for submerged pipeline, reclamation, shore protection, bridge, and others), 285 marine protected areas, 309 special use zones, and 451 reserved areas (Zhang 2003). This approach was later identified as being outdated, overly simplistic, and insufficient in some areas. In relation to marine energy, for example, Feng et al. (2016) state that the marine energy utilisation zones, which covered tidal energy, tidal current energy, wave energy, and thermal energy, were "overly detailed as well as incomplete" but ignored the offshore wind energy zone. The national MFZ covers internal waters, the territorial sea, contiguous zone, exclusive economic zone, and continental shelf.

A third and new round of MFZ took place between 2009 and 2012. This round was advanced jointly with relevant authorities and coastal Local Governments in accordance with the Sea Area Use Administration Law, the Law on Marine Environmental Protection, and the Sea Island Protection Law. In March 2012, the State Council approved this latest round of national MFZ. A special functional zone was created for MRE. According to the Technical Guidelines for Marine Functional Zoning and the Technical Requirements for Provincial Marine Functional Zoning,[2] all sea areas of China area divided into eight Class I functional zones and 22 Class II functional zones. The MRE zone is a subzone under the Class I zone, i.e. the "mines and energy zone". Sea areas that have rich and exploitable MRE (wave, tidal current and tidal energy, salinity and temperature gradient energy) are

[2]Available in Chinese only: http://www.tsinfo.js.cn/inquiry/gbtdetails.aspx?A100=GB/T%2017108-2006.

categorised as renewable energy areas. Because offshore wind energy is different from the other sources and the resource is larger, its development is viewed as compatible with some other sea uses and no special basic functional zone is defined for it. The Technical Guidelines list all of the data and materials required for the zoning and the methods used. Base maps, remotely sensed imagery, and satellite imagery are all used as a basis for the maps produced. Accompanying documents detail the area's socioeconomic characteristics and existing marine activities. These documents also include an assessment of the physical environment, possible future plans for sea use, environmental protection requirements, commercial fisheries, and marine reclamation to present as comprehensive and detailed a basis for future zoning as possible. These documents can be accessed by the public on the associated information management system via the Internet.

One of the main purposes of MFZ is to allocate the most suitable sea areas for specific activities and thus avoid conflicts. In areas designated as an "agriculture and fishing zone", no industrial development involving marine reclamation can take place. Similarly, in a "port shipment zone" no activities that would adversely affect shipping can take place. When applying to use an area of sea space, an EIA and justification for that use are required so that it can be demonstrated that the new use conforms with the requirements of the MFZ. With respect to project consenting, this varies according to whether the project is funded by the Government or by private sources. A range of consents is required for projects funded by the Government. These include an initial approval from the Department of Development and Reform, a pre-examination and an EIA from the Land Resources Department and Environmental Protection Department, planning permission from the Urban Planning Department, as well as a formal land use approval granted by the Land Resources Department. For the water-based elements of the project, a certificate of right to use sea areas from the SOA or the maritime administrative department of Local Government is required. A different permitting procedure applies to the power production and grid connection elements of the project, which involves the utility distribution grid operator. The variety of consents required involves a number of different authorities which also vary according to the source of the funding.

Ireland

Ireland has a huge potential MRE resource, primarily for wind and wave energy (DCENR 2014). The Marine and Renewable Energy Test Site in Galway Bay is a quarter-scale test site that is fully operational. A second full-scale, grid-connected test site, the Atlantic Marine Energy Test Site, on the west coast is at the advanced planning stage, and onshore works are underway. The Irish Government's Department of Communications, Energy and Natural Resources (DCENR), published an Offshore Renewable Energy Development Plan (OREDP) in February 2014 (DCENR 2014). The plan highlights the potential opportunities for the

country relative to MRE at low, medium, and high levels of development to reflect the findings of the SEA of the plan carried out prior to plan publication (SEAI 2010). As a policy document, the OREDP sets out key principles, specific actions, and enablers needed to deliver Ireland's significant potential in this area. Accordingly, the OREDP is seen as providing a framework for the development of the sector. The implementation of the OREDP is coordinated by the DCENR, and an Offshore Renewable Energy Steering Group (ORESG) has been created to oversee the implementation. The ORESG consists of members of the main Government departments with roles and responsibilities related to energy and the marine environment, developers, and broader interest and user groups when necessary. The work of the ORESG, and hence the implementation of the OREDP, is organised according to three work streams: environment, infrastructure, and job creation. Under the environment work stream, the Group is tasked with ensuring that the needs of the marine energy industry are reflected in the ongoing reform of the foreshore and marine consenting process. Actions and recommendations derived from the SEA and Appropriate Assessment (specific to the conservation objectives of the site in question) of the OREDP are also taken forward by this group.

The consenting process for MRE incorporates occupation of sea space, electrical generation aspects, environmental impacts, and terrestrial planning requirements. The key legislative instrument governing offshore development is the Foreshore Act, 1933, as amended. Under the provisions of that Act, a project proponent requires a foreshore consent, in the form of a licence and/or lease, to develop in the foreshore area. The foreshore is legally defined as the area between mean high water and the 12 nautical mile territorial sea limit. Currently, foreshore consenting for marine renewables is administered by the Department of Housing, Planning, Community and Local Government (DHPCLG). The Department realises that the nature, scale, and impact of MRE developments can vary considerably but states that all require foreshore consent (1) to investigate/survey the site, (2) to construct the development (and cabling), and (3) to occupy the property.[3] A foreshore licence is required for activities that are not permanent or that do not require sole occupation of the foreshore such as site investigation works and studies relating to EIA. Subsequent to this, a developer may apply for a foreshore lease to undertake further development activities that require exclusive use of the foreshore or longer occupation of the area. It is not possible to obtain a foreshore lease unless the aforementioned preliminary work has been completed, but successful completion of site investigation works does not automatically entitle a developer to a foreshore lease. A lease is generally granted for 35 years and is subject to regular review, on a 5-year basis, by the competent authority. The Minister has the right to reject any application for a foreshore licence or lease, modify the area sought under licence, or allow others to simultaneously investigate the suitability of the licence area (Simas et al. 2015).

Along with the foreshore consents, MRE developments are subject to the requirements of the Electricity Regulation Act, 1999, because MRE devices qualify

[3]See http://www.environ.ie/planning/foreshore/offshore-renewable-energy-projects.

as electricity-generating stations under that legislation. The procedures for electricity authorisations are complex and based on installed capacity (O'Hagan and Lewis 2011). Essentially, a developer must have a licence to generate and a licence to construct or reconstruct a generating station. The applications can be made separately or jointly and, where applicable, must be accompanied by an Environmental Impact Statement (EIS). An EIS, a term used in Irish law, is prepared by the developer and contains an analysis of the likely positive and negative effects a proposed development may have on the environment. Subsequently, the appropriate competent authority then conducts an "assessment" of the EIS, which is then taken into account before consent is granted. Ireland has a significant number of designated coastal conservation areas under EU and national legislation. For EU Special Areas of Conservation designated under the EU Habitats Directive and Special Protection Areas designated under the EU Birds Directive, collectively known as Natura 2000 sites, if a development is likely to affect such a site an Appropriate Assessment (AA) may be required. The AA is specific to the conservation objectives of the site in question. The competent authorities will accept an integrated EIA/AA submission because both relate to the site though the purposes of the assessments differ. Onshore Planning Permission/Exemption for any associated onshore works is required from the adjoining planning authority, or equivalent, depending on the project proponent. A grid connection offer from the relevant operator and a Power Purchase Agreement is also required and operates under a separate administrative process.

A new system for foreshore consenting is currently under development. The development commenced with a comprehensive public consultation on the new process in January 2013 and was followed by the publication of a draft Maritime Area and Foreshore (Amendment) Bill 2013 in October of that year (DECLG 2013). The new legislation seeks to better align the foreshore consenting system with the terrestrial planning system and will also introduce a planning system for marine developments in the exclusive economic zone (EEZ) and on the continental shelf. As a result of the entry into force of the MSP Directive in the EU (and consequently Ireland) as well as a general election in Ireland in 2016, which resulted in a reorganisation of government departments, progress of the Bill through the legislative process has stalled. One impact of the EU MSP Directive is that Member States are required to have maritime spatial plans in place by 31 March 2021. Because this will possibly present a new approach to planning marine activities, it will be intrinsically linked to any consenting processes in operation, and for that reason, it would seem sensible for Ireland and its competent authorities to advance both elements in parallel. At the time of this writing, however, Ireland has no formal MSP system in place. Draft regulations to transpose the provisions of the EU's MSP Directive into Irish law were published in April 2016, subject to a public consultation exercise until May 2016 and enacted into law as the EU (Framework for Maritime Spatial Planning) Regulations 2016 by the Government in June 2016.

A national Integrated Marine Plan, called Harnessing Our Ocean Wealth, is already in place, and it sets out the Government's vision, goals, and "enabling" actions needed to realise the maritime potential of Ireland (Government of Ireland 2012). An appropriate MSP framework for Ireland in the short to medium term was identified as being needed in the plan. A dedicated Enablers Task Force, appointed by the Government's Marine Coordination Group in December 2012, was asked to advise on the development of an MSP framework, and their findings were published in July 2015 (Enablers Task Force 2015). The Task Force recommended a national, strategic marine spatial plan for Ireland's marine waters, and more detailed plans to be developed at a later stage to cover the subnational level as required. The Task Force has specified that MSP will require the enactment of primary legislation, establishment of a lead responsible authority, and a plan-making framework. In the interim period, it is suggested that a multidisciplinary MSP body be created to begin the various processes and actual plan development. The Task Force estimated that a national plan could be adopted within 4 years (Enablers Task Force 2015).

In terms of data and information necessary to undertake MSP and forward planning of MRE projects, Ireland has a considerable amount of data collected by different regulatory bodies, private enterprises, and researchers. These data were collected for other purposes originally and include a marine atlas developed to comply with the EU's Marine Strategy Framework Directive requirements,[4] a seabed survey of the country's entire EEZ area and seabed mapping of the inshore areas,[5] and a range of marine and terrestrial data for various sectoral SEAs. As part of the OREDP, an ocean energy portal covering various aspects of ocean energy development was also created.[6] This information is all freely available and could be used to inform the future development of marine spatial plans. There is also strong scientific and technical research capacity in both MSP and MRE in many universities and third-level institutions. Though no specific zones have been allocated for MRE development, an SEA of the OREDP indicates the areas of highest environmental sensitivity and, whilst these areas do not preclude development of marine energy, there may be additional regulatory requirements for consenting a project in those areas. As part of the implementation of the OREDP, the DCENR has convened an Environmental Working Group that is overseeing the preparation of guidance for EISs and Natura Impact Statements (Appropriate Assessment) as they relate to marine renewables, guidance on environmental monitoring of MRE projects, and a report on environmental, social, and economic data sources and availability and associated data gap analysis. This guidance was published for public consultation in December 2016.

[4] http://atlas.marine.ie/.

[5] http://www.infomar.ie/data/.

[6] http://oceanenergyireland.ie/.

Japan

MRE is at the very early stages of development in Japan. Wind turbines have been incorporated into certain specific locations such as at ports, but there is no clear way in which MSP includes the needs of the MRE sector. Japan has had a Basic Act on Ocean Policy since 2007 that does not prescribe any formal approach to MSP, but it does provide a legal basis for the integrated management of coastal areas and river basins. Under the Basic Act, a policy for the promotion of development of ocean renewable energy was developed which recognises the huge potential of offshore renewable energy generation for the country. Specifically, in relation to offshore wind, the policy states that efforts should be made to reduce implementation costs, resolve technological problems related to durability, and establish methods for assessing environmental impacts (Headquarters for Ocean Policy 2013). Concerning wave and tidal power generation, the policy recognises that Japan is already lagging behind other countries with respect to these technologies and states that basic research for improving efficiency and economic potential should be promoted with due consideration of the special features of seas around Japan. In 2012, the Headquarters for Ocean Policy began working on an action plan for the promotion and utilisation of offshore renewable energy (Headquarters for Ocean Policy 2012). The purpose of the policy was to establish operational demonstration sites in Japanese waters and to coordinate the use of sea areas with local stakeholders. Two or more demonstration sites were to be selected by the end of 2012 in accordance with a specially developed site selection methodology, the requirements for their operation (cables, operation and maintenance requirements, etc.), financial viability, and necessary Government support schemes.

The involvement of stakeholders in planning activities at sea is given high priority under the action plan. The action plan proposes a coordination mechanism that would involve local governments in order to decide upon the most appropriate methods for building consensus with stakeholders, by examining social conditions associated with the use of sea areas from the perspectives of users such as those involved in maritime transportation, the fishing industry, and natural conservation areas. Given the economic significance of commercial fisheries to the economy of Japan, it is the sector most likely to potentially conflict with offshore renewable energy. As a result, MRE developers meet frequently with representatives of the fisheries sector. There is no structured mechanism for doing this as of yet, but the action plan suggested as an underlying principle that a win-win relationship was necessary. This would be accomplished, for example, by involving the fisheries sector representatives in the actual MRE project or giving them priority access to electricity in emergency situations, rather than solely depending on a resolution based on compensation, which is common in relation to public works (Headquarters for Ocean Policy 2012). In some locations, movies based on in situ observation data and numerical simulations have been used to explain the operating principles and effects of MRE devices on the environment to local residents, fishermen, and other marine users.

The action plan called for an examination of the legal issues that might surround the development of MRE projects, specifically in relation to long-term use of sea areas of the territorial waters and the EEZ (Headquarters for Ocean Policy 2012). It was anticipated that this type of legal analysis would help to ensure the safety of offshore structures and power generation equipment through compliance with existing safety standards such as those deriving from the International Electrotechnical Commission, the International Organisation for Standardisation (ISO), and the International Maritime Organisation (IMO). Part of the work on legal issues also focused on the administration of consenting so as to refine and streamline the procedures, perhaps through the application of a one-stop-shop approach. No further details about how these actions have progressed is currently available as the Ocean Policy is updated every 5 years with the next update due in 2017.

Whilst there are no absolute exclusion areas for MRE development in Japan, it is difficult to develop these types of projects in areas used for military training or in nature reserves. Generally, fisheries zones can be adjusted to accommodate different marine activities, but this is not usually achievable within marine protected areas. In terms of data and information that could be used for both site selection and marine planning more broadly, an open-access marine cadastre has been developed and can be accessed by the public and other stakeholders. The cadastre is a direct output from the Basic Act on Ocean Policy in 2007, which called for the development of a system that integrated and provided marine-related information that was dispersed across various regulatory agencies. By developing the cadastre, the information became organised in a more efficient, rational, and user-friendly manner, which could then contribute to the development of marine industry to promote marine-related activities and implement sustainable marine governance (Headquarters for Ocean Policy 2013).

New Zealand

The New Zealand Government has a target of 90% of electricity generation from renewable sources by 2025 (Ministry of Economic Development 2011). The current version of the energy strategy refers to the potential of marine energy for the country, but recognises marine energy is at an early stage of development in New Zealand and states that the Government will encourage it, as appropriate (Ministry of Economic Development 2011). New Zealand has a huge EEZ but no holistic approach to MSP. Marine planning is implemented in a regional manner under the provisions of the Resource Management Act (RMA) 1991 and the coastal plans developed thereunder. When enacted in 1991, the RMA replaced or amended more than 50 pieces of other legislation related to planning and resource management. The rationale for the new legislation was to help achieve a more coordinated, streamlined, and comprehensive approach to environmental management. Under the RMA, regional coastal plans are developed by regional councils and unitary authorities. These plans include objectives, policies, and rules for the activities that

are permitted, controlled, or prohibited within the plan area. The plans operate in a nested way in that they must be consistent with the national New Zealand Coastal Policy Statement (NZCPS) (New Zealand Department of Conservation 2010). The Policy Statement and plans made under the RMA have a seaward limit of 12 nautical miles and an inland scope that varies according to the local geography.

The most recent NZCPS dates from 2010. Like the energy strategy, the NZCPS also acknowledges the potential for the country to generate electricity from offshore wind, wave, and tides in the future, and this is reflected in a number of the policy objectives, specifically those related to activities in the coastal environment. The NZCPS also emphasises the need for coordinated management across council boundaries as well as land and sea. The RMA is complemented by the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012, which seeks to promote the sustainable management of the natural resources of the EEZ and the continental shelf and manage the environmental effects of permitted and non-permitted activities. It does not equate to MSP, but rather focuses on the planning and management of individual uses. The potential of MSP to assist in planning and managing large marine spaces has been recognised in many parts of New Zealand, and recently, the focus has centred on developing a dedicated marine spatial plan for the Hauraki Gulf–Tikapa Moana region, which covers an area of 1.3 million hectares of ocean. In this area, a preliminary review of MSP initiatives and their possible application to that region highlighted the role of science and the possibility of formalising a Hauraki Gulf Science Advisory Group to oversee any necessary scientific work (Hauraki Gulf Forum 2011). The Hauraki Gulf is one of New Zealand's most intensively used marine areas and was designated as the country's first marine park in 2000. A marine spatial plan is being developed using a bottom-up approach involving central and local government and the *mana whenua* (the Māori who have tribal links to the area), and it is managed by a Stakeholder Working Group. The plan is non-statutory but is intended to provide clarity and certainty to people using the marine space.

The marine spatial plan for Hauraki Gulf could be expanded to incorporate sustainable energies, but it does not specifically include marine energy at this time. This could change as MRE technologies reach commercial maturity. In relation to the aquaculture sector, for example, resource consent applications for marine farms can only be made within aquaculture management areas identified in regional coastal plans. Consents for MRE deployments are evaluated and approved by regional councils in relation to offshore activities and those that straddle land and sea. District and city councils issue land use permits for onshore activities. Alternatively, if a project is deemed to be of national significance, the RMA 1991 prescribes a separate process for such decisions, which is administered by the New Zealand Environmental Protection Authority. To be a nationally significant proposal, it must be considered by the Minister to have national importance or effect in some way. For land-based proposals, this responsibility lies with the Minister for the Environment, and for coastal proposals, it lies with the Minister of Conservation. If a proposal straddles both areas, the Ministers must work collaboratively. When making a decision about whether a proposal is of national significance, a

Minister can consider the level of public concern about the proposal, the impacts the proposed development would have on the environment, the technology, and processes or methods that are new to New Zealand and that may affect its environment and whether the impacts are likely to be experienced in more than one district/region (Environmental Protection Authority 2013). These considerations are derived from Part 6AA of the RMA 1991.

In New Zealand, conflicts between different marine users have already been experienced. Consenting processes are based on specific sectoral activities rather than MSP-based activities, which could increase the possibility of conflict. The Environmental Protection Authority recently declined several high-profile applications where marine mining, environmental protection, and aquaculture activity came into conflict; e.g. Chatham Rock Phosphate Limited was refused a marine consent to mine phosphorite nodules in Chatham rise because it would have adverse environmental effects on benthic communities and potentially existing aquaculture operations in the area.[7] In September 2014, the New Zealand Government launched the Sustainable Seas national science challenge to enhance utilisation of the country's marine resources within biological and environmental constraints. The Sustainable Seas initiative will look at frameworks for assisting the Māori and stakeholders to navigate conflicting uses including trade-offs, mitigation measures, and negotiated accommodations (Ministry of Business, Innovation and Employment 2015). This situation arose from the specific rights of the Māori as a partner to the Treaty of Waitangi that, in some instances, have led to conflicts between the multiple economic, cultural, spiritual, and recreational uses of the marine environment and have the potential to impede development of the marine economy.

Further offshore in the EEZ, certain activities are restricted because of the presence of sensitive ecosystems and because there may be disturbances to local economic activities and Māori interests. The highest level of marine protection applies to marine reserves, and currently, there are 44 reserves in the territorial waters around New Zealand. Marine reserves can be established where there is typical, beautiful, or unique underwater scenery, natural features, or marine life of such distinctive quality that their preservation is in the national interest. Under the Marine Reserves Act 1971, a number of activities can be specifically managed, controlled, or excluded from marine reserves. These activities include marine farming, fishing, extraction, anchoring, point discharges, and research. Strict rules govern the removal or disturbance of marine habitats and life within the boundaries of a marine reserve. Permits are required for monitoring or research within a marine reserve if the activity could potentially cause damage under the Marine Reserves Act. There are also Cable Protection Zones (CPZs) protecting high-value electricity cables for the provision of hydroelectricity. The Submarine Cables and Pipelines Protection Act 1996, the associated Submarine Cables and Pipeline Protection Order 2009, and subsequent amendments legally protect the submarine cables laid

[7] http://www.epa.govt.nz/EEZ/chatham_rock_phosphate/Pages/default.aspx.

within the CPZ. None of these instruments currently impinge upon MRE because there are only a limited number of MRE deployments at sea.

The present marine development consenting system works effectively in a regional context, but there can be very different outcomes depending on where an activity takes place. Generally, the New Zealand planning process is highly participatory. The Environmental Protection Authority and the RMA have an open process and solicit public views. The implementation plan for the NZCPS has a dedicated "engagement" stream for district and regional councils to ensure they are well informed about the requirements and statutory obligations of the policy and are supported to implement its policies (Department of Conservation 2011). The engagement stream is supported by a range of specific actions designed to engage with different stakeholder groups, both regulatory and non-regulatory. A proposal for a marine energy test site off the Wellington coast involved the local council along with Grow Wellington, an economic development agency within the region, though this is still in the planning stage (IEA-OES 2015).

Nigeria

The Nigerian Government has been focusing on studying the feasibility of Ocean Thermal Energy Conversion (OTEC). The respondent to the OES Annex IV questionnaire stated that a preliminary analysis suggests that Nigeria could develop over 10 separate multi-product OTEC plants each generating 100-500 MW, along the coastal shores of the country on an incremental basis if funding permits. A consortium comprising FOT-K and the Nigerian Institute for Oceanography and Marine Research (NIOMR) received Government endorsement, and the first phase of feasibility studies is under way.[8] These studies are expected to identify the most suitable sites for OTEC plants in Nigerian waters. Further offshore, on the continental shelf, the economic viability of OTEC plants is also being explored. The federal Government of Nigeria is deliberating on the creation of a Centre for Ocean Renewable Energy Resources to be co-located within NIOMR in Lagos. The idea is that it would oversee all OTEC initiatives from research and feasibility/development studies to the conceptual design, engineering, and deployment of the integrated OTEC facilities, including connection to the national grid and facility management. In addition, Nigeria has a tidal resource but currently insufficient data to determine whether it would be sufficient for commercial-scale development. NIOMR collects oceanographic data in Nigerian waters, but the temporal scale of the data is not always consistent and the spatial scale is limited to the Lagos area and its environs.

No formal MSP system exists in Nigeria, and marine governance could be described as fragmented with multiple authorities having legal remits and responsibilities. The main authorities include the Nigerian Navy, the Nigerian Maritime

[8] http://www.niomr.gov.ng/OTEC%20page.php.

Administration and Safety Agency, the Nigerian National Petroleum Corporation, and NIOMR, all of whom also collect various types of marine data that could be used for MSP purposes in the future. Because feasibility studies are currently under way for OTEC, it and other types of marine energy do not have a sufficient presence as of yet to be taken seriously in planning policy and processes. The same could be said of MSP because no Government department or agency is designated as being responsible for MSP. Marine scientific data, usually tidal observations, have been collected since 2003, but there is currently no central portal or planning data set into which this information can be fed. This means no strategic approach is taken to data collection, which could limit the use of the data in any future marine planning system. When NIOMR is conducting research in the territorial sea, it must have permission from the NigerianNavy because they are the responsible entity. No allocated or restricted zones exist in Nigerian waters at this time, but it is unclear who would have authority to allocate marine space for offshore energy deployments if such an activity was proposed. The overlapping mandates of various Government departments and agencies have been a key contributory factor to existing conflicts between marine users. Marine developments tend to be planned and managed on a single-use basis with little or no involvement of the public. In cases where cumulative impacts have arisen, these were also managed independently, depending on who has the applicable data and information.

Norway

Ocean energy is generally included in renewable energy policies in Norway. In terms of consenting, a dedicated Offshore Energy Act was enacted in 2010 and it fits into a wider planning framework. The Planning and Building Act, for example, governs planning to one nautical mile from the baseline (low-water mark or straight baseline) and facilitates the preparation of local, inter-municipal, and regional plans for these areas though they tend to cover only land-based activities. From one nautical mile to the limit of the EEZ, there is no explicit legislation for MSP, but the Norwegian Marine Resources Act 2009 (*Havressursloven*) enables the development of Integrated Management Plans, which are accompanied by a series of Government declarations and related parliamentary reports. Originally, the legislation was drafted to protect against biodiversity loss; consequently, planning and management decisions are made with this central objective in mind. The Ministry of the Environment has lead authority for national goals, management systems, and performance monitoring and also plays a key role in coordinating the efforts of other entities that have marine remits (Norwegian Ministry of the Environment 2009).

Integrated Management Plan development began in 2001: the first one in 2006 covered the Barents Sea and was revised in 2011; followed by the Norwegian Sea plan in 2009; and the North Sea and Skagerrak plan in 2013. The plans are advisory and do not detail how to manage particular marine activities. Sectoral ministries and

other regulatory agencies retain the responsibility for management of their sectors, but management must be conducted in a way that is consistent with the overarching plan. The plans cover all existing economic sectors in the plan areas. With respect to renewable ocean energy, the various plans recognise the potential operation of this sector but as of yet renewable ocean energy does not have a commercial-scale presence. The Integrated Marine Plan for the Norwegian Sea states that MRE production will be facilitated but should take into account environmental considerations and other activities (Norwegian Ministry of the Environment 2009). The Barents Sea–Lofoten Integrated Management Plan acknowledges that theoretically there is substantial potential for MRE production (Norwegian Ministry of the Environment 2011), and it tasked a dedicated working group, composed of all the relevant regulatory authorities, with identifying the "best" areas for offshore wind energy in 2010. Subsequent to these impact assessments, the Water Resources and Energy Directorate advised that five of the areas should be given priority—the total area being up to 750 km^2, assuming a turbine size of 5 MW (Norwegian Ministry of the Environment 2013). Two prototype tidal plants currently operate within the Barents Sea–Lofoten management area (Norwegian Ministry of the Environment 2011).

The Offshore Energy Act provides a framework for regulating offshore renewable energy production, and as a general rule, it applies beyond the baselines and on the continental shelf. It can also apply inside the baselines. Under the provisions of the Act, an EIA must be conducted prior to an area being opened for licence applications. Section 2.3 of the Act provides that production areas may only be created after the regulatory authorities have opened specific geographical areas for licence applications. The rationale was that the authorities would adopt a spatial planning process whereby the most appropriate sites were selected in areas where the potential for conflict was as low as possible. Local and regional authorities can participate in this process but more as consultees than as participants. The Integrated Management Plans enable all activities that fall with the geographic scope of the plan to be managed within a single context, so the total environmental pressure from activities should not threaten the ecosystems. Cumulative impacts are explicitly dealt with in the plan documents by detailing the existing cumulative impacts, their assessment, and the effects expected over the longer term. This practice then provides a basis for an overall assessment of the need for measures and tools that are presented later in plan.

Due to the environmental premise of the Integrated Management Plans, substantial amounts of scientific data and information have been integrated into the plans and their supporting documents. These are accompanied by sector-specific scientific reports that describe the data and analyses used. The sector-specific reports may also be used to guide local planning and management decisions. This practice has been supplemented in more recent years through national programmes such as Mareano,[9] which maps bathymetry, topography, sediment composition,

[9]http://mareano.no/en/start.

biodiversity, habitats, and biotopes as well as pollution in the seabed in Norwegian offshore areas. The information derived from such programmes is used in policy- and decision-making for fisheries, hydrocarbons, etc. There is no single geographic information system (GIS) for each of the plan areas but an online state of the environment website hosts a range of thematic information and maps.[10] Due to the extensive maritime area of Norway, over 2 million km^2, significant resource challenges exist for mapping, analyses, plan implementation, and review. Trans-boundary issues, given Norway's proximity to EU countries, also necessitate joint action on certain topics. At a local level, coastal municipalities also need to develop greater capacity for planning and data gathering. All reports and other documents related to the Integrated Management Plans are available through the Internet, and stakeholders are encouraged to participate in the process. Public meetings are often hosted by industry representatives and non-governmental organisation (NGO) groups. In inshore waters, the Planning and Building Act prescribes the rules for public participation including public hearings, contributions, and meetings.

Sectoral interactions and conflicts are comprehensively included in each of the three plans. Because ocean energy currently has no large presence in Norwegian waters, the plans deal only with offshore wind in the North Sea plan area. The North Sea and Skagerrak plan states that there will be spatial overlaps between offshore wind farms and maritime transport activities, and certain petroleum exploration activities and fishing, which have the potential to lead to conflict if activities are not adequately planned and mitigated (Norwegian Ministry of the Environment 2013). The North Sea and Skagerrak plan proposes suitable mitigation measures such as amending shipping lanes and removing certain navigation aids where there could be conflicts with shipping; reducing the size of the area for offshore wind development where it could overlap with petroleum exploration activities; and early engagement with fisheries representatives so as to avoid important fishery grounds (Norwegian Ministry of the Environment 2013). In internal waters, close to shore, conflicts tend to occur between fishing and aquaculture activities (e.g. Narvik); platforms and vessels with conservation sites, landscape, and recreation (e.g. Masfjorden, Rossfjorden/Lyngdal); and decommissioning of oil platforms with spawning grounds (Vindafjord).

Portugal

Portugal has been developing a MSP system for a number of years and was the first country within the EU to transpose the requirements of the EU MSP Directive into national law in 2015. The Basic Law for Planning and Management of the National Maritime Space was enacted in April 2014 (Law No. 17/2014 of April 10) and

[10]See http://www.environment.no/Interactive-map/?lang=en&extent=-138770|6733674|809030|7275274&layers=77:100;106:70;&basemap=KART&opacity=70&saturation=100.

covers the Portuguese maritime area from the baselines to the outer limit of the continental shelf beyond 200 nautical miles. This law is a framework instrument and accordingly does not specify how it will be implemented or operate in practice. According to the legislation, the ecosystem approach and adaptive, integrated, and transboundary management are principles that should be observed. This resulted in two types of legally binding national instruments for MSP for private and public entities. Article 7 describes Situation Plans (*Planos de situação*) and Allocation Plans (*Planos de afetação*). The Situation Plan identifies the protection of historical and archaeological sites, preservation of the marine environment/biodiversity, and the spatial and temporal distribution of current and future uses and resources. The Allocation Plan identifies and allocates areas for new uses, not included in the Situation Plan, but once approved, the Allocation Plans are automatically integrated into the Situation Plan.

The framework law was given substantive legal effect under Decree-Law No. 38/2015 in March 2015. This Decree-Law is organised around four main sections: the legal framework for national MSP instruments; the legal framework for private use of national maritime space and associated financial regime; monitoring and technical assessment instruments; and the legal framework for private use of transitional water resources for aquaculture (Article 1). If a marine activity requires a certain spatial area or certain volume of marine space that is greater than that of a "common use",[11] then a title for its use is assigned in one of three ways. The assignments are dependent on the nature and duration of the proposed private use under Article 48:

1. Concession: where the use of the area is continuous (over the entire year) up to a maximum duration of 50 years (Articles 52–53);
2. Licence: for intermittent (or temporary/seasonal) use(s) of the marine area for periods of less than 1 year and up to a maximum of 25 years (Articles 54–56);
3. Authorisation: limited to scientific research projects and/or pilot projects involving new technologies or non-commercial uses with a maximum duration of 10 years (Article 57).

Any such title obliges the holder to comply with broader requirements including the achievement of Good Environmental Status under the Marine Strategy Framework Directive and Good Ecological Status for coastal and transitional waters. Where a proposed use is already included in the Situation Plan, the proposer of the project can request an appropriate title for that use. In contrast, if the use is not yet included in the Situation Plan, the granting of a title for use is dependent on the approval of an Allocation Plan (Article 50). The Situation Plan is still under development, but it will be based on a preliminary map of existing uses, which has already been compiled for the Portuguese coastal area. On this map, two types of areas have been assigned to wave energy: priority areas with a high wave energy resource and a reduced level of other uses; and secondary areas with a wave

[11]A common use could refer to leisure uses, for example.

resource that is still interesting for exploitation but in areas where conflicts with other marine uses may arise.

Chapter 4 of Decree-Law No. 38/2015 covers the fees payable for a private use of national maritime space. This "utilisation tax" (*Taxa de Utilização Privativa do Espaço Marítimo* [TUEM]) aims to compensate for private use of "common" marine space and to cover the administrative costs associated with planning and management and any possible environmental costs associated with impacts deriving from the activity operating. Private uses permitted under authorisations do not have to pay the tax because they are deemed to be non-commercial. Under Article 76(2), this tax exemption extends to uses that involve the development and use of geological and energy resources. The major share (75%) of the tax goes to the authority responsible for granting the title for private use (i.e. the Natural Resources, Security and Maritime Services Directorate-General, (*Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos* [DGRM]), but 25% goes towards the adjoining state or autonomous region.

In association with the private use title, a developer of a MRE project also has to apply for a power production licence, administered by the Energy and Geology Directorate-General (*Direcção Geral de Engenharia e Geologia* [DGEG]), the entity that coordinates all licensing processes (including the marine space licence), operating as a one-stop shop. The power production licence encompasses a production permit and an operation permit. If the project is to be grid-connected, the procedure starts with a request for a power supply reservation from the public electrical network from a given point and may also necessitate the submission of an EIA, if the project, or parts of it, is located in or near a national ecological reserve, a Natura 2000 site, and/or the national network of protected areas (Decree-law 215B/2012). Depending on the project's dimension and characteristics, the Commission for Coordination and Regional Development (CCDR, *Comissão de Coordenação e Desenvolvimento Regional*) or the Environmental Portuguese Agency (larger projects) oversees the EIA process. Outside of protected areas and if the project is not covered by national EIA legislation, the CCDR must return a finding of no significant impacts to the DGEG. The EIA procedure for offshore energy projects (except wind farms with 20 or more turbines for which a full EIA is required) follows a simplified procedure, led by the CCDR of the area in which the project is to be located. This is usually quicker and has a specified time frame. Onshore work associated with offshore renewable energy development requires approval from the local planning authority. A specially designed online system (Article 58 of Decree-Law No. 38/2015) is under development to facilitate coordination and communication during the licensing process (of all activities subject to approval in the marine space). The legislation also provides that where other consents are required for a particular activity, they can be viewed simultaneously on the electronic portal and administered centrally from there (Article 62).

South Africa

A national MSP system is in the early stages of development in South Africa. It is not yet operational and consequently any marine and coastal developments generally fall within the scope of the Integrated Coastal Management (ICM) Act 2008 and associated National Coastal Management Programme (NCMP). The current programme runs from 2013 to 2017 and seeks to resolve existing user conflicts and other management issues. The ICM Act defines the coastal zone as the area comprising coastal public property, the coastal protection zone, coastal access land and coastal protected areas, the seashore, coastal waters, and the EEZ and includes any aspect of the environment on, in, under, and above such areas. Arguably, it already provides a basis for marine and coastal spatial planning. The NCMP states that spatial planning in the coastal zone seaward of the high-water mark at this time remains largely sectoral and hence planning processes still principally take place independently from each other (DEA 2014). The overarching Act provides for the strengthening of partnerships between authorities that work in the marine area through the creation of Memoranda of Understanding particularly in relation to activities in the coastal zone that do not currently fall within the scope of the ICM Act. This could include, for example, mining, infrastructure development, fisheries and marine aquaculture, MRE, state assets, shipping, oil and gas, and biodiversity and protected areas.

Research surveys of the Agulhas Current on the east coast of South Africa and of wave energy have proved the technical feasibility of extracting significant large-scale renewable energy from the Agulhas Current and waves (Government Communications 2015). Whilst there are no active MRE deployments in South African waters at this time, any prospective deployments would be subject to a number of different legislative instruments administered by different competent authorities. All renewable energy developments are governed by the National Energy Act 2008. These developments may also be covered by more general legislation such as EIAs and SEAs. The Department of Environmental Affairs (DEA) is currently working on an SEA of wind and solar photovoltaic (PV) energy though it is for land-based developments. If a power generation plan is greater than 100 kW, a power generator licence needs to be obtained from the National Energy Regulator of South Africa when the plant is to be connected to the national grid. South Africa's National Utility provider (ESKOM) is responsible for granting Independent Power Producer access to the national grid. Both of these applications are granted at the discretion of each of the responsible entities. There are no timelines associated with the granting of the consents.

The development of a more integrated approach to ocean governance has been put forward by the South African Government through the Operation Phakisa initiative, which has as its key objectives the establishment of MSP and development of a national ocean and coastal information system. Originally, there was a target of delivering a national MSP framework by December 2015, to be accompanied by a regional framework and more detailed small-scale marine spatial plans that would

enable the transition to a sustainable ocean economy (Marine Protection Services and Governance 2014). A draft Marine Spatial Planning Framework was published by the DEA in August 2016, and though this does not include ocean energy as a current use, it does recognise the sector as an emerging use once an economic and reliable technology is available (DEA 2016). MSP would complement the ICM Act and associated management structures within the territorial sea (12 nautical miles). A dedicated, cross-sectoral Oceans Secretariat is to be established to launch processes and structures to clarify legislation, processes, and responsibilities related to ocean resources for multiple users, including the coordination of timelines for decision-making and facilitation of trade-off discussions between potentially competing industries. The Secretariat would be comprised of three units with functions related to research and data management, permitting and authorisation, and enforcement and compliance (Marine Protection Services and Governance 2014). The permitting and authorisation unit is intended to coordinate the various departments involved to ensure permits and authorisations are processed within predetermined timelines, facilitate cross-departmental discussions if conflict arises between consenting authorities, and to provide a platform for streamlining processes.

Though there are no planned or operational offshore energy projects and no predetermined zones or sites for such developments, a number of protected areas exist along the coastline where development will be prohibited. Section 56 of the Integrated Coastal Management Act of 2008 also provides for the demarcation of coastal planning schemes for specific purposes and activities, or prohibition of certain purposes and activities in the coastal zone or coastal management area, under certain conditions. With changes in marine management expected, it is difficult to say with certainty how future marine activities will be administered. An EIA will remain a requirement for marine developments, and though its completion is dependent on the project's electrical output, the spatial area covered, and the technology to be used, there is an obligation to consult with the public. Public consultation usually takes place via stakeholder meetings at which members of the public can raise their concerns. Generally, development in marine space has not been a priority in the past because the focus has been on conservation activities rather than development of economic activities. Vast areas of land are available for energy development, and the sea shelf around South Africa has a steep gradient that could place a technical constraint on the future development of offshore energy projects.

Spain

In 2010, as part of Spain's transposition of the EU's Marine Strategy Framework Directive, the Spanish Protection of the Marine Environment Act entered into force. This Act contains principles and processes for planning in the marine area and covers internal waters, the territorial sea, the EEZ, the fisheries protection zone in the Mediterranean, and as far as the continental shelf. No other MSP system is operational, though research projects have explored the potential use of MSP for

specific developments, such as the siting of wave energy devices on the Basque continental shelf (Galparsoro et al. 2012). This involved the development of a Suitability Index for wave energy converters that incorporates the technical, environmental, and socioeconomic constraints to deployment. The information generated was combined with the accessible energy potential and the technically exploitable wave energy potential to enable wave energy developers and regulators to identify the most suitable sites for subsequent surveys and studies. This approach was used to select the Basque Marine Energy Platform (*bimep*) site, where 17 data layers covering 10 technical, 4 environmental, and 3 socioeconomic factors were included in a dedicated GIS.

No dedicated consenting process for ocean energy projects exists in Spain, but several legal instruments apply to the development of a project. The Ministry of Industry acts as a coordinator for the various consents required and passes the applications on to other regulatory authorities for comment. Those authorities then return their comments to the Ministry of Industry which decides whether or not to grant consent. An authorisation for occupation of the maritime area is required from the Ministry of Agriculture, Food and Environment. EIA legislation (Royal Decree 1/2008) provides that a developer must submit an initial document outlining the project and its expected environmental impacts. The competent authority analyses the initial document in the light of submissions made by other marine entities and determines whether a full EIA is needed. If approved, the Environmental Authority will grant the Environmental Authorisation and attach project-specific conditions. A simplified process for marine energy projects was introduced in 2013 and is administered by the Ministry of Agriculture, Food and the Environment. The streamlined process was an attempt to address recognised delays in the consenting process with respect to the time taken to get approval. Under the new system, a defined time frame of no more than four months, or six months if there are exceptional circumstances, is necessary (Simas et al. 2015).

Along with meeting the above requirements, MRE development also requires a number of consents related to electrical generation. Royal Decrees 1955/2000 and 1028/2007 govern energy development and the procedure for authorising electricity-generating stations in the territorial sea, respectively. Royal Decree 1028/2007 was originally drafted for offshore wind but has since been expanded to cover ocean energy technologies. The construction, extension, modification, and exploitation of electrical installations require the following:

1. Request for Administrative Authorisation: a technical document related to the project's installation plan;
2. Project Execution Approval (AEP): relates to the commissioning of the project and enables the developer to start construction; and
3. Exploitation Authorisation: once constructed, this allows the development to be "switched on" and proceed to commercial production.

The Ministry of Industry is the competent authority for the Administrative Authorisation. Regional Governments may be involved if the project is located in

internal waters. If an offshore energy development is likely to affect maritime safety or navigation, the Directorate-General of the Merchant Navy, part of the Ministry of Development, will be contacted for input. Where a project requires onshore work, an additional consent from the Port Authorities is needed if such work incorporates the occupation of public ports.

The Ministry of Industry, Energy, and Tourism conducted an SEA of offshore wind in 2009 (Ministerio de Industria, Energía y Turismo 2009) to determine areas of the public maritime domain that had favourable conditions, including little or no expected environmental effects, for the installation of offshore wind farms. The SEA categorised areas according to their suitability including unsuitable or "exclusion zones" and areas that may be suitable, though subject to additional requirements or conditions. Over 60% of the area included in the SEA was considered unsuitable (Ministerio de Industria, Energía y Turismo 2009). This finding was attributed to the fact that there was potential for conflict with other priority marine uses or there was an increased likelihood of significant environmental impacts. There is no provision within any of the legal instruments or administrative processes for dealing with conflicts. Previously, conflicts have been dealt with on a case-by-case basis and have focused on the provision of monetary compensation to those most affected; for example, financial compensation was given to fishermen who lost access to their fishing grounds as a result of MRE development.

It is not yet clear whether additional legislation will be necessary to transpose the requirements of the EU MSP Directive or whether an amendment to existing legislation would suffice. The lack of coordination between administrative entities that have a marine remit at national and local levels remains problematic. During the development of the *bimep* test site, for example, administrative complexities created difficulties during consenting because both national and local administrations were involved as a result of a complex separation of powers between central government, provinces, and autonomous communities. The public can be consulted during all or some of the individual consenting processes, primarily through informal public events. There is also a legal requirement for consultation as part of the EIA process, usually when the EIS has been submitted to the competent authority and before a final assessment is made.

Sweden

The Swedish Agency for Marine and Water Management (SwAM) has been working on the development of maritime spatial plans for three areas: the Gulf of Bothnia, the Baltic Sea, and the Skagerrak and Kattegat. The plans cover both the territorial seas and the EEZ of each area. SwAM is the lead agency for plan development, but activities are planned in association with county administrative boards and coastal municipalities as well as environmental NGOs and the public. Plan development was preceded by the addition of dedicated MSP legislation to the Environmental Code in 2014 (Ordinance 2015:400). This Ordinance recognises the

Government's view that MSP is a necessary tool for the conservation of marine areas and for enabling cohesive marine management. The Ordinance contains provisions for the geographical boundaries of MSP, plan content, and the responsibility for preparation, consultation, and cooperation in the proposal process, and monitoring and review. The plans are non-statutory but operate as guidance documents that should be taken into account when making decisions related to the sea. The Government has authority to adopt binding regulations to fulfil the objectives of the plans, if that is deemed necessary. Under the Planning and Building Act, Swedish municipalities have planning responsibility for Swedish territory, which is taken to include internal waters and the territorial sea. Accordingly, there are 65 municipalities where the responsibilities of the municipality and the State overlap with respect to the territorial sea.

No single legal instrument governs ocean energy in Sweden; rather, the consenting process applied is broadly similar to that for wind energy. It falls within the scope of the Swedish Environmental Code—framework legislation that covers water-based activities such as hydropower and bridge development and not ocean energy per se. No special rules apply to ocean energy. A developer initially has a meeting with the adjoining regional authority, who normally administers the consenting process, and discusses the proposed project, the other authorities that need to be involved, and the EIA process. This information may also be captured in a document that can be used at a later stage for consultation purposes and as a basis for EIA-related work. The developer commences EIA baseline studies after this pre-consent consultation and conducts public meetings about the proposed development. This is all documented and submitted to the regional authority. An approved EIA is a prerequisite for making an application for consent to the Environmental Court. The Environmental Court makes the final decision about whether a permit will be granted. It is at this stage that supplementary information may be requested. If a permit is granted, it usually will have specific terms and conditions attached to it based on the findings of the EIA.

As part of the marine plan development process, the Swedish Energy Agency has declared specific areas for offshore wind where a significant physical wind resource is available. These areas are designated as being in the "national interest" and accordingly are protected under the Swedish Environmental Code in that such areas are protected from measures that may damage their value. In 2013, 27 such offshore wind areas were designated, encompassing an approximate total sea area of 4,000 km^2 (SwAM 2014). As of yet no areas of national interest have been allocated for wave energy development, though it is recognised that this could be important for commercial development in the future. Two test sites, one for wave energy demonstration in Lysekil and one for marine currents research in Söderfors, are currently operational. These sites are operated and managed by Uppsala University. No nationwide resource assessment and mapping exercise has been conducted to inform future site selection and investigation for wave energy development according to the current status report (SwAM 2014). The supporting documentation for MSP development explores the possible conflicts between the various marine sectors, including offshore wind primarily with nature conservation

and defence activities. The marine plans developed are anticipated to propose possible solutions for such conflicts. Certain nature reserves currently preclude the development and operation of ocean energy devices, but these activities usually are decided upon on a case-by-case basis by the regional authority.

United Kingdom

The United Kingdom (UK) comprises England, Wales, Scotland, and Northern Ireland. The latter three may be referred to as devolved administrations because each has its own government or executive branch and legislature. England is governed directly by the UK Government and Parliament on all issues. In Wales, Scotland, and Northern Ireland, certain responsibilities have been retained by the UK Government and are known as "reserved" matters. These vary by administration: in Scotland, "energy" is a reserved matter, and in Northern Ireland, the "foreshore, sea bed, and subsoil and their natural resources" are a reserved matter. In effect, this means that for certain policy areas, the UK Government in Westminster makes the policy and/or legislation, which is then applied in the devolved administrations by their authorities. The UK enacted the Marine and Coastal Access Act in 2009, and this forms the legal basis for marine planning. Under Section 44 of that Act, the UK Government published the Marine Policy Statement, which establishes the framework for preparing marine plans and conducting decision-making in the marine environment (HM Government 2011). In the devolved administrations, this Statement has either been applied in its entirety or supplemented with additional administration-specific legislation for the area.

The Crown Estate is a UK entity that manages lands held by the Crown as sovereign including the foreshore and seabed, usually out to 12 nautical miles and as landowner in the EEZ out to 200 nautical miles. The Crown Estate has legal authority to alienate property through granting a right in the seabed or foreshore to a third party for specific purposes such as mineral extraction, fish farming, or MRE generation. In relation to MRE, it is The Crown Estate that issues leases for renewable energy, depending on the site and technology. The Crown Estate has run six offshore wind leasing rounds since 2000. This leasing activity specified the type and scale of the project, commencing with projects of 30 turbines during Round 1 (2000), larger projects further offshore in Round 2 in 2003, and most recently Round 3 in 2009 during which sites were selected after the completion of an SEA. During this process, project proponents bid for exclusive rights to develop offshore wind farms within the round areas or "zones". The procedures that apply following a successful bid are complex and detailed elsewhere (The Crown Estate 2014; O'Hagan 2015). Currently, there are no absolute prohibitions on siting of ocean energy projects in the UK, but additional requirements may apply if a project is to be located within a designated conservation site or a site of special scientific interest. This can also be the case if a project is to be sited near military grounds. The Crown Estate operates in waters all around the UK, but a consultation on

proposals to establish an interim body to manage The Crown Estate assets in Scotland post-devolution is currently under way (The Scottish Government 2016a). The situation in Northern Ireland is also uncertain given complex jurisdictional issues with the Republic of Ireland.

The UK Government retains responsibility for decommissioning offshore renewable devices under Sections 105–114 of the Energy Act 2004. The Department of Energy and Climate Change (DECC) administers this process and has published guidance notes for developers that apply to territorial waters in or adjacent to England, Scotland, and Wales (between the mean low-water mark and the 12 nautical mile territorial sea limits) and to waters in the UK Renewable Energy Zone (including the part adjacent to Northern Ireland territorial waters). The scheme does not apply to the territorial or internal coastal waters of Northern Ireland because of uncertainties surrounding the ownership of the seabed. Neither does it apply to inter-tidal areas (between the high-water mark and the low-water mark) of any of the other administrations. The guidance applies to all forms of offshore renewable energy devices regardless of the scale of the deployment or whether it is a commercial or demonstration project (DECC 2011). Usually during the pre-application consultation phase, developers will be made aware of the need to discuss their decommissioning plan with the DECC. When a developer has obtained one or more of the required consents (e.g. a marine licence), the Secretary of State will issue a notice requiring the developer to submit a decommissioning programme. This will be drafted by the developer and contain information about what parts and how the project will be decommissioned, an EIA/Habitats Regulations Assessment if necessary and measures to mitigate impacts on the marine environment, stakeholder consultation, anticipated costs and financial security, seabed clearance, and any necessary post-decommissioning monitoring. To align with international law, particularly the Law of the Sea Convention, IMO standards, and the OSPAR Convention, there is a presumption in favour of complete removal of the installation. Exceptions may also be considered under extenuating circumstances, such as unacceptable risk to human safety or the marine environment (DECC 2011). Each administration of the UK is dealt with separately below.

The Marine Policy Statement covers a host of aspects relevant to the implementation of marine planning in the UK. Specifically, Section 2.3.1.6 states that "Marine Plans should provide for continued, as well as new, uses and developments in appropriate locations. They should identify how the potential impacts of activities will be managed, including cumulative effects. Close working across plan boundaries will enable the marine plan authority to take account of the cumulative effects of activities at plan boundaries. The consideration of cumulative effects alongside other evidence may enable limits or targets for the area to be determined in the marine plan, if it is appropriate to do so" (HM Government 2011). In practice, cumulative impacts are more difficult to quantify because there can be a lack of appropriate data; however, the process of developing marine plans on a regional basis has enabled the collection of additional data as well as comprehensive stakeholder input, which in turn identifies areas that are either sensitive to cumulative impacts or areas that are currently very busy. At the industry level, the largest

renewable energy trade association in the UK, RenewableUK, has issued guidelines on cumulative impact assessment for offshore wind farms. The development of guidelines was driven by delays—up to 42 months—experienced in the consenting process for offshore wind farms (RenewableUK 2013).

A strong focus has been placed on engaging with stakeholders during marine plan development. This is intended to give those tasked with writing the plan a greater depth of knowledge about the region in question, but it also seeks to decrease the likelihood of conflicts between different marine sectors in UK waters, which have been known to occur previously. The process of marine planning aims to work through conflict and maintain stakeholder engagement throughout the process. Provision of information is also a key part of the process, and most of the devolved administrations have their own approaches to addressing this (see below). The Marine Policy Statement and the approach taken by those writing the marine plans are guided by the high-level marine objectives (HM Government 2009) that mirror the full range of the UK Government and devolved administrations' marine policies rather than the priorities of any one government department. The marine plans are there to aid decision-makers during the licence application process, at an operational level. It should be noted that according to the Marine Policy Statement, in England and Wales, consents for Nationally Significant Infrastructure Projects (NSIPs), including the larger offshore renewable energy and port developments, must be determined in accordance with the UK Planning Act 2008.

England

The Marine and Coastal Access Act 2009 (MCAA) provides a legal framework for marine planning and the creation of the Marine Management Organisation (MMO), which is responsible for marine planning in English inshore and offshore areas. The boundaries of English marine plan areas were identified after receiving stakeholder and expert input and resulted in 11 plan areas and 10 marine plans (in the north-west, one marine plan covers both the inshore and the offshore regions). In each marine plan region, the priorities and directions for future development within the plan area are outlined and this information is used to inform marine users about the more suitable locations for their activities and where new developments may be sited. The Marine Policy Statement states that marine plans should take account of and identify potential areas for the deployment of different renewable energy technologies (HM Government 2011). At this time, offshore wind is more commercially mature than wave or tidal technologies, and accordingly, it features most prominently in the published marine plans for English waters. In the East Inshore and East Offshore Marine Plans, for example, offshore wind is considered to be one of two transformational sectors over the 20-year vision of the plan, and therefore, there are two dedicated wind policies within the plan area (DEFRA 2014).

The MMO's marine planning team has engaged the public through workshops and public consultation throughout the planning process. For each plan area, a

Statement of Public Participation describing how and when the MMO would provide people with opportunities to get involved in the preparation of marine plans for areas in which they live, work, or have an interest, and how this information is then used, has to be produced in a dedicated report. Information about current marine uses and activities is presented in a Marine Information System[12] (MIS), developed by the MMO, as an interactive Web-based GIS tool to aid implementation and use of adopted marine plans. The evidence base for marine planning is also available via a Marine Planning Portal[13] that is used throughout the plan development process. Both of these tools have been created to increase awareness and support for the marine plans and their development. The Crown Estate also has a decision-support system called Marine Resource System (MaRS),[14] which is GIS-based and can be used to identify areas suitable for offshore energy development based on a number of spatial data sets that have been incorporated into the system. The latter is currently offline to facilitate a planned redevelopment of the system, which can then be used for Round 3 developers and future customers.

MRE projects are primarily consented under the provisions of the Planning Act 2008 and Marine and Coastal Access Act 2009. This varies according to the overall capacity to be generated by the MRE installations. Projects over 100 MW capacity are considered NSIPs and require consent under the Planning Act 2008. NSIPs must be approved by the Planning Inspectorate in a six-stage process. First, there is a pre-application consultation during which the Planning Inspectorate screens and scopes the project and the applicant consults with other relevant statutory consultees, local authorities, communities, or any affected person. After this consultation, the Planning Inspectorate will accept or refuse the project in principle. If the Planning Inspectorate accepts the project, they have 28 days to decide whether the application meets the application standards and consultation requirements before progressing to examination. Prior to examination, public notices must be published by the developer to enable all interested parties to register for involvement in the examination process. During the examination phase, an inspector or panel of inspectors is appointed as an examining authority who then examines the application, in accordance with the Marine Policy Statement, for a period of up to six months. During this period, the examining authority will prepare recommendations for the Secretary of State. The Secretary of State then has three months to issue a decision on the proposal. Post-decision, there is a six-week period during which the decision can be legally challenged in the High Court. Under Sections 98 and 107 of the Planning Act, the total process from the examination to determination phases should not exceed nine months.

The Planning Act 2008 attempted to streamline the consenting process because the development consent granted under it now replaces the previous consents required under Section 36 of the Electricity Act 1989, planning permissions, and

[12] http://mis.marinemanagement.org.uk/.

[13] https://planningportal.marinemanagement.org.uk/.

[14] http://www.thecrownestate.co.uk/mars-portal-notice/.

related environmental approvals (Planning Act, Section 33). Consents or permissions related to navigation risks, safety zones, and the statutory decommissioning scheme are required from the DECC. Projects under 100 MW capacity are subject to the provisions of the Marine and Coastal Access Act 2009 and are administered by the MMO in English waters. The MCAA consolidated six consents into one marine licence. The pre-application stage of the process can be completed online, and applicants can request screening and scoping opinions as well as reviews of their Environmental Statement (ES, the term used in UK law). The MMO will decide whether an EIA is required based on the individual case, consultation with the applicant, and criteria specified in Annex 2 of the Marine Works (EIA) Regulations 2007 or Schedule II of the Electricity Act (EIA) (England and Wales) Regulations 2000. When a full EIA is requested, the applicant must submit an ES incorporating the information set forth in Schedule 3 of the Marine Works (EIA) Regulations 2007. At this stage, the applicant will also submit a Section 36 Electricity Act application form, a Marine Licence application form, the ES, and/or an assessment under the Habitats Regulations (to comply with EU Habitats Directive provisions) online. Unlike other countries, the MMO manages consultation with other public authorities, agencies, and interested parties before providing a final decision. One possible weakness of the MCAA process is that there is no defined time frame for making a final decision though DEFRA guidance contains estimated timescales for dealing with each aspect of a marine licence application (DEFRA 2011).

Wales

The Welsh Government is currently developing the Welsh National Marine Plan (WNMP), which will cover Welsh inshore and offshore waters in a single plan. Public consultation on a proposed approach to marine planning in Wales was conducted during the first quarter of 2011 (Welsh Assembly Government 2011). Two central aims of the WNMP are to promote suitable marine opportunities and to sustainably manage existing and future marine activities. The WNMP will also provide a policy framework for informing marine licensing decisions. A range of supporting work has been conducted in support of plan development. A Strategic Scoping Exercise was carried out to review and analyse the available evidence for Welsh waters (Welsh Government 2015), and a number of research projects to fill specific evidence gaps, such as those related to aquaculture, seascapes, and recreational fishing, have also been commissioned (Welsh Government 2015). A dedicated portal for marine data and information has also been developed as part of this process.[15]

Projects over 100 MW in the Welsh territorial sea and the EEZ are processed according to the NSIP scheme, outlined in the England section (above).

[15]See http://lle.gov.wales/apps/marineportal/#lat=52.5145&lon=-3.9111&z=8.

Responsibilities for consenting MRE projects under 100 MW in Welsh inshore waters (up to 12 nautical miles) are devolved to the Welsh Ministers. The operation of marine licensing was delegated to Natural Resources Wales in April 2013. Because Natural Resources Wales follows the scheme prescribed in the Marine and Coastal Access Act 2009, it operates in a way similar to that outlined for England but with a different competent authority. The Marine Licensing Team in Natural Resources Wales acts as a one-stop shop for marine licensing and is also responsible for EIA and Habitats Regulations Assessment aspects. Like in England, developers of small-scale projects must already have a seabed lease from The Crown Estate. Consents related to navigational safety and decommissioning remain the responsibility of the DECC. Developments that necessitate onshore work may require terrestrial planning permission under the Town & Country Planning legislation, administered by adjoining local authorities.

Scotland

The Marine (Scotland) Act was enacted in 2010 and is similar to the MCAA in that it provides for marine planning and licensing, marine conservation, seal conservation, and enforcement. A new marine management authority for Scottish waters, Marine Scotland, was also created under the Act. Its Marine Licensing Operations Team (MS-LOT) is responsible for all marine licensing functions. A National Marine Plan (NMP) for Scotland was adopted on 25 March 2015 and laid before Parliament on 27 March 2015 (The Scottish Government 2015a). It is a wide-ranging document that covers all current Scottish marine sectors and includes overarching environmental objectives such as those contained in the EU's Marine Strategy Framework Directive. The NMP is accompanied by an interactive Website where Marine Scotland hosts all of its data.[16] The high-level marine objectives of the plan are to achieve a sustainable marine economy; to ensure a strong, healthy and just society; to live within environmental limits; to promote good governance; and to use sound science responsibly (The Scottish Government 2015b). The plan also outlines key objectives for the offshore wind and ocean energy sectors in Scotland, spanning planning and licensing aspects as well as maximising benefits from development of the sector at regional level (Scottish Government 2015b). The NMP will be supported by regional marine plans covering 11 marine regions as far as the territorial sea limit (12 nautical miles). The regional marine plans will be developed by local Marine Planning Partnerships that include representatives from local authorities, inshore fisheries groups, and local coastal partnerships. The Marine Planning Partnerships have delegated powers from Scottish Ministers, and the plans developed will reflect local issues and needs in each region. The partnerships do not have consenting or licensing powers. The first two regional plans

[16]See http://www.gov.scot/Topics/marine/seamanagement/nmpihome.

will cover the Shetland Isles and Clyde area.[17] To complement the NMP and regional plans, sectoral marine plans for offshore wind, wave, and tidal energy sources have also been published and built upon to create separate Regional Locational Guidance documents for offshore wind, wave, and tidal energy (The Scottish Government 2012a, b, and c, respectively).

Any gaps identified during the processes listed above have informed the prioritisation of research and consequently wider national marine planning. To date, work has focused on the uncertainties related to interactions between wave and tidal energy and the marine environment, including potential impacts of MRE on seabirds, marine mammals and habitats, as well as generic research into the potential effects of devices on the marine environment. A dedicated Marine Mammal Scientific Support Research Programme focuses on marine mammal interactions with MRE devices, unexplained seal deaths, and the decline in common seal numbers—the results of which will inform Scottish marine policy and wider marine mammal management and conservation (The Scottish Government 2012d). Marine Scotland has been innovative in licensing offshore energy projects by implementing a risk-based approach through its "Survey, Deploy and Monitor" policy (The Scottish Government 2016b). This approach informs site characterisation survey requirements in the pre-consenting period by enabling EIA requirements to be adjusted at the scoping stage, thereby potentially reducing the burden of collecting survey data to inform EIAs on small-scale projects or projects of low environmental risk. The duration of site characterisation surveys and the level of monitoring are determined by the overall risk profile of the project, based on the environmental sensitivities of the area, the scale of development, and the specificities of the device. These factors are scored and combined to provide an overall risk profile expressed as low, medium, or high. Two years of site characterisation data are required for projects that score "high", whereas for a project with a "medium" score, 2 years of data may also be requested, but monitoring requirements may be relaxed by Marine Scotland on the basis of the monitoring results. Small-scale projects located in areas of low environmental sensitivities may require only 1 year of site characterisation data.

Under the provisions of the Marine (Scotland) Act, offshore licensing is devolved to the Scottish Ministers in Scottish inshore waters (up to 12 nautical miles) and offshore waters (12–200 nautical miles). MS-LOT acts as a one-stop shop for all aspects of marine licensing. With respect to MRE, prospective developers must firstly apply for a marine licence to occupy part of the Scottish marine area (territorial sea). Consent under Section 36 of the Electricity Act 1989 is required for the construction and operation of offshore generating stations that have an overall capacity higher than 1 MW but lower than 50 MW in Scottish waters. Like in England and Wales, the need for an EIA is decided on a case-by-case basis. Additional requirements such as a Habitats Regulations Assessment (Appropriate Assessment under the Habitats Directive) are also administered by Marine Scotland where projects are likely to affect certain species or habitats included in the Habitats

[17]See http://www.gov.scot/Topics/marine/seamanagement/regional.

Directive. The nine-stage procedure to be followed is broadly similar to that of England and Wales:

- pre-screening consultation with MS-LOT;
- environmental screening and scoping;
- consultation on screening and scoping, managed by MS-LOT;
- preparation of documents and pre-application;
- MS-LOT gate checking of documentation;
- submission of applications;
- consultation stage;
- determination [of consent]; and
- monitoring and post-consent actions.

MS-LOT manages consultation with statutory and non-statutory consultees to determine whether an EIA and/or AA is required.

If an EIA or AA is required, the developer may request a formal scoping opinion by submitting a scoping report to Marine Scotland along with a cover letter. MS-LOT will then issue a copy of the scoping report to each of the statutory and non-statutory consultees with a cover letter and advise them of a three-week consultation period. Subsequent to this period, MS-LOT will issue a formal scoping opinion. Under the EIA Regulations, a scoping opinion must be provided in nine weeks. After the screening and scoping stage, the pre-application phase begins with the applicant preparing all of the relevant documents, public notices, and application forms. The ES, a non-technical summary of the Marine Licence application form, the Section 36 licence application form, and other required documents must go through a three-week gate-checking process whereby MS-LOT confirms whether all of the documentation fulfils the requirements of the legislation. If no issues arise, the developer can then submit a formal application, pay the application fee, and publish the public notices. MS-LOT will proceed to administer the application and consultation procedures. According to the Licensing Manual, applications for marine licences only should be dealt with in 8–12 weeks, upon receipt of payment, and provided there are no objections or complex issues (The Scottish Government 2012e). Marine Scotland aims to make a decision on Section 36 applications within nine months of receipt of the application. The timescales for decision-making may vary if developers are requested to provide additional information during the consultation stage, because this will require further consultation and public notices. If an application is refused, MS-LOT will explain the reasons for refusal to the developer and provide advice about a way forward and a new submission, if applicable. Consents granted by MS-LOT may be accompanied by various terms and conditions that are enforceable by MS-LOT, which has statutory power to ensure compliance (The Scottish Government 2012e). One obligation is for developers to submit regular monitoring results, which may result in a change to subsequent monitoring programmes.

Northern Ireland

The Marine (Northern Ireland) Act entered into force in 2013 and has a structure similar to those outlined above. The Act covers the Northern Ireland inshore region, marine conservation zones, and reform of marine licensing for certain electricity work. The Northern Ireland inshore region is defined as the territorial sea and the seabed adjacent to Northern Ireland out to 12 nautical miles, though jurisdictional issues in the border bays with the Republic of Ireland persist. In those areas, a separate North South Implementation Body, the Foyle Carlingford and Irish Lights Commission, has responsibility for promoting and developing both Loughs for commercial and recreational purposes related to marine, fishery, and aquaculture matters. The Northern Ireland Department of Agriculture, Environment, and Rural Affairs (DAERA, formerly the Department of Environment) is the competent authority for MSP and is continuing to work on the Northern Ireland Marine Plan. The plan will cover the Northern Ireland inshore region, out to 12 nautical miles, and the offshore region, beyond 12 nautical miles, in a single document. The Marine Plan Team published a Statement of Public Participation in June 2012, which was subsequently reviewed and updated in May 2013 (DOENI 2013). The draft marine plan is currently undergoing a Sustainability Appraisal, and once this has been completed, both will be issued for public consultation, subject to Northern Ireland Executive and Secretary of State for the Environment approvals, because the draft marine plan includes reserved matters (DAERA 2015).

The Marine and Fisheries Division of DAERA carries out licensing and enforcement functions in Northern Ireland territorial waters, under Part 4 of the Marine and Coastal Access Act 2009. The process follows a similar format to that of Scotland, England, and Wales and consists of the following stages:

- pre-screening consultation with the Marine and Fisheries Division;
- formal EIA screening and scoping (if applicable);
- Habitats Regulations Assessment screening and submission (if applicable);
- preparation of documentation, e.g. ES;
- formal application;
- consultation, feedback, and mediation;
- licence determination and issuing of licence(s) (if needed);
- management of returns, e.g. monitoring reports; and
- decommissioning (if required).

Applicants may request a screening opinion under the Marine Works (EIA) Regulations 2007 (as amended) to determine whether an EIA is required. At this stage, the Marine and Fisheries Division will consult with whomever it deems appropriate before issuing a screening opinion. Consultees are allowed one month (28 days) to respond. Once that decision is made, it will be communicated to the applicant and other relevant consultees and it will appear on the Marine and Fisheries Division's public register. The same procedure and timelines apply to scoping. After screening and scoping, an applicant can make a formal application

for a marine licence. No statutorily defined time frames exist for processing an application, but there is a policy target of processing the application within four months of having received all of the necessary information (DAERA 2016). The consultation phase of the consenting process is managed by the Marine and Fisheries Division. This includes ensuring that the applicant addresses the concerns raised by the stakeholders.

The electrical elements of an MRE project are consented under Section 39 of the Electricity (Northern Ireland) Order. Section 39 consents are granted by the Department for the Economy (formerly the Department of Enterprise, Trade and Investment [DETI]) for offshore generating stations whose capacity exceeds 1 MW. Under the Marine Act (Northern Ireland) 2013, Marine Licences and Section 39 consents can be dealt with simultaneously. If an MRE development requires the construction of onshore works, these may require planning permission. Responsibility for terrestrial works is shared by the Department for Infrastructure and 11 local authorities (Councils). If a development is deemed to be regionally significant, an application can be made directly to the Department for Infrastructure which is responsible for regional development, regionally significant projects, and planning legislation. In some instances, all three consents (marine licence, Section 39 Electricity Order consent, and planning permission) will require the submission of an ES. Prior to Government reorganisation in May 2016, a memorandum of understanding between the DOENI (now DAERA) and DETI (now Department for the Economy) had created a framework for streamlining planning, licensing, and consent application processes, which allowed for the submission of a single ES for all three consents. Prior to any form of new MRE project, the developer must already have a seabed lease from The Crown Estate. Two 100 MW tidal energy projects are currently in an advanced planning stage, having already secured development rights from The Crown Estate in 2012.

United States of America

In the USA, the term marine and hydrokinetic (MHK) energy is used more commonly than MRE. Consenting of projects in the USA is largely determined by location, according to the separation of powers between state and federal authorities and jurisdictions. This has created difficulties for the implementation of a national MSP system. Given the diverse range of political barriers and the multi-jurisdictional and sector-specific nature of jurisdictions over marine space, a comprehensive, country-wide, and prescriptive approach to MSP is probably unrealistic. To date, efforts have focused primarily on coordinating activities between states and federal agencies and promoting greater consistency in their respective endeavours. An Executive Order from the Office of the President led to the release of the National Ocean Policy (NOP) Implementation Plan in 2013 (National Ocean Council 2013). This plan describes particular actions that federal agencies will take to address key ocean challenges. The NOP divided the USA into nine regions and encouraged the

creation of a Regional Planning Body (RPB), composed of the federal, state, local, and Native American Tribal representatives from that area. These bodies are supported in each region by staff from the National Oceanic and Atmospheric Administration (NOAA) in an effort to place science at the centre of marine planning processes and resultant decision-making. Each RPB is in a different stage in implementing marine planning.[18] It should be noted that the RPB has no regulatory authority; federal and state agencies retain these responsibilities.

The Bureau of Ocean Energy Management (BOEM), under the aegis of the US Department of the Interior, is the federal agency responsible for regulating MRE development on the Outer Continental Shelf (OCS, 3–200 nautical miles offshore) and issuing leases for energy development. BOEM has been instrumental in the creation of State-level Renewable Energy Task Forces. The Task Forces can coordinate local, State, and federal efforts to explore and enable MRE development. So far, Task Forces are operational all along the East Coast and in Oregon, California, and Hawaii.[19] In some areas, their work has resulted in the identification of potential Wind Energy Areas, which can later form a BOEM lease area. Independently of this process, many states are also using MSP to guide marine activities and conservation. Washington, Oregon, California, Rhode Island, and Massachusetts had developed state-level marine plans, prior to the publication of the NOP. Washington State completed its first round of MSP in 2013. This effort incorporated data and capacity analysis, education and outreach, creation of data management and display tools, and stakeholder meetings. Though the Washington State Legislature endorsed continued funding for marine and coastal planning activities ($3.7 million USD for the current biennium starting July 1, 2013), state actions have currently stalled as state agencies and the Governor determine a path forward (Van Cleve and Geerlofs 2013).

Though some states (e.g. Massachusetts) are moving towards the designation of specific zones for MRE development, such activity will have to coexist with already established marine uses and the legal protections they might have. National Marine Sanctuaries, for example, are created by statute under the Ocean Sanctuaries Act, as amended, and prohibit activities that would alter the seabed or subsoil or potentially affect environmental conditions within the sanctuary. Shipping lanes and marine protected areas also tend to be excluded from project development activities. Areas identified and used by the Department of Defense may make development at those sites more difficult or at least require an additional level of consultation before any lease could be issued. In Massachusetts, siting and development standards for special, sensitive, or unique (SSU) marine and estuarine life and habitat and for commercial fishing, recreational fishing, and areas of concentrated recreational activity "direct development away from high-value resources and concentrations of existing water-dependent uses" (Commonwealth of Massachusetts 2015).

[18]Links to all regional bodies and their plans can be found on http://cmsp.noaa.gov/activities/index.html.

[19]See http://www.boem.gov/Renewable-Energy-State-Activities/.

Within SSU areas, the Massachusetts plan adopts a precautionary set of standards. Johnson (2014) states that the permitting agency "shall presume that the location of a project outside an SSU area represents a less environmentally damaging practicable alternative than a location within an SSU area". Conflicts experienced to date have tended to materialise when incumbent ocean users or agencies perceive risks to their interests as a result of proposed new uses or protection of ocean resources. The primary solution to address such conflicts has been negotiation between the (potentially) affected stakeholders and the responsible state or federal authorities, depending on the activity concerned.

The Federal Energy Regulatory Commission (FERC) exercises regulatory jurisdiction over MRE projects on navigable waters within 3 nautical miles of the shore and on any projects with an onshore grid connection under an amendment to the Federal Power Act. FERC powers do not extend to OTEC projects, which are under the remit of NOAA following the provisions of the OTEC Act 1980. Due to the fact that the USA has not signed the United Nations Law of the Sea Convention, its definition and interpretation of the term "continental shelf" is different than elsewhere and is understood to include all submerged lands, subsoil, and seabed between the seaward extent of the states' jurisdiction, usually 3 nautical miles, to the limit of federal jurisdiction of 200 nautical miles. In effect, this means that BOEM is responsible for granting the lease if a project located on the OCS produces, transmits, or transports energy and incorporates the temporary or permanent attachment of a structure or device to the seabed. The construction and operation of an MRE device on the OCS will also require a licence from FERC. In an effort to clarify the complex jurisdictional issues that surround authority and responsibilities in marine areas, FERC and BOEM published wide-ranging Guidelines on Regulation of Marine and Hydrokinetic Energy Projects on the OCS in 2012 (BOEM/FERC 2012).

Under the Guidelines, three types of leases can be granted by BOEM for MHK projects (BOEM/FERC 2012):

1. A commercial lease is required for a commercial project.
2. A research lease is issued to federal agencies or states only for renewable energy research activities that support the future production, transportation, or transmission of renewable energy.
3. A limited lease applies to projects of limited scope, normally where the activities associated with project are limited to 5 years and the power generated by the project is also restricted (e.g. 5 MW), both of which are specified in the terms and conditions attached to the lease.

BOEM often assists states in the development of their MRE resource, through specific development proposals and the Task Forces established for that purpose. All lease applications submitted to BOEM are considered on a case-by-case basis but in collaboration with other regulatory and state agencies. A project can be developed with a BOEM lease and without a FERC licence if the technology is experimental, the deployment is temporary, or where it is for educational purposes

and the power generated is not transmitted to the grid. In circumstances outside of these, FERC has the power to grant licence waivers or exemptions. To come under an exemption, a project must be small, short-term, located outside a sensitive area (in FERC's own opinion), removable and capable of shut down at short notice, removed before the end of the licence period, and initiated by a draft application with relevant supporting environmental information capable of analysis by FERC (BOEM/FERC 2012).

Leasing occurs via competitive rounds initiated by BOEM and developers can then respond. Alternatively, a developer can submit an unsolicited application to BOEM stating their interest in obtaining a lease for a specific OCS location, outlining the area concerned, the project proposed, and available resource and environmental data. Applicants must demonstrate that they are qualified to hold a lease in compliance with the Code of Federal Regulations. If there are no competing applications, the developer will then be requested to provide a Site Assessment Plan detailing environmental surveys and resource assessment studies to support the planned project (BOEM/FERC 2012). This does not apply if the proposed project does not involve the installation of bottom-founded facilities. Once a developer has concluded the required documentation and made payment, BOEM will issue a lease to the successful developer. A finalised Site Assessment Plan must be submitted within six months of receiving the lease. The lease does not extend to generation of power, which can only occur once a FERC licence has been obtained. The guidelines specify that the applications for a BOEM lease and FERC licence can be made together, but this is dependent on the type of licence concerned and whether the project is in response to a competitive leasing round or is an unsolicited application.

FERC licensing may follow one of three different forms: an Integrated Licensing Process (ILP), a Traditional Licensing Process, or an Alternative Licensing Process (ALP) (BOEM/FERC 2012). The ILP is the most common process and involves a pre-application stage, during which any necessary studies are conducted and a licence application is prepared, and a post-application stage, when the application is reviewed, an environmental document is compiled, and a decision about licensing is made. FERC coordinates the input of stakeholders during various stages of the process. The process may take up to 2.5 years when in response to a competitive leasing round. Unsolicited applications usually take less time, but this depends on the complexity of the proposed project. FERC licence applications take approximately 1 year, but again this can vary according to the licence type and area concerned. Pilot project licences from FERC take 6 months from the date of submission of the application. The lifespan of the BOEM lease also varies by type: commercial leases are generally issued for 25 years and limited leases for 5 years. Research leases are decided on a case-by-case basis through negotiation with BOEM personnel, federal, or state agencies. FERC licences can be issued for up to 50 years, which can be extended for a further 30–50 years. Pilot licences from FERC tend to be granted for a 5-year period given the early stage of the technology and the scale of the deployment. The BOEM/FERC (2012) guidelines include hybrid projects that are defined as projects that include technologies that generate electricity from more than one form of renewable energy, one of which is a MHK

technology (e.g. wind- and wave-generation) under the same lease. Such projects require both a BOEM lease and a FERC licence.

Projects that straddle the boundary dividing state waters and OCS waters are also covered by the guidelines. In these situations, a developer is required to obtain a lease from BOEM for the OCS part of the project and a licence from FERC for both the OCS and state waters parts. In such cases, FERC prefers to administer the project as one complete project, which is feasible provided the developer consults with FERC, BOEM, the adjoining state authorities, and stakeholders at a sufficiently early stage of the project planning process. When a structure is to be deployed in navigable waters, an authorisation from the US Army Corps of Engineers is required under the Section 10 of the Rivers and Harbors Appropriations Act. If the laying of seabed cables and anchors requires dredging, a permit under the Clean Water Act (Section 404) may be necessary. Any devices that have the potential to obstruct navigation must be clearly marked by navigational aids, but these require a Private Aid to Navigation Permit administered by the US Coast Guard under Title 33 of the Code of Federal Regulations Part 66 (33 CFR Part 66).

With respect to environmental effects, the regulatory framework is also intricate. The National Environmental Policy Act (NEPA) provides a framework for identifying and assessing environmental effects. Under NEPA, the federal agency will first determine whether the project can be excluded from a comprehensive environmental review, termed a "categorical exclusion" (CX).[20] If this is not the case, then an EA will be prepared by the federal agency. The EA document will contain sufficient information to conclude whether an EIS is necessary. If no significant effects are identified during the EA, a Finding of No Significant Impact will be made by federal agency officials coupled with the appropriate supporting documentation. If significant environmental impacts are anticipated, an EIS will be produced with the assistance of other regulatory agencies and stakeholders. A range of additional regulatory authorities may be involved at this stage, each operating under its own governing legislation specific to a range of topics. Specifically, these cover impacts on endangered species and habitats (Endangered Species Act), marine mammals (Marine Mammal Protection Act), migratory birds (Migratory Bird Treaty Act), fisheries and fish habitats (Magnuson-Stevens Fishery Conservation Act), and historic resources (National Historic Preservation Act). The effects on air and water and state coastal zone management policies are also governed by separate legislative instruments.

Given the range of regulatory agencies and topics to be considered prior to project approval, the availability of data and information is a central consideration in MRE development. There are a host of state initiatives for data provision. At the federal level, marine data can be found in a dedicated Marine Cadastre,[21] developed

[20]Broadly equivalent to the "screening" stage in the EU.

[21]See http://marinecadastre.gov/, an integrated marine information system that provides data, tools, and technical support for ocean and Great Lakes planning. It was designed specifically to support renewable energy siting on the US Outer Continental Shelf but is also used for other ocean-related efforts.

in partnership between NOAA's Office for Coastal Management and BOEM. GIS-based tools are favoured and have been developed by federal and state agencies in an effort to provide tools that can handle complexity, uncertainty, and temporal data more effectively. The US Department of Energy, NOAA, and the BOEM funded a team comprising Parametrix, Oregon State University, Robust Decisions, and The Nature Conservancy to develop a tool using Bayesian logic, called a Bayesian Analysis of Spatial Siting (BASS). BASS can integrate disparate data in a manner such that the uncertainty of the data is known and the user can see the risks associated with making certain decisions. The BASS tool is building on a previous Oregon Wave Energy Trust effort involving many of the same partners to assess cumulative effects, potential impacts, and benefits of various MRE scenarios (Van Cleve and Geerlofs 2013). BOEM has also published a range of guidance documents on different types of environmental information including spatial data for site characterisation; avian survey information; geological, geophysical, and hazard information; fisheries survey information; benthic habitat information; and marine mammal and sea turtle information.[22]

A small number of open-water test centres are currently under development in US waters, including the Pacific Marine Energy Centre–South Energy Test Site (PMEC-SETS) and the Hawaii Wave Energy Test Site, operated by the US Navy. It is unlikely that these will be pre-consented because there does not appear to be any provision in US law to facilitate such a process. Commercial-scale projects are planned but not yet functioning. Decommissioning of MRE installations is not yet an issue; however, these aspects are governed by 30 CFR Part 285, which provides that all facilities, including pipelines, cables, and other structures and obstructions must be removed once they are no longer operational. Removal must occur no later than 2 years after the termination of the related lease (30 CFR 285.902). This could be problematic in the future for large projects because the 2-year time frame applies regardless of the size of the project (Kaiser and Snyder 2010). According to Section 6.2 of the BOEM/FERC guidelines (2012), developers are required to provide a decommissioning bond or other acceptable form of financial assurance as part of their BOEM lease and/or FERC licence. Under the terms of a commercial lease, a developer must submit a Construction and Operations Plan (COP) for OCS renewable energy activities under 30 CFR Part 585. The COP describes all of the facilities that are constructed and used for the project, including a conceptual decommissioning plan for each of the planned elements, including onshore and support facilities (US Department of the Interior 2016).

[22]See http://www.boem.gov/National-and-Regional-Guidelines-for-Renewable-Energy-Activities/.

Conclusions

Based on the descriptions of the countries' practices described in the previous sections, it is evident that approaches to MSP are at the very nascent stage of development and implementation. This makes a comprehensive analysis of its impact on the future planning and existing management of MRE projects difficult to state with any kind of certainty. From the information obtained from questionnaire respondents, and also from documentary sources, it appears that great hopes still persist about how MSP could improve planning and management of marine energy developments, and how it could enable more integrated and cohesive marine governance. Like the "developing" status of MSP, MRE can also be described as "developing" in the majority of nations included in this chapter. There are some obvious leaders in terms of commercial-scale development, but for a significant proportion of the countries considered, the presence of MRE devices in waters is almost exclusively limited to projects related to research, further testing, and refinement of technologies. In certain countries, there is little demand for marine space, so MRE development and implementation of MSP are low on the political agenda. The status of the MRE sector can mean that regulatory authorities are not yet overly concerned with the operation of their consenting system. In some jurisdictions, the need for a process for approving the deployment of an ocean energy device has yet to arise. Conversely, countries in which the MRE resource has been mapped and quantified are more likely to have sectoral policy objectives for this emerging sector, and the preparation of those policies often raises awareness of the need to streamline consenting processes or develop new systems.

Jurisdictional boundaries in sea spaces appear to be a key factor that is determining how consenting operates in practice: different zones are subject to different legal instruments and the substance of those instruments is often administered by different authorities responsible for different jurisdictional zones. In the USA, for example, authority for the regulation of ocean space is fragmented and spread across a number of state and federal agencies, divided both spatially and by sector. MRE developments incorporate a wide variety of regulated activities, and accordingly, it is somewhat inevitable that the consenting system governing such development is convoluted and ad hoc in many places. The number and types of different consents required make it difficult to streamline efforts under either one consent or one administrator. The number of regulatory authorities with a marine remit and the levels of interaction and communication between them is a key concern within the MRE developer community internationally. One possible impact of this is uncertainty for the developer and their investors, but at a societal level, it could have weighty implications for achievement of goals related to greater renewable energy production, more efficiency, and cost reduction (Dubbs et al. 2013). The UK, Norway, and parts of Canada have endeavoured to address the issues of multiple consents and authorities through the enactment of legislation that either reforms marine management completely or addresses ocean energy specifically. In some cases, this might be the most preferable option, but for the majority

of countries, it could be regarded as an extreme solution that would require considerable political commitment as well as human and financial resources.

Most land use decisions are devolved to local decision-makers, and certain actors question how a more centralised approach to MSP could affect the ability of local authorities and communities to influence how coastal and marine spaces are used. Despite MSP being advocated as a process that is participatory and stakeholder-driven, currently it is difficult to identify successful examples of MSP at a national scale, given the varying stages of MSP implementation. The reality of the land–sea divide presents a challenge not only to those trying to develop projects in a specific marine space, but also to those trying to better integrate and implement strategic marine governance and the processes it entails. Existing planning and management systems might apply to land only or extend to coastal plans that have a narrow geographical scope, maybe 1 mile from the shoreline. In countries that have no formalised approach to MSP, coastal and regional planning tools are cited as providing a sufficient basis for strategic planning. MSP is perceived to be a tool that can bring land and sea planning systems closer together, but this is very much dependent on how a country chooses to implement MSP. Existing examples tend to consist of a high-level national plan under which objectives pertaining to the important maritime sectors taking priority. In some instances, this has led to criticism of the marine plans developed—opponents say MSP is too focused on economic development and that it ignores environmental and social objectives, whilst advocates are delighted that their sector features in a strategic policy. Whilst the legal basis for harnessing MRE is well established, the procedures involved are multifaceted and often challenging. It is probable that this situation will change as the number of operational MRE projects increases, but in the short-term efforts should concentrate on delivering a process that is both effective and proportionate to the types of development that are presently being installed, namely small-scale, time-limited deployments.

Whilst MSP is intended to deliver sustainable development through the definition of economic, social, and environmental objectives, the material presented in this chapter would suggest that the extent to which this is reflected in existing systems varies by location. In countries such as Canada, Norway, and parts of the UK, MSP processes are founded on a strong environmental component with a concerted effort to plan future activities around the physical realities of their particular marine space. This helps to sustain an environmental focus in MSP as implementation progresses. In consenting processes applicable to MRE developments, the environment is considered formally through the EIA process and to a lesser extent in the SEA, the latter not always being applied to MRE plans and programmes as of yet. Where there are designated conservation sites, these can trigger additional assessment such as the Appropriate Assessment in the EU. The fact that environmental effects are considered only in an EIA may be problematic given the formulaic approach taken for conducting such assessments, which is becoming more apparent. There is little or no consistency in the methodologies applied to the study of specific parameters, which limits the ability to draw inferences, identify trends, and increase knowledge about environmental effects because

different methodologies may produce different results. Scientists need to be able to compare data and results across project sites to build knowledge, increase expertise, and thereby advance learning about these new technologies and the marine environment that can then be used in the development of MSP systems. For a new industrial sector like MRE, it is essential for regulators, developers, and the public more generally to understand the interactions of devices with the marine environment and vice versa. The level of understanding necessary cannot be delivered solely by EIAs and requires a more strategic approach to researching environmental effects as well as more robust monitoring programmes. In situations where consents have taken significant time to obtain, they delay can often be attributed to inadequate environmental information. Uncertainty surrounding actual effects is also a major issue and may be a result of a lack or poor level of knowledge about both the baseline conditions of the receiving environment and the impacts of technologies on each individual environmental receptor. In some instances, the key issue may be getting the scientific information to the decision- and policy-makers.

Not surprisingly, data to support MSP and site-level consenting are said to be frequently lacking in many of the countries examined herein. The scientific data needed to support planning of marine and coastal uses needs strengthening, and the data to support decisions on MRE projects appear to be limited to the availability of the physical resource. In parts of the UK, for example, insufficient data exist to enable an understanding of natural variability and interconnections coupled with changing pressures related to levels of human activities and climate change. Planning decisions, however, continue to be based on fixed lines on a map, and this cannot reflect physical, biological, and social realities. Cumulative impacts remain problematic with no agreed-upon methodology for how to address them using MSP or indeed decision-making systems. Lack of knowledge about interactions with the marine environment coupled with strongly sectoral-based management of marine activities has the potential to increase the likelihood of conflict between different sectors and within local communities. In all of the planning systems featured in this chapter, situations where conflicts have arisen have been dealt with on a case-by-case basis, with no prescribed process for such eventualities addressed in management frameworks. Acceptance of any form of development is neither automatic nor unconditional. Habitually, the involvement of the public in decision-making was almost totally limited to the consultation phase of the EIA process, which resulted in frustration amongst stakeholders in terms of both how they were involved in project planning and their ability to influence the outcome. The strong participatory feature of MSP seeks to limit the possibility of conflict by ensuring each sector is better understood by both other competing sectors and the public. It is also through efforts like this that opportunities for coexistence may be explored, but examples of these are exceptional currently. Zoning for specific marine uses is implemented in some countries, but does not appear to be a commonly used approach, particularly for MRE where dedicated zones are relatively rare. Restrictions to siting development do occur, particularly in areas of high conservation value and also in areas of military use.

At this juncture, arguably, MSP does not feature as prominently as expected in the planning and management of MRE. The implementation of MSP has been limited by technical, political, and resource aspects, which vary by country; yet its implementation could provide an opportunity to improve consenting of all forms of marine developments by increasing transparency and providing greater certainty for developers and their investors, regulators, and all stakeholders. The existing marine spatial plans and related coastal plans tend to focus on existing uses of marine spaces, giving with less consideration to new or innovative marine activities. There is an aspiration across all stakeholders for "good practice" examples of MSP and empirical evidence of how MSP has improved marine governance. In theory, MSP can balance precaution and risk to provide flexibility in decision-making but within a framework that is predicable, consistent, and transparent to those involved. The highly adaptive nature of MSP makes it an approach that is capable of responding to changing circumstances. As such, it should be ideal for the realities of the MRE sector where substantial development potential remains and a large amount of learning needs to occur. In conclusion, MSP offers a range of strengths and opportunities for MRE, but bringing MRE to fruition is entirely dependent on the approach taken to its implementation and enforcement in each country.

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