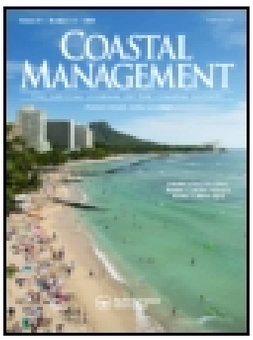

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Stakeholder Perspectives on the Value of Marine Spatial Planning Towards Advancing Offshore Wind in the U.S.

Kendra Ryan[a], Alison Bates[a], Morgan Gopnik[b], Andy Danylchuk[a], and Adrian Jordaan[a]

[a]Department of Environmental Conservation, University of Massachusetts Amherst, Amherst, MA, USA; [b]Department of Public Administration and Policy, American University, Washington, DC, USA

ABSTRACT

The United States contributes only 0.2% of the 18,814 MW of global installed offshore wind capacity. Lack of development has been attributed in part to a cumbersome regulatory process that includes the evaluation of environmental impacts. Assessments are based on biological, social, and technical data that are often incomplete. Marine spatial planning (MSP) may help fill data gaps. We conducted semi-structured interviews with key informants to understand (1) whether a lack of biological data impedes offshore wind environmental assessments, (2) whether MSP could mitigate these impediments, and (3) whether MSP could advance offshore wind development in the U.S. in other ways. Most informants stated that a lack of biological data in offshore wind environmental assessments was problematic due to incomplete data, uncertainty of data, and mismatched scales. Data issues may be mitigated by creation of data products and increased communication, outcomes of MSP that may benefit the regulatory process by increasing data availability, resolving conflicts among users, and providing a common operating picture. Challenges remain in integrating MSP into the processes of siting and permitting offshore wind, but it provides a strategic framework for the systematic identification, collection, collation, analyses, application, and management of data in the offshore wind environmental regulatory process.

KEYWORDS

environmental assessment; environmental impact statement; marine spatial planning; offshore wind; United States

Introduction

Offshore wind energy

International acknowledgement that climate change is a common concern has led nations to invest in renewable energy sources in order to hold the increase in global average temperature to $<2\,^{\circ}C$ above pre-industrial levels (United Nations 2015). Producing energy from renewable resources, including offshore wind, is one method to help reduce greenhouse gas emissions to achieve this temperature objective. As of 2017, offshore wind turbines contributed only 18,814 MW of global installed capacity (GWEC 2018), 0.8% of global renewable power capacity (REN21 2018), yet their potential is

CONTACT Kendra Ryan klryan@eco.umass.edu Department of Environmental Conservation, University of Massachusetts, Amherst, MA, USA

great as they take advantage of steady wind resources, high wind velocities, and proximity to coastal demand centers (Musial and Ram 2010). The National Renewable Energy Laboratory estimates that the U.S. offshore wind final net technical resource is 2,059 GW (Musial et al. 2016). Despite these benefits, to date the United States (U.S.) has installed only one offshore wind farm, consisting of five 6 MW turbines at Block Island, Rhode Island (Smythe and McCann 2018). Lack of development in the U.S. has been attributed to high capital costs, uncertain federal policy support, lack of manufacturing and supply chains, stakeholder resistance, and a cumbersome permitting process (Musial and Ram 2010; Van Cleve and Copping 2010; Tierney and Carpenter 2013; Navigant Consulting 2014; USDOE 2015).

The relative nascence of the offshore wind industry in the U.S. provides an opportunity for marine spatial planning (MSP) to be a valuable tool towards integrating with existing fabric of ocean uses and streamline siting and permitting, although MSP has not been comprehensively incorporated into offshore wind planning in the U.S. However, MSP would have to inform the current regulatory procedures for offshore wind development, including the evaluation of environmental impacts and broader issues concerning siting and public acceptance. The process involves impact assessments, which should be based on biological, social, and technical data as mandated by the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. §§4321–4370); however, biological data at appropriate spatial and temporal scales are lacking (Ryan, Danylchuk, and Jordaan in press), thus impeding environmental impact assessments (EIAs). Some experts have suggested that MSP might help fill data gaps, such as species abundance/distribution and potential impacts from technology, and help overcome other obstacles involved in the siting of offshore wind facilities. This leads to three questions addressed by this research: (1) does a lack of biological data impede EIAs for offshore wind? (2) could MSP help mitigate these impediments?, and (3) could MSP help advance offshore wind in other ways?

U.S. Federal regulatory process for offshore wind development

The Energy Policy Act of 2005 authorized the Bureau of Ocean Energy Management (BOEM; formerly Minerals Management Service, MMS) to issue leases, easements, and rights of way for renewable energy development on the outer continental shelf (i.e., submerged lands under U.S. federal jurisdiction lying seaward of state waters, those from coastline seaward generally to 3 nm). The authorization process for offshore wind projects occurs over four phases: planning and analysis, leasing, site assessment, and construction/operation (USDOI BOEM 2015). Environmental reviews conducted during the planning/analysis and construction/operation phases are mandated by NEPA, which requires U.S. federal agencies to evaluate the adverse effects on environmental resources that may result from a major federal action. These reviews require extensive data, at appropriate spatial and temporal scales, that must be identified, assembled from various sources including published studies, numerical models, field studies, expert judgment, and traditional knowledge, then analyzed, shared, and applied. Proposed projects must also be reviewed by other state and federal agencies (e.g., U.S. Fish and Wildlife Service (FWS), National Oceanic and Atmospheric Administration (NOAA), U.S. Army Corps

of Engineers (USACE), Environmental Protection Agency (EPA), U.S. Coast Guard, Federal Aviation Administration (FAA)) to receive permits, certifications, leases, or consistency determinations. The review processes can be lengthy and costly, and require a site-specific rather than an ecosystem based planning approach.

In 2010, BOEM attempted to reduce the complexity of the application process through the "Smart from the Start" program. It established wind energy task forces composed of local, state, and federal partners who conducted cursory screenings to identify wind energy areas (WEA) on the outer continental shelf of the Atlantic coast that had the least conflict with other uses and the highest wind energy potential (Frulla, Hagerman, and Hallowell 2012). Development of WEAs under 'Smart from the Start' would not be categorized as MSP, as the process was not integrated across sectors or participatory with stakeholders, two characteristics commonly associated with effective MSP (Ehler and Douvere 2009).

Marine spatial planning

Many uses compete for ocean space, including commercial and recreational fishing, oil and gas exploration, offshore renewable energy production, marine protected areas, navigation channels, anchorages, military exercise areas, unexploded ordnance grounds, dredge and fill areas, and marine recreation. A vast, seemingly limitless space is quickly saturated with potentially conflicting uses, particularly on the more limited continental shelves. MSP has been described as "a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that are usually specified through a political process" (Ehler and Douvere 2009) and is implemented to attempt to minimize conflicts among competing uses.

Recognizing the potential benefits of MSP to coherently accommodate competing demands, especially emerging industries such as aquaculture and renewable energies, the European Union passed Council Directive 2014/89/EU establishing a framework for maritime spatial planning[1]. The directive set a 2021 timeline by which all member states must have a maritime spatial plan in place. Member states have latitude to develop a top-down prescriptive approach, a bottom-up approach, or a combination of both. The process to develop the plan should include problem and opportunity identification, information collection, planning, decision-making, implementation, monitoring, and assessment (Council Directive 2014/89/EU). However, determination of specific process components, such as the participants in the process, a work plan, temporal and spatial scales, and principles, goals and objectives, remain under the purview of member states. Furthermore, MSP is a tool to support the Marine Strategy Framework Directive of 2008 (Council Directive 2008/56/EC), which instructs that adaptive management based on an ecosystem approach be implemented in the marine sector.

In the U.S., Integrated Coastal Zone Management (ICZM)[2] and Ecosystem Based Management (EBM) are related approaches to multi-sector planning that pre-date MSP. Increased awareness of environmental impacts in the early 1970s led to the passage of the U.S. Coastal Zone Management Act of 1972 (CZMA), one of the first formal efforts to plan and manage multiple uses in the coastal area (Cicin-Sain et al. 1998).

Fundamental to CZMA is the federal consistency provision, which requires federal actions that have reasonably foreseeable effects on the coastal zone be consistent with the enforceable policies of a state's approved state management program (16 USC. § 1456). This mandated cooperation among local, state, and federal entities foreshadowed the multisector management encouraged by MSP. In the U.S., EBM, an integrated approach to management that considers the entire ecosystem, including humans (McLeod et al. 2005), first took root in the terrestrial space in the early 1990s. The National Oceanographic and Atmospheric Administration officially adopted the strategy in 1994, adapting the concepts of EBM to the marine space. MSP builds on the idea of integrated management, but attempts to go further by framing a practical approach with defined outcomes to achieve the goals of EBM (Ehler and Douvere 2009) as exemplified in the often-used phrase "marine spatial planning for ecosystem-based management" (Crowder and Norse 2008; Douvere 2008; Ehler and Douvere 2009; Council Directive 2014/89/EU). The process of how this approach is realized, and how outcomes are incorporated into environmental reviews, may differ from region to region (Ryan, Danylchuk, and Jordaan 2018). Definitions, goals, drivers, processes, key elements, and examples of EBM, ICZM, and MSP are compared in Table 1.

MSP[3] was introduced into U.S. policy in 2010 with the declaration of a National Policy for the Stewardship of the Ocean, Our Coasts, and the Great Lakes (NOP), as described in Presidential Executive Order 13547. The newly created U.S. National Ocean Council expanded on this executive order, a presidential directive with the power of law, through a National Ocean Policy Implementation Plan (National Ocean Council 2013a) and a Marine Planning Handbook (National Ocean Council 2013b). The plan did not establish a national level MSP effort, rather it divided the U.S. into nine regions based on previously described large marine ecosystems, suggesting that a regional planning body (RPB) composed of federal, state, and tribal authorities be established for each region. Despite the voluntary nature of MSP processes, in 2016 two RPBs published regional marine plans - the Northeast Ocean Plan (Northeast Regional Planning Body 2016) and the Mid-Atlantic Regional Ocean Action Plan (Mid-Atlantic Regional Planning Body 2016). However, a majority of plans were eventually produced at the state level, including Oregon (Oregon Ocean Resources Management Task Force 1991), Massachusetts (Commonwealth of Massachusetts 2015), Rhode Island (CRMC 2010), and Washington (Hennessey and Hart 2017), and included smaller spatial scales of state waters (generally from the shoreline to 3 nautical miles), and in some cases extended seaward to include additional areas of economic or ecological interest. The Rhode Island Ocean Special Area Management Plan (OSAMP) was noteworthy because it is the only U.S. MSP process that was directly linked to development of an offshore wind project, the first in U.S coastal waters (Ryan et al. 2018). In addition, authority for OSAMP was derived from existing federal law, CZMA, and OSAMP produced enforceable policies with extensive stakeholder input (Bates 2017).

In June 2018, after a change in leadership in the U.S., Executive Order 13547 was formally revoked by a new Executive Order 13840, Ocean Policy To Advance the Economic, Security, and Environmental Interests of the U.S. The new order eliminates the National Ocean Council and RPBs, and removed as controlling policy for federal agencies the National Ocean Policy Implementation Plan, the Marine Planning

Table 1. Federal environmental legislation related to offshore wind energy projects.

Act	Topic	Lead	Documents
NEPA	Environmental effects of major federal actions	CEQ and the lead agency conducting each review	EIS, EA, or FONSI
CZMA	Federal consistency provision	NOAA	Consistency determination
Outer Continental Shelf Lands Act	Marine resource extraction, lease issuance, and development plan approvals	BOEM	Lease
ESA	Protection of threatened and endangered species and their critical habitats	NMFS (part of NOAA); U.S. FWS	Biological Assessment, Incidental take permit, Habitat conservation plan
Marine Mammal Protection Act	Protection of marine mammals	NMFS; FWS	Incidental take permit, Habitat conservation plan
Magnuson-Stevens Fishery Conservation and Management Act (MSA)	Protection of essential fish habitats of federally managed fisheries	NMFS	Essential fish habitat assessment
Migratory Bird Treaty Act	Protection of migratory birds	FWS	Review requirement
Bald and Golden Eagle Protection Act	Assessment of impacts to bald and golden eagles	FWS	Review requirement
Rivers and Harbors Act	Regulation of structures located in navigable waters of the U.S.	USACE	Individual permit
National Historic Preservation Act	Protection of historic properties	National Park Service; Advisory Council on Historic Preservation; State or Tribal Historic Preservation Officer	Review requirement
Clean Water Act	Regulation of disposal of dredge and fill material; discharge of hazardous substances	EPA; USACE; lead state agency (depends on jurisdiction)	Individual permit; water quality certification
Clean Air Act	Maintains National Ambient Air Quality Standards	EPA	Permit for vessel emissions
Federal Powers Act	Requires license for electrical power generation within or on navigable waters	BOEM; FERC	License
Marine Protection, Research, and Sanctuaries Act (Ocean Dumping Act)	Restriction of dumping at sea	EPA; USACE	Individual Permit
National Marine Sanctuaries Act	Prohibits the destruction, loss of, or injury to sanctuary resources	NOAA	Review requirement
PWSA	Protection of navigation and marine environment	USCG	Navigation safety plan
Federal Aviation Act	Protection of U.S. navigable airspace	FAA	Individual permit

Handbook, and the two regional plans. The effects of this new executive order are still unknown as federal, state, and local entities reorganize under the new directive. As coordination of economic, security, and environmental interests requires spatial planning, and future efforts to streamline data incorporation into offshore wind siting and development could help increase energy portfolio diversification, expert informants' views can help future efforts identify strengths, weaknesses, and opportunities for MSP to inform the process.

Methods

Interview description and design

To answer the research questions, we drew on telephone interviews with key informants involved in the offshore wind industry and/or the NEPA process, conducted between February and April 2017. A semi-structured interview style was selected to gather in-depth information about a sensitive topic, seek descriptive information, and try to understand underlying motivations and attitudes (Bernard 2011). In addition, this style of interview works well in projects dealing with high-level bureaucrats and elite community members with limited time (Bernard 2011). This type of research is limited though, by possible biases of the participants and of the interviewer (Weiss 1995). For example, the interviewer may give more credence to comments that support preconceived notions, known as hypothesis confirmation bias, or may try to search for coherence in disparate remarks by the participants, known as consistency bias (Weiss 1995). Yet, a semi-structured interview allows flexibility in the conversation to let a wider range of information be introduced, leading to more in-depth responses and descriptions, rather than one-word answers (Kempton et al. 2005).

Questions in the interview guide were based on reviews of relevant literature regarding MSP and EIAs. Interview topics included participants' experience with NEPA, offshore wind energy, and MSP; general perspectives of MSP; outcomes of MSP; how outcomes of MSP may be used in NEPA for offshore wind energy projects; benefits and drawbacks of MSP outcomes; and, other ways that MSP outcomes may affect the regulatory process regarding offshore wind energy projects. In order to differentiate between the process of MSP and its results, participants were deliberately asked to describe the outcomes of MSP. Follow-on questions about the benefits and drawbacks of MSP and its use in NEPA for offshore wind energy referred to these outcomes. The style of questions was modeled after examples used in similar research (Bates and Firestone 2015) and the length of the guide was adjusted based on informal tests. Five iterations were edited among the authors prior to submission for review. The Human Subjects Institutional Review Board at the University of Massachusetts Amherst approved the interview guide that was used to ensure all topics were covered equally in each interview, thus providing more reliable, comparable data. Pretests of interview questions were conducted with five professional peers with subject matter expertise to gauge the clarity and effectiveness of the questions. Minor modifications were made as a result of the pretests and comments from the university review board prior to finalizing the interview guide.

Interviewees

Key informants included federal regulators, state regulators, fisheries council members, non-governmental organizations, industry members, consultants, and academics. These stakeholders, individuals who can affect or are affected by a project (modified from NOAA 2007, Achterkamp and Vos 2008), are experienced with the offshore wind industry and/or the NEPA process. Potential interviewees were identified through attendance lists, presentations, and agendas at state task force meetings and public comments received from 2011 to 2017 as listed on BOEM's Renewable Energy website (Table 2). As the lead agency for offshore wind projects in the U.S., BOEM's website includes a comprehensive list of offshore wind energy activities. The list of names collected was filtered to include only those that included job titles or affiliations in order to confirm their status as key informants. The authors identified additional potential

Table 2. Comparison of integrated coastal zone management, ecosystem based management, and marine spatial planning definitions, goals, drivers, process, and key elements.

	ICZM (Cicin-Sain et al. 1998)	EBM (McLeod et al. 2005)	MSP (Ehler and Douvere 2009)
Definition	Continuous, dynamic, multi-disciplinary process by which decisions are made for the sustainable use, development, and protection of coastal and marine areas and resources	Integrated approach to ocean management that considers entire ecosystem, including humans	Public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that usually have been specified through a political process
Driver	User-user conflicts, user-environment conflicts	Human activities disturbing ecosystems and their services	User-user conflicts, user-environment conflicts
Goal	Sustainable development, reduce vulnerability to natural hazards, maintain essential ecological processes, life support systems, and biological diversity all in coastal and marine areas	Maintain ecosystem in healthy, productive, resilient condition so that it can provide the services humans want and need	Comprehensive, adaptable spatial management plan that may include zoning maps and permit system
Process	Iterative process of issue identification and assessment, program planning and preparation, formal adoption, funding, implementation, operation, and evaluation	Ecosystem planning, cross jurisdiction goals, spatiotemporal zones, adaptive co-management, and monitoring	Identifying need and establishing authority, financial support, stakeholder participation, pre-planning, assess existing conditions, assess future conditions, develop management plan, implement plan, monitor and evaluate, and adapt plan
Key Elements	Area planning, promotion of economic development, stewardship of resources, conflict resolution, protection of public safety, proprietorship of public submerged lands and waters	Protecting and restoring ecosystems, cumulative effects, connectivity, uncertainty and dynamics, spatial scales, biodiversity, actions have no undue harm, stakeholders, monitor	Ecosystem-based, integrated, place-based or area-based, adaptive, strategic and anticipatory, participatory

Table 3. Documents used to identify potential interviewees.

State/RPB	Source
Delaware	BOEMRE/Delaware Renewable Energy Task Force Meeting, Lewes, March 24, 2011
Georgia	Public comments received on the Notice of Intent to prepare an Environmental Assessment, 2013
Hawaii	BOEM-Hawaii Intergovernmental Renewable Energy Task Force Meeting, Honolulu, June 3, 2015
Maryland	5th Task Force Meeting, January 29, 2013
Massachusetts	Renewable Energy Task Force Teleconference, (October 17, 2011)
	BOEMRE – Rhode Island (RI)/Massachusetts (MA) Joint Task Force Meeting, New Bedford, May 2, 2011
	Request for the Taking of Marine Mammals Incidental to the Construction of the Block Island Transmission System, November 26, 2013
	Task Force Webinar, January 16, 2014
	BOEM Massachusetts Renewable Energy Task Force, April 29, 2015
New York	Public comment to the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York Environmental Assessment, June 2016
North Carolina	BOEM North Carolina Task Force Meeting Agenda, April 19, 2016
Oregon	BOEM-Oregon OCS Renewable Energy Task Force Portland, April 12, 2012
	BOEM-Oregon Renewable Energy Task Force Meeting Portland, June 28, 2013
	79 Fed.Reg. 30876 Notice of Intent To Prepare an Environmental Assessment for Proposed Wind Energy-Related Development Activities on the Pacific Outer Continental Shelf Offshore Oregon and Notice of Public Scoping Meetings
Rhode Island	International Marine Spatial Planning Symposium: Sharing Practical Solutions, Narragansett, October 2015
Mid-Atlantic RPB	Mid-Atlantic Regional Planning Body Webinar, July 11, 2016
Northeast RPB	Northeast Regional Planning Body Membership Roster, October 2016
West Coast RPB	Federal Marine Spatial Planning: West Coast Update Webinar, February 2, 2017
na	80 Fed. Reg. 189, Request for Information on the State of the Offshore Renewable Energy Industry—Request for Feedback, September 30, 2015

interviewees based on attendance at conferences and workshops. Interviewees themselves also identified other potential subjects, a sampling technique known as snowball sampling (Bernard 2011).

Email requests for interviews were sent to 110 persons of diverse occupations, genders, and geographical locations. Twenty-eight respondents agreed to be interviewed and 24 interviews ranging from 24 to 71 min were ultimately conducted (Table 3). All interviews were confidential, and interviewees were assigned a number to protect their identity during analysis. Categories of interviewee affiliation included lead agency (e.g., BOEM; $n = 5$), cooperating agency (e.g., National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife, EPA, $n = 12$), and non-agency stakeholders (e.g., non-governmental organization, academia, industry; $n = 7$) (Table 4). Due to the low number of interviews, we combined numerous sectors into the category of non-agency stakeholder, recognizing that these respondents may have very differing, and perhaps conflicting, perspectives.

Data analysis

Interviews were recorded, transcribed, and thematically coded using the qualitative data analysis software, Nvivo for Mac, Version 11 (QSR 2016). A total of 161 pages of transcribed data were analyzed. One researcher undertook all the interviews, transcriptions, and coding. Preliminary codes were developed based on literature reviews and new codes and sub-codes were created as themes emerged during analysis. For example, within MSP, the codes of data, communication, and conflict resolution were initially determined. As interviews proceeded, the data code was further subdivided into

Table 4. Demographics of interviewees to include affiliation (i.e., lead agency, cooperating agency, and non-agency associates), years of experience, gender, and geographic location (east or west coast).

Interview #	Affiliation category	Years of experience	Gender	Location
1	Cooperating agency	5	M	East coast
2	Cooperating agency	4	M	East coast
3	Lead agency	8	M	East coast
4	Non-agency stakeholder	20	M	East coast
5	Cooperating agency	12	F	East coast
6	Non-agency stakeholder	5	M	West coast
7	Cooperating agency	13	M	East coast
8	Non-agency stakeholder	3.5	M	West coast
9	Non-agency stakeholder	7	F	East coast
10	Lead agency	7	M	East coast
11	Non-agency stakeholder	2	F	East coast
12	Non-agency stakeholder	21	M	East coast
13	Cooperating agency	31	M	East coast
14	Cooperating agency	6	M	East coast
15	Non-agency stakeholder	2	F	East coast
16	Cooperating agency	9	F	East coast
17	Cooperating agency	37	M	East coast
18	Cooperating agency	7	F	East coast
19	Lead agency	6	F	West coast
20	Lead agency	2	M	East coast
21	Cooperating agency	1.5	M	East coast
22	Cooperating agency	1.5	F	East coast
23	Lead agency	14	F	East coast
24	Cooperating agency	20	M	East coast

Note that 'years of experience' may refer to the number of years a person is in the current position and not the total number of years of related educational and professional experiences.

identification of data, recognizing data gaps, and filling data gaps. This approximates the method of grounded theory, a general methodology to develop and generate theory based on the interplay of data analysis and data collection (Glaser and Strauss 1967; Strauss and Corbin 1998). It allows for the discovery of emerging patterns in data, the process used here to expand, consolidate, and create new codes based on the interviews. Once all interviews were complete, the researcher reviewed all of the coding again and merged similar themes. The final structure of the database included the main code of *MSP*, sub-codes of *general impressions*, *outcomes*, *benefits*, *drawbacks*, *challenges*, *personal involvement with MSP*, and *how MSP integrates into NEPA*, and three to twelve themes within each sub-code in which participants' statements were categorized.

Results and discussion

Several recurring themes emerged from questions regarding general perspectives on MSP (not specific to offshore wind energy), outcomes of MSP, benefits and drawbacks of MSP outcomes, how the outcomes of MSP may be used in NEPA, and other ways MSP outcomes may affect the regulatory process. These were grouped into the themes of consensus building and data in the discussion below. In addition, the view of biological data as an impediment to EIAs was reviewed here. Of note is that participants were asked, "In your opinion, what are the outcomes of MSP?" Twelve participants phrased outcomes as potentialities (e.g., would be, should be, or ideal outcomes) and nine stated that the identified outcomes are currently happening. Three responses were

ambiguous. Furthermore, the distinction between outcomes of MSP and benefits of the MSP outcomes seemed to blur for several participants. For example, some participants noted increased communication among stakeholders as an outcome, while others listed it as a benefit.

Consensus building

Active stakeholder participation in the planning process and integration across sectors are two characteristics of effective MSP (Ehler and Douvere 2009). Key informants identified how these characteristics have been realized during general MSP processes (not specific to offshore wind energy) in the U.S. through increasing communications, developing a common operating picture, minimizing conflict, and making better decisions. These attributes also form the foundation of consensus building, a systematic practice that brings together stakeholders of different interests in face-to-face discussions to address a policy issue (Innes and Booher 1999). *Common operating picture* is a military term used to describe a common understanding of a situation through collecting, sharing, and displaying multidimensional information to facilitate collaborative planning for effective decision-making. This term is also useful in MSP.

Eight participants stated that improved communications among lead agencies, cooperating agencies, non-agency stakeholders, and the general public is an outcome of MSP (Figure 1) and four participants identified increasing communications as a benefit of MSP (Figure 2). Increased communications should facilitate coordination and compliance with the complex, multiagency regulations that govern offshore wind development, discussed earlier. Face-to-face communication, fundamental to consensus building (Innes 1996; Innes and Booher 1999), encourages stakeholders from diverse

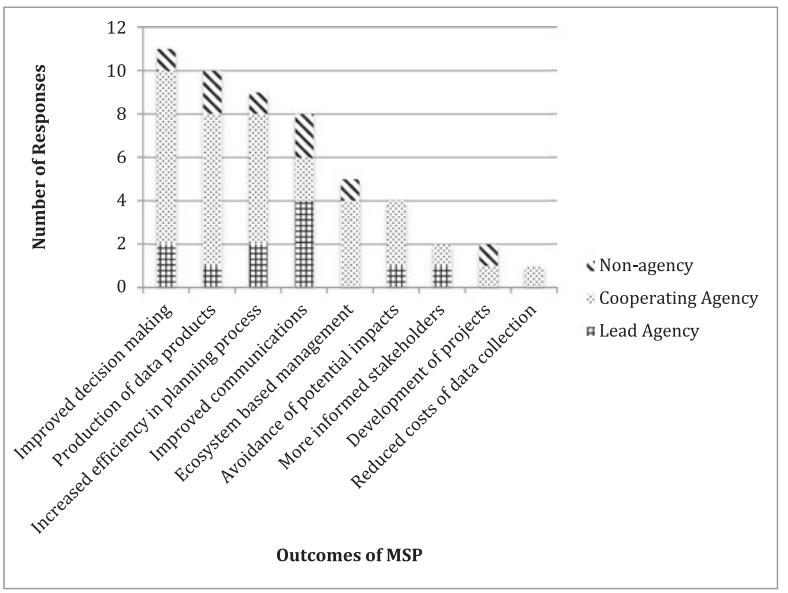

Figure 1. Identified outcomes of marine spatial planning, delineated by participants' affiliation with a lead agency, cooperating agency, or non-agency. Participants may have identified multiple outcomes.

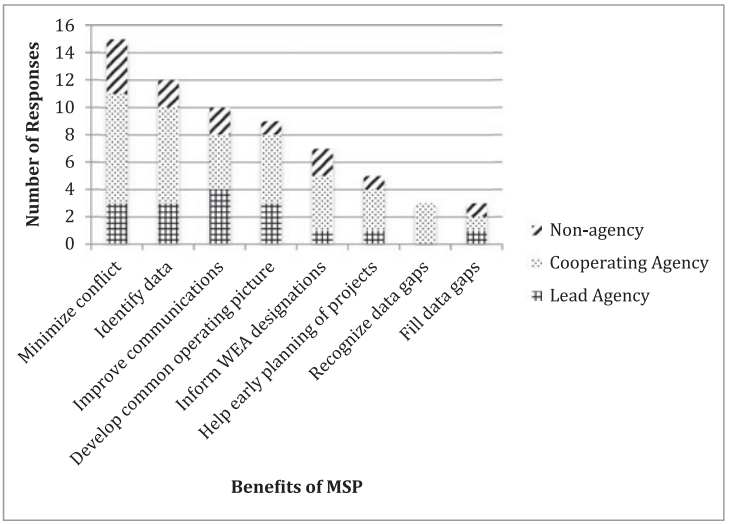

Figure 2. Identified benefits of marine spatial planning, delineated by participants' affiliation with a lead agency, cooperating agency, or non-agency. Participants may have identified multiple benefits.

backgrounds to establish personal, familiar relationships that lead to continued collaboration:

> By virtue of these different forums in which I've gotten to know some of the state agency contacts, I feel comfortable cold-calling or emailing them and saying, 'Hey, I know you are doing an MSP effort, we have a bunch of data on whales and birds and sea floor benthos and here is where you can find it.' [Female, 6 years' experience, lead agency]

Furthermore, discussions among agencies and developers initiated early in the planning process can help to develop strategies and mechanisms that, once established as part of the institutional processes, may lead to a better understanding of timelines and expectations in the regulatory process.

Nine participants described benefits of MSP that can be grouped under the term common operating picture. Some of their phrases included: "provide a good overall start," "get everyone on the same page," "give a common picture to start discussions," "get everybody looking at the same data," "are a jumping off point," "allow everyone to see everything," "are a common reference point," and "summarize what is out there." A common operating picture provides situational awareness to enable stakeholders to make accurate, informed decisions based on current or planned activities and pertinent factors. It is created by identifying relevant information, integrating data, and making it understandable and available to all stakeholders. Geographical information systems are frequently used to consolidate, manipulate, analyze, manage, and present spatially informed data. Colorful images of selected layers are incorporated into fact sheets, posters, and presentations to more easily describe environmental and physical features. However, greater efforts are needed to incorporate social, cultural, and behavioral data, which are included less frequently than other types of data and do not lend themselves as easily to GIS-based mapping (Gopnik 2015). Common operating pictures are provided through online GIS applications integrated into regional data portals, thus

allowing queries and analysis of particular layers of interest. Consensus building requires all stakeholders to have common information in order to explore interests, agree on facts, develop options, and make decisions. Thus, developing a common operating picture is important to deal with potentially controversial planning and policy tasks (Innes 1996).

Demands for ocean resources are increasing as population grows, technology changes, consumption escalates, and land resources become limited (Douvere 2008; Flannery et al. 2016). Conflicts among human uses may arise when different sectors seek to use the same space at the same time, but lack common objectives. Disputes among emerging users (e.g., offshore wind, marine renewables, aquaculture) who would like access to spaces typically used by traditional users (e.g., commercial fishing or shipping) are particularly noted. For example, some commercial fishers have expressed concern that development of offshore wind farms would restrict their access to traditional fishing grounds resulting in loss of profits and potential loss of heritage (Mackinson et al. 2006). Furthermore, human-environmental conflict results from increased extraction of ocean resources that amplifies adverse effects on the natural environment, including over-fishing, loss and destruction of habitat, pollution, and acidification (Douvere 2008). Identifying and minimizing these conflicts is desirable and eleven participants stated that conflict resolution was a benefit of using MSP.

> It goes right into the managing of the natural resources that are there and preventing the kinds of conflicts that arise when you are in a react mode, rather than a proact mode. [Male, 4 years' experience, non-agency stakeholder]

Resolving conflicts early in the planning process may also reduce project costs and risk of litigation in offshore wind energy projects, a plague of the Cape Wind project (Cape Wind 2014).

> Certainly that is the intent … is to streamline things and prevent Cape Wind kind of accidents from happening again. [Female, 12 years' experience, cooperating agency]

Effectively managing conflict is necessary in order to reach consensus on final decisions. Better decision-making by developers and agencies was the most cited outcome of MSP (Figure 2). Participants expanded on the term "better" to mean a more informed process, supported by best available scientific data that could balance and arbitrate between competing users:

> If it is done properly, an equitable and consistent set of decisions in terms of how you are going to allow different activities and when and where and how you would allow different activities to take place. [Male, 37 years' experience, cooperating agency]

For potential offshore wind developers, better decision-making includes more informed project proposals being crafted and submitted for agency review. By communicating with other stakeholders and referring to common operating pictures and their data, developers can become informed about environmental concerns and other users within areas being considered for offshore wind projects:

> Projects that were never going to see the light of day … our hope is that we'll get fewer, better projects that will not require as much time to go through the environmental review and permitting and licensing process. [Male, 13 years' experience, cooperating agency]

> … make good projects happen [so that we do] not start out with bad projects, being proposed bad, and having to work a lot to recraft them. [Male, 20 years' experience, cooperating agency]

Participants also recognized the WEA identification process as an example of better decision-making, but not as an MSP process. The area identification process is led by BOEM, and includes comments from the public, industry groups, interagency task forces, and federal, state, and local governments. Many WEAs on the east coast of the U.S. (e.g., Massachusetts, Rhode Island, New Jersey, Delaware, Maryland, and Virginia) were established using the area identification process but were not informed by an ecosystem-based or multi-sector planning process and therefore would not be considered MSP. Several of the WEA designations were controversial and required significant modification after publication (Bates, 2017); a comprehensive MSP process could potentially alleviate such controversies. However, several states (e.g., Georgia, South Carolina, California, and Hawaii) have not yet designated WEAs in their state waters and could thus incorporate MSP into their decision-making if they move forward with that planning process.

Data

Data and understanding about underlying processes are critical for defining and analyzing existing and future conditions, two steps in a systematic approach to MSP (Ehler and Douvere 2009). Participants noted that creating data products, increasing data availability, identifying data gaps, and filling data gaps, are important benefits and outcomes of MSP. Ten participants identified data products (referring to portals, maps, and modeling results) as key outcomes of MSP. Data portals, online repositories of biological data and decision support tools have been created through regional and state MSP efforts. The Mid-Atlantic and Northeast regional planning bodies each host their own portals—the Mid-Atlantic Ocean Data Portal[4] and the Northeast Ocean Data Portal[5]. Jointly, BOEM and NOAA sponsor the Marine Cadastre[6] to support the needs of the offshore energy and marine planning communities. Geographic coverage, spatio-temporal scales, and contributors of data vary among the portals.

> It's definitely really nice to see how as a private industry, you can get onto a data portal and just find all this information in one point. You can see where there are buried cables. You can see where there are specific fishing grounds and stuff and I would imagine that it would just make life so much easier. [Male, 5 years' experience, non-agency stakeholder]

The portals enable all stakeholders to access publicly available data from the same place, thus buttressing creation of a common operating picture, reducing potential conflicts, and encouraging submission of more informed project proposals by developers. However, some participants believed that data products should be seen as supporting tools for other outcomes of MSP (e.g., better decision-making and communications) rather than independent outcomes:

> I view the portal as nothing more than a means to an end. What the portal does is provide a visual … that's all it does. It provides a visual of what is out there, how much is out there, what's important, that the general public doesn't have. [Male, 4 years' experience, cooperating agency]

Whether data products are an end result of MSP or simply a means to an end, identification of data was the second most noted benefit of MSP (Figure 2).

> You often have a lot of different stakeholders around the table, involved in the conversation. They often bring [biological] data and share it amongst themselves, which is incredibly useful from a knowledge building perspective and a collaborative perspective. [Male, 6 years, cooperating agency]

Value placed on identification and sharing of data supports the significant efforts and investments (e.g., Real-time Opportunity for Environmental Observations and Atlantic Marine Assessment Program for Protected Species) being put into amassing, organizing, analyzing and displaying data in portals and other media (e.g., fact sheets, presentations, posters). Key informants believed that improved access to data could expedite planning and applications for offshore wind projects by developers and better informs impact analyses by regulators. Dissemination of biological data to stakeholders facilitates more informed decision-making by providing science-based information about positive and negative environmental impacts. For example, Klain, MacDonald, and Battista (2015) discussed an initiative by Vineyard Power on Martha's Vineyard, MA that included an interactive, offshore wind map viewer based on scientific data and traditional knowledge. It was used to inform stakeholders of environmental impacts and to solicit opinions on suitable project locations. A true understanding of environmental issues by stakeholders is critical to success of offshore wind projects because some opposition may be based largely on uncertainties (Klain et al. 2015).

The identification of data is not enough though. The spatial and temporal scales of data must also match the objectives and needs of the planning process. Ambiguous or mismatched scales relating to administrative boundaries, ecological processes, data availability, or methodologies may influence the quality of assessments (João 2002; Gontier 2007). Furthermore, the choice of scale may benefit one stakeholder over another, or set artificial boundaries on analyses that influence decisions (Karstens, Bots, and Slinger 2007). Key informants spoke to this issue and discussed how MSP can help identify data gaps at particular scales and prioritize additional research to fill these gaps.

> I think there are some real questions about what scale and whose responsibility it is at what scale to collect what data. And I think that one of the benefits of marine planning is aggregating data and making sense of it and in some cases identifying where there are holes and having either federal or state initiatives help fill those holes. [Female, 7 years, cooperating agency]

The issue of which entities, government or industry, collect data at which scales was brought up by several participants. Most agreed that federal and state government agencies sponsor research at regional and coastal scales (e.g., Cetacean and Turtle Assessment Program and Atlantic Marine Assessment Program for Protected Species) while developers focus on site-specific research.

Biological data is an impediment in NEPA

The importance of data identification and data products, as noted by the key informants, supports the notion that a lack of biological data is an impediment in the offshore wind energy NEPA process. Fifty percent of participants (one lead agency, eight

cooperating agency, and three non-agency) identified insufficient biological data as a barrier in the environmental assessment process:

> The lack of information about where marine mammals are and when is definitely a problem when it comes to deciding where these offshore wind farms should be. [Male, 1.5 years' experience, lead agency]

Analysis of the spatiotemporal scales of biological data in EIAs supported these responses of data insufficiencies (Ryan et al. in press). For example, EIAs were found to have incomplete species lists, incomplete species life histories, and lacked descriptions of potential impacts such as acoustic disturbances and collision risks. Only three participants (one lead agency, one cooperating agency, and one non-agency) specifically stated that biological data are not an impediment in the regulatory process:

> There is way too much of an emphasis in the U.S. on getting all the data perfectly. There's way too much of a focus on doing anything because there is uncertainty about X. And there's always an X that someone is uncertain about and I don't feel like that's a reason to not go forward and get something done, just because you don't know everything you could possibly know about some kind of factor … It is ludicrous that people think we need more than what we already have. [Male, 5 years' experience, non-agency stakeholder]

Some participants stated that federal regulations require the use of *best available science* in decision-making and thus a requirement to collect *additional* data does not exist. These participants may have been referring to provisions in the Endangered Species Act (ESA) ("solely on the basis of best scientific and commercial data available") and Magnuson-Stevens Fishery Conservation and Management Act (National Standard 2; "Conservation and management measures shall be based upon the best scientific information available."). However, NEPA does not include any such statement; rather, the Council on Environmental Quality (CEQ) regulations, which implement NEPA, demand information of "high quality" and professional integrity (40 C.F.R. §§ 1500.1, 1502.24). Furthermore, debate exists among scientists, policy makers, managers, and stakeholders about what constitutes best available science and how it should inform policy. Informing this debate are perceptions and expectations of science—an organized body of knowledge or a rigorous, standardized method of collecting information. One view is that science is uncontested and universally applicable, the other holds that science is subjective and conditional (Sullivan et al 2006).

Eight participants (three lead agency, three cooperating agency, and two non-agency) first stated that biological data is not a barrier, yet as the interviews proceeded, they contradicted this view.

> Because there is actually quite a lot of information out there in general. Well, it depends on your time frame. The impacts would be another part that … there might be some fuzziness about the impacts of various activities, but I'd say our knowledge is actually quite good. [Male, 7 years' experience, lead agency]

Lead agency participants were more likely to answer in this manner than cooperating agency or non-agency stakeholders. Participants' reluctance to directly state that biological data are an impediment to the offshore wind NEPA process may be attributed to the political climate at the time of the interviews. Federal programs and agencies supporting the environment are facing severe resource cuts. Since January 20, 2017 (approximately the start of these interviews), several presidential executive orders have

been issued attempting to reduce the scope of federal protection of environmental resources or habitats.[7] Furthermore, at the time of these interviews, the EPA and the U.S. Department of Agriculture were under a gag order that prohibited the sharing of agency information with media and other outlets (Scientific American 2017). Potentially different answers to these interview questions may have been given if the interviews were conducted under a different political climate.

Challenges of MSP

According to Ehler and Douvere (2009), the principal output of MSP should be a comprehensive spatial management plan for a marine area or ecosystem that sets out priorities for the area in time and space. Yet, practical application of MSP in the U.S. differs significantly from this theory (Gopnik 2015) and the outcomes identified in this research differ as well. No participant identified a marine spatial plan as an outcome of MSP. Rather the outcomes and benefits described above, including increased communication among stakeholders to facilitate integrated governance and improved access to data through data portals and from common operating pictures, reflect the expected outputs of MSP among U.S. stakeholders. The difference in expectation of MSP outcomes may be partially explained by the governance structure in the U.S. According to federal guidance for MSP (Executive Order 13,547 - Stewardship of the Ocean, Our Coasts, and the Great Lakes, the National Ocean Policy Implementation Plan, and the Marine Planning Handbook) existing mandates and authorities of federal agencies will not change to accommodate the goals of MSP. Six participants mentioned that there is a challenge in realizing the benefits of MSP while maintaining existing regulatory authorities. Without congressional support, their authorizations to fund MSP are also lacking (Gopnik 2015), leading many to wonder:

> What exactly are we doing here? What does a regional marine plan look like? Particularly, when nobody's authorities change. So, if everyone has the same legal authority and requirements and all that sort of thing, then what can you actually do? [Female, six years' experience, lead agency]

However, another participant believed that, despite lack of authority and congressional buy-in, MSP could be a lasting framework used in ocean planning:

> If the executive order gets rescinded or anything like that … there is a commitment … there is certainly a feeling of commitment around the table that this is good practice … these are good practices regardless of whether there is an executive order or not. So, this is the best way to make decisions, to be able to avoid and minimize impacts and … not just impacts to resources but conflicts in ocean space. Hopefully, either way, we are going to keep moving forward. [Male, six years' experience, cooperating agency]

The prediction that the executive order would be rescinded came true in June 2018, when a new executive order was signed dismantling the RPBs and the existing MSP processes. Despite this order, the outcomes and benefits identified by interviewees—improved communication and reduction of conflict—continue through preexisting groups and informal dialog (Smythe and McCann 2018). Although MSP is established in the regulatory process as one approach to minimize conflict and improve decision-making, other methods may also be considered. Ocean zoning, the allocation of ocean

space to specific users is a common feature of MSP (Ehler and Douvere 2009). It has been incorporated into other marine spatial plans, including in Germany (BSH 2009a, 2009b), Scotland (Scottish Government 2015), and at the state level in Rhode Island (CRMC 2010). However, it is notably absent from U.S. regional plans:

> I can't speak for all of the different regions, but for the northeast, we made a pretty conscious decision that [zoning] is not what we are talking about here. All we are doing here is providing the most up-to-date data on all these uses and resources that are out there to allow for a kind of venue to make the best decision possible. [Male, six years' experience, cooperating agency]

Both the Northeast and Mid-Atlantic regional planning bodies removed the terms spatial or zoning from their final plans, referring to them as an 'Ocean Plan' and an 'Ocean Action Plan' respectively.

> I think it hurts it. I think people will try to, from the science and regulatory sides, will still have to grapple with those issues, but those terms [spatial and zoning] were removed out of moral and political cowardice. [Male, 37 years, cooperating agency]

Traditional marine users, who may feel encroached upon by new users such as offshore wind, resisted attempts to zone at the regional scale and lobbied for this position at the federal level:

> And [zoning] generated a lot of backlash from the Republican side in Congress. Particularly about perceived restrictions on business interests and so it became a bit of a flash point in terms of issues in how far these regional planning bodies were going to go at this stage in terms of having prescriptive management measures. [Male, 37 years, cooperating agency]

Despite the lack of political will in the U.S., proponents of zoning argue that such a framework would facilitate alignment of ocean interests and attainment of healthy ecosystems (Eagle et al. 2008; Yates et al. 2015).

Drawbacks of MSP

Participants seemed reluctant to identify any drawbacks to MSP (Figure 3). Flannery et al. (2016) note that comparatively little analyses of potential negative impacts of MSP have been undertaken, including potentially serious distributive impacts. However, the most frequently cited drawbacks in this study were associated with data: the apprehension that stakeholders may solely depend on data portals to inform environmental reviews, data in the portals would not be updated, and data products, such as maps combing multiple layers of data, are presented without adequate explanation of assumptions or analyses. Additional interesting points were made by individuals, for example, MSP may lead to binding decisions and to increased development of offshore wind projects; social data was not adequately incorporated into the process; MSP framework is top down and not participatory; and MSP would lead to ocean zoning.

In a lawsuit to block the lease of the New York WEA to Statoil Wind of Norway (Fisheries Survival Fund et al. vs. Sally Jewell et al.)[8], 2017, the plaintiffs argue that BOEM did not adequately consider the impact of wind power development on the region's fishery resource, relying on incomplete repositories of data to justify the analyses in the environmental assessment (the plaintiff's motion was denied.). Furthermore,

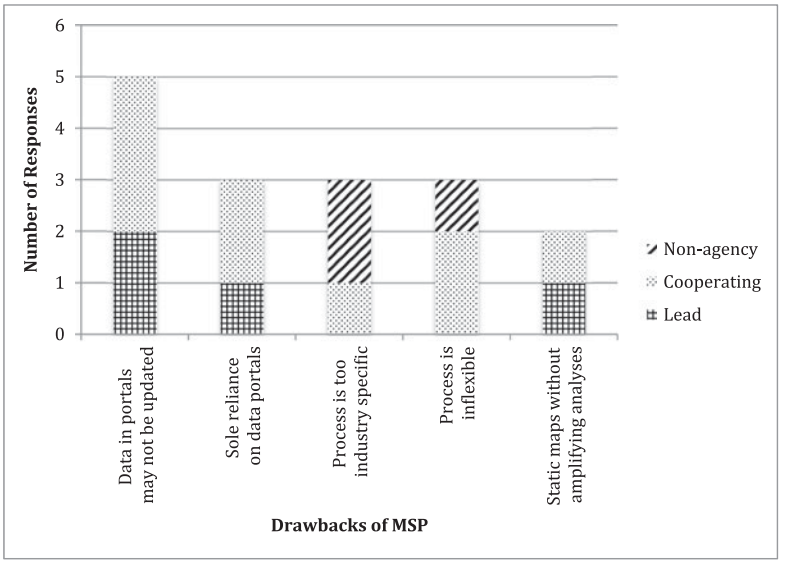

Figure 3. Most commonly identified drawbacks of MSP. Participants may have identified more than one drawback. Drawbacks identified by only one participant are excluded from the figure, but mentioned in the text.

the Mid-Atlantic Ocean Action Plan states that data portals should be used knowing that data gaps, uncertainties, and limitations of data sets exist within it. As a result, developers and regulators should use all available sources of data, including peer-reviewed literature, gray literature, surveys, citizen science, traditional knowledge, and predictive modeling to inform impact analyses.

Five participants, some of who serve as representatives on regional planning bodies, worried that data in the portals would not be maintained and updated after initial plan development:

> That is a HUGE issue! … you need it to be up to date in order to make good decisions, but also from a credibility perspective. First time someone goes in there and does something based on information that hasn't been updated in seven years, that is going to erode credibility in people wanting to use the data portal. [Male, 30 years' experience, non-agency stakeholder]

The Mid-Atlantic and Northeast Ocean Plans include action items to develop and implement plans to sustain operations and maintenance to address the longevity of their data portals; however, some participants were skeptical that these action items would be implemented due to limited financial and personnel resources.

Conclusion

Semi-structured interviews with 24 key informants in the offshore wind energy and MSP sectors were conducted to understand: (1) whether a lack of biological data impedes EIAs for offshore wind, (2) whether MSP could assist in mitigating these impediments, and (3) whether MSP could advance development of offshore wind in the U.S. in other ways. The offshore wind energy EIAs and WEAs existing at the time of

the interviews were not conducted or planned within an MSP framework. Most participants stated that a lack of biological data in environmental assessments for offshore wind was problematic. Incomplete species-specific data (e.g., seasonality of presences), uncertainty of data, mismatched scales, and incomplete understanding of how project activities affect species were cited as impediments in the impact assessment process. The small number of interviewees in each stakeholder category and the small number of categories represented potentially limited the breadth of responses. Interviewing more informants in each category and including members of other categories not represented here (e.g., marine industries, coastal communities) could help expand the replies.

Participants identified numerous outcomes of MSP, including the production of data products, such as data portals. These products may be helpful in the offshore wind energy NEPA process to mitigate perceived problems in EIAs, which are required both in the planning phase and prior to the construction phase of potential projects. However, participants cautioned that wind energy developers and regulators should not ignore other data sources and solely depend on MSP-related data portals for environmental reviews. Furthermore, processes must be established and responsible entities identified to ensure the data in those portals is updated regularly. Additional benefits of MSP that may be incorporated into the NEPA process include identifying data needs, existing data, data gaps, and methods to fill data gaps. Thus, MSP provides a strategic framework for the systematic identification, collection, collation, analyses, application, and management of data in the offshore wind environmental regulatory process.

Participants stated that other MSP outcomes may also advance development of offshore wind in the United States. Increased communication among stakeholders and a common operating picture are foundations of consensus building, a systematic practice that brings together stakeholders of different interests. Consensus building could minimize conflicts among traditional (e.g., commercial fishing) and nontraditional (e.g., offshore wind) sectors, allowing better decision-making through an informed process that is supported by best available scientific data.

For the potential efficiencies of MSP to be realized, it must occur prior to the designation of WEAs and finalization of NEPA documents. The Northeast and Mid-Atlantic ocean plans were issued after WEA designations and lease auctions were conducted in these areas. Nevertheless, offshore wind projects in these regions may still benefit from MSP during the scoping and analyses of the second EIAs required prior to approval of the construction and operation plans. The west coast, Hawaii, and the Great Lakes have not yet designated WEAs, drafted NEPA documents, or undertaken MSP efforts. If MSP is implemented early, it may mitigate data impediments in the NEPA process and help advance the offshore wind industry.

Notes

1. In Europe, marine spatial planning is referred to as maritime spatial planning.
2. Coastal Zone Management (CZM), Integrated Coastal Area Management (ICAM), Integrated Coastal Management (ICM), Integrated Marine and Coastal Area Management (IMCAM) are other names and acronyms associated with ICZM (Cicin-Sain et al. 1998).
3. Some U.S. government documents use the term Coastal and Marine Spatial Planning (CMSP) to describe this approach.
4. http://portal.midatlanticocean.org/ocean-stories/every-map-tells-a-story/
5. http://www.northeastoceandata.org/

6. http://www.marinecadastre.gov/
7. Executive Orders include: Implementing an America-First Offshore Energy Strategy (4/28/17), Review of Designations Under the Antiquities Act (4/26/17), Promoting Energy Independence and Economic Growth (3/28/17), Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the "Waters of the United States" Rule (2/28/17), Expediting Environmental Reviews and Approvals For High Priority Infrastructure Projects (1/24/17).
8. *Fisheries Survival Fund et al. v. Sally Jewell et al.,* 236 F.Supp.3d 332 (D.D.C. 2017)

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