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# Reimagining community-centered engagement to guide offshore wind planning and development

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## ABSTRACT

Community engagement in energy development is increasingly recognized as critical to align project design choices with the needs and perspectives of affected communities. However, offshore wind (OSW) development along the U.S. West Coast has often seen engagement efforts that are inconsistent, delayed, or disconnected from local decision-making. This study advances theoretical and applied understanding of public participation in energy planning by developing a framework for community-centered engagement tailored to the governance and socio-political contexts of OSW. We integrate insights from a literature review, a community inventory, and 25 semi-structured interviews with experts from government agencies, developers, consultants, Tribal representatives, NGOs, and research institutions. The framework aligns the OSW project lifecycle with the spectrum of public participation, accounting for timing, institutional roles, and place-based contexts. It moves beyond general best practices by offering a structured yet adaptable guide to improve engagement strategies, coordination, and credibility. This work synthesizes participation and governance theory with energy transition scholarship, demonstrating how engagement frameworks can serve as boundary-spanning tools to connect top-down policy imperatives with community expectations, values, and capacities. It also provides developers, agencies, practitioners, and local actors with actionable guidance to anticipate and navigate engagement challenges in OSW deployment. Grounded in empirical findings and situated within real-world planning and permitting systems, the framework offers conceptual and applied insights into the social dimensions of energy system transformation.

## 1. Introduction

Offshore wind (OSW) development has emerged as a potential, yet controversial, solution to meet rising energy demands on the U.S. West Coast. Unlike the fixed-bottom platforms deployed in the shallow waters of the East Coast and the European North Sea, West Coast OSW projects must contend with a steep continental shelf and deep waters, necessitating floating platforms anchored to the seabed [2]. Recent technological advancements in floating OSW, coupled with strong and consistent Pacific winds, have created commercial interest to construct OSW power plants along the U.S. West Coast.

However, the policy and governance landscape for offshore energy development is complex and contested. Conflicts between federal policy, state renewable energy goals, and social and environmental considerations have introduced significant barriers to OSW advancement. Recent federal administrative actions suggest additional challenges for permitting OSW projects on the West Coast [3], potentially stalling state-driven initiatives such as California's ambitious OSW targets. At the same time, marine and coastal areas are home to diverse ecosystems and communities<sup>1</sup> whose cultures and economies are deeply intertwined with marine resources. Advancing OSW development in federal waters thus requires navigating federal siting and permitting processes led by

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<sup>1</sup> We conceptualize “community” broadly to include a group of people organizing around a shared interest, affiliation, or geography [4].

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the Bureau of Ocean Energy Management (BOEM),<sup>2</sup> aligning with state and local policies, and addressing concerns from affected communities.

Robust community engagement is critical to this process. Effective engagement helps identify and integrate community concerns into the design of renewable energy projects, especially those involving new infrastructure. However, concerns have been raised about the adequacy of current engagement approaches, particularly when they are perceived as primarily instrumental or compliance-oriented [5–7]. Communities respond to uncertainty, institutional distrust, and siting practices in ways that have the potential to influence project timelines [8]. In such environments, frameworks can provide a structured set of assumptions, concepts, values, and practices that use a shared language to guide inquiry and interpretation [9]. Frameworks also help position and bridge knowledge across different scales and domains [10]. Particularly in emerging energy markets, such as OSW on the U.S. West Coast, there is a need to examine how engagement is conceptualized and operationalized across governance and project development processes to provide consistency and a shared baseline for communities and decision-makers.

Despite the recognized need for community-centered approaches, comprehensive frameworks for engagement in OSW planning and development along the West Coast are underdeveloped. This research responds to that gap by proposing a structured framework designed to center community needs and values throughout the OSW development process. Our research was motivated by two primary objectives: (1) to develop a practical and adaptable framework for community engagement in OSW that aligns with project development timelines and governance processes, and (2) to identify key barriers and opportunities in OSW engagement based on insights from interviews with key informants involved in OSW and community engagement along the U.S. West Coast. Building on established scholarship in public participation and democratic governance, we aim to provide a multidimensional, adaptable framework that can be applied across diverse community contexts.

Throughout this paper, we use the term “community engagement” to describe the range of mechanisms through which members of the public participate in or influence OSW governance and decision-making. We adopt the term “community” rather than “stakeholder” to reflect the localized impacts of offshore development and to acknowledge the distinct legal and governance status of Tribal Nations [11,12]. Engagement may serve regulatory, deliberative, or informational purposes and may be shaped by different policy instruments or institutional structures [13]. Our framework draws from relevant literatures in public participation, environmental governance, and energy policy to identify areas where engagement practices may evolve in response to both procedural and contextual challenges.

This study advances a community-centered engagement framework that explicitly links stages of the OSW project lifecycle with levels of public participation, institutional roles, and place-based contexts. The remainder of the manuscript is organized as follows: Section 2 reviews the literature on participatory approaches, engagement frameworks, marine governance, and OSW development in the United States. Section 3 outlines the research design, including key questions, data collection, and analysis. Section 4 presents the results and discussion, introducing our proposed engagement framework and highlighting key themes derived from 25 interviews. Finally, Section 5 concludes by synthesizing findings, offering strategies to better align local community values with national and global energy goals, and discussing how future efforts can build on our findings.

<sup>2</sup> Federal waters extend from 3 to 200 nautical miles of the coastline on the West Coast. Offshore wind development can also occur within state waters (3 n. mi from coastline) but is less viable due to lower wind speeds and increased visual impacts close to shore. Each state has their own process to evaluate proposals for development in state waters. This paper focuses on offshore wind development in federal waters.

## 2. Background

### 2.1. Governance and management of coastal marine resources

Framing engagement and related strategies for OSW depends largely on whether governance structures incentivize meaningful public input. Governance, broadly defined as the “means to steer the process and influence decisions and actions within the private, public, and civic sectors” [14, p. 7], encompasses the institutions, structures, and processes that guide management and policy actions through public administration. Soma et al. [15] argue that “good” governance should rest on five core principles: accountability, legitimacy, responsibility, representation, and transparency. Similarly, Bennett and Satterfield [16] identify four primary governance goals: effectiveness, equity, responsiveness, and robustness. Governance of marine settings is inherently complex, characterized by multiple competing interests across conservation, fisheries, tourism, and energy development sectors [17]. In marine environments, governance includes a range of mechanisms and institutions that structure resource use, problem-solving approaches, and enforcement of acceptable behaviors [18].

Greater public involvement is increasingly recognized as essential for improving the legitimacy and sustainability of governance outcomes, particularly in environmental management [19]. Collaborative, multi-partner processes can illuminate the multiple values associated with ocean ecosystems and ensure diverse activities are incorporated into planning efforts. Communities can contribute their place-based knowledge and lived experience to fill data gaps and capture socio-ecological relationships that conventional research and site or impact assessments may overlook. Early inclusion of community organizations, government agencies, NGOs, and the public is essential not only for consensus-building in OSW siting and design but also for catalyzing creative solutions. Development scenarios informed by broad, diverse participation have been shown in some studies to yield more salient, legitimate, and transformative outcomes that can advance local energy and sustainable development objectives [20].

### 2.2. Planning for offshore wind on the U.S. west coast

OSW development in the United States is emerging amid increasing intensity of marine use, overseen by a web of federal and state agencies with varying jurisdictions. BOEM, situated within the U.S. Department of the Interior, is the primary federal agency responsible for OSW development on the Outer Continental Shelf (OCS). Authorized by the Energy Policy Act of 2005, BOEM oversees leasing, permitting, rule-making, and operational oversight of OSW projects on the OCS. BOEM's OSW siting and permitting process is divided into four phases: 1) Planning: BOEM identifies potential Wind Energy Areas (WEAs), gathers commercial interest and public comments, prepares Environmental Assessment (EA) of lease activities under the National Environmental Policy Act (NEPA); 2) Leasing: BOEM publishes leasing notice, holds auction, issues lease; 3) Site assessment: Lessee submits Site Assessment Plan (SAP) to evaluate the site conditions, BOEM conducts technical and environmental review of SAP; If approved, Lessee conducts site assessment; and 4) Construction and operations: Lessee submits Construction and Operations Plan (COP); BOEM prepares Environmental Impact Statement (EIS) on the COP under NEPA; If approved, Lessee submits design and installation plans and constructs wind project. [21] (Fig. 1).

To expedite environmental reviews leading to faster project permitting, BOEM established intergovernmental task forces as part of its 2010 “Smart from the Start” program [22]. The BOEM Intergovernmental Renewable Energy Task Forces include representatives from Tribal, local, state, and federal government agencies in the identification of WEAs under consideration for offshore leasing. However, comprehensive community engagement as part of the formal regulatory process is not generally required outside of consulting agencies and public comments sought through the environmental review process [23]. On

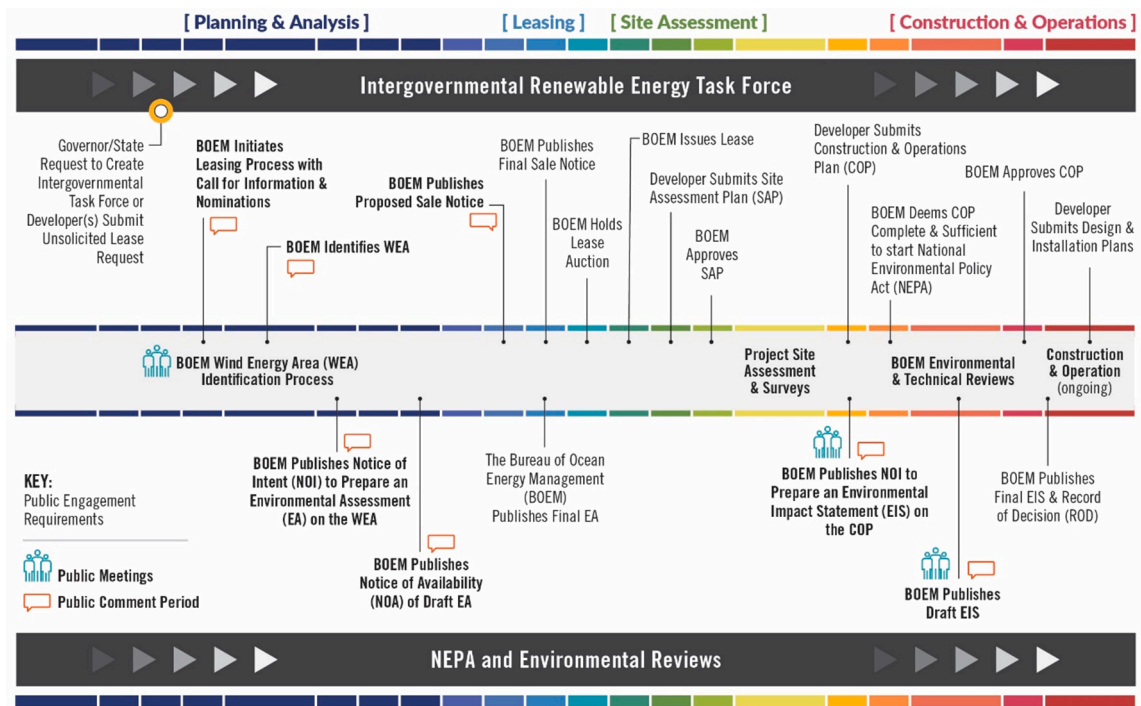


Fig. 1. Overview of BOEM siting and permitting process for offshore wind and opportunities for public engagement. Graphic developed by Pacific Northwest National Laboratory Communications.

the U.S. West Coast at the time of writing, OSW development stages have varied by state: leaseholders in California are conducting site assessment surveys [24], Oregon has postponed planned leasing activities [25], and Washington remains in pre-planning while exploring various options [26]. The lease areas off the coast of California have the potential to host between 4.5 and 8 GW of generation capacity [27], which represents 5% to 9% of the total generation capacity installed in the state as of 2024 [28]. Cost of electricity produced at floating offshore wind power plants is projected to be between \$60/MWh to \$200/MWh by 2030 [29], becoming competitive with other renewable energy generation technologies.

### 2.3. Community engagement in offshore wind

Along the West Coast, significant opposition has emerged to OSW development from Tribal Nations, state officials, and other community groups, citing concerns about the current siting, leasing, and permitting process, environmental impacts, and lack of meaningful engagement [25]. OSW development is characterized by a set of structural features that distinguish it from many other renewable energy technologies, including high capital costs, long leasing and permitting timelines, and centralized financing models. These characteristics constrain the range of decisions that can be meaningfully influenced through engagement with local communities, particularly with respect to core technical parameters like turbine design, platforms and cables, or ownership structures. Because of these challenges, engagement for OSW requires careful design and planning to be able to identify where the public has the ability to shape outcomes and where decision authority remains inflexible.

Community engagement in OSW development serves dual functions: it satisfies regulatory requirements linked to permitting and fosters more democratic, inclusive governance by integrating local voices into decision-making. Arnstein's [30] "ladder of participation" remains a foundational framework for integrating diverse community perspectives. It illustrates varying degrees of public involvement, from marginalization to passive information sharing to full community

control. The ladder highlights the importance of aligning engagement mechanisms with the underlying goals: whether to inform, consult, collaborate, or empower communities [31].

The International Association for Public Participation (IAP2) adapted Arnstein's framework into a "spectrum of public participation," which classifies engagement mechanisms based on the degree of public influence on decision outcomes [32] (Fig. 2). Decision-makers can leverage this spectrum to design more meaningful engagement processes and move beyond minimal, compliance-driven consultation [33]. Recent reviews emphasize "co-production" approaches in climate, conservation, energy, and wind development contexts as a way to enhance collaboration (Solman et al. 2021). Co-production, in this sense, moves beyond conventional consultation to foster deeper collaboration between communities and project developers or decision-makers. It involves communities not merely providing feedback but actively shaping problem definitions, project goals, siting decisions, and benefit-sharing mechanisms [35]. Operationalizing co-production requires shifting from unidirectional information flows to iterative dialogue that treat local and expert knowledge as complementary [36]. Practical methods for enabling co-production include participatory mapping exercises, joint fact-finding workshops, collaborative visioning sessions, and community-driven scenario planning [37].

Despite the availability of collaborative and co-production tools, most engagement in renewable energy development is generally limited to consultation, often failing to substantively incorporate community input [33]. This "halfway up the ladder" approach can intensify conflict, disregard cultural values, and marginalize local knowledge systems [38,39]. Energy justice frameworks provide critical perspectives, emphasizing the equitable distribution of benefits and burdens, the recognition of diverse knowledge systems, and inclusive participation in decision-making [40]. Community engagement operationalizes energy justice by ensuring local perspectives shape project outcomes, mitigating the risks of top-down, technocratic decision-making that historically exacerbated disparities [41,42]. However, balancing inclusivity with limited community resources and capacity for engagement remains challenging, requiring thoughtful trade-offs between broad

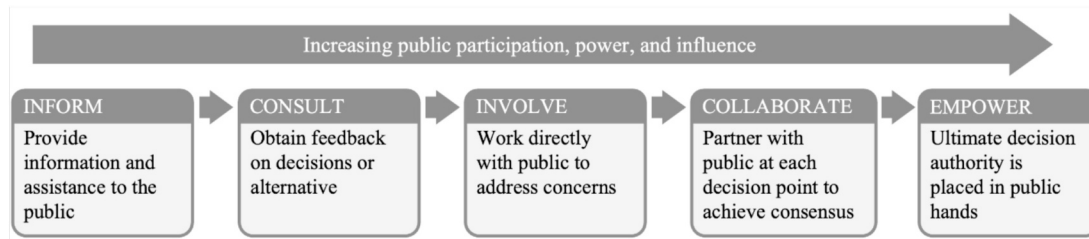


Fig. 2. Spectrum of public participation model; adapted from IAP2 [32].

participation and values-driven deliberation [43,44].

Community benefit mechanisms have emerged as a prominent tool for addressing distributive and procedural equity concerns associated with OSW development. These mechanisms often take the form of community benefit agreements (CBAs), negotiated funds, workforce and supply-chain investments, and commitments to mitigate local social and economic impacts. Bingham et al. [45] emphasize that CBAs in OSW are best understood as a diverse set of negotiated arrangements shaped by regulatory context, developer incentives, and community capacity. Their analysis highlights both the potential of CBAs to formalize benefits and their limitations, including uneven bargaining power, lack of enforcement mechanisms, and challenges in defining appropriate beneficiaries in offshore settings where impacts are diffuse.

Moreover, Cisneros-Montemayor et al. [46] caution that CBAs in emerging ocean sectors risk reproducing existing inequities if they prioritize economic growth over inclusive governance and long-term community well-being. They argue that equitable benefit-sharing arrangements require early engagement, transparency in how benefits are allocated, and attention to historically marginalized coastal and Indigenous communities. These principles are increasingly relevant as OSW expands along U.S. coastlines.

Insights from land-based wind research underscore these concerns. Kreider et al. [47] demonstrate that benefit mechanisms are unevenly distributed across geography, time, and sociodemographic groups, often favoring communities with greater institutional capacity. Further studies highlight how the design and framing of benefit mechanisms shape their social legitimacy. Aitken [48] show that community benefits for wind development are interpreted as compensation, inducement, or genuine benefit-sharing. Walker et al. [49] demonstrate that perceived procedural fairness and alignment with community priorities mediate whether benefit provision increases support for OSW projects.

Existing frameworks for community engagement in energy development emphasize inclusive participation, procedural fairness, and legitimacy of decision-making processes, with the expectation that these qualities support more durable social acceptance of projects [50]. Procedural fairness has been shown to be essential for recognizing local knowledge and ensuring that communities have meaningful roles in shaping energy decisions rather than serving as passive consultees [51]. While such principles are well established in the natural resource management literature through collaborative planning, co-production of knowledge, and adaptive decision-making, these approaches have rarely been translated into engagement frameworks tailored to wind energy, and even less so to OSW.

In a land-based wind context, engagement frameworks typically emphasize outcomes such as social acceptance or attitude formation rather than focusing on the design and timing of participatory processes [52–54]. Empirical research has demonstrated that opposition to wind projects is driven primarily by concerns over fairness, transparency, distribution of benefits and burdens, and exclusion from decision-making [55,56]. In response, a limited number of studies have proposed more process-oriented approaches. For example, Jami and Walsh [57] highlight the value of third party facilitation in land-based wind planning in Canada, while Howard [50] documents how regulatory compliance requirements in Australia can constrain engagement to

procedural checkboxes rather than meaningful participation.

Recent studies have begun to document how the structure of offshore leasing and permitting processes constrains opportunities for meaningful input, particularly for underrepresented groups [58]. Fisheries communities, for example, face practical and institutional barriers related to timing, technical complexity, and misalignment between regulatory processes and lived experiences, limiting their ability to influence OSW planning outcomes [59–61]. These dynamics underscore the need for engagement frameworks that are explicitly designed for offshore contexts and account for regulatory constraints, recognize place-based marine livelihoods, and operationalize principles of equity and procedural fairness across the OSW project lifecycle.

### 3. Methods

#### 3.1. Research approaches

Our research approach integrated multiple methods to contextualize and inform the development of a community-centered framework for OSW engagement (Fig. 3). It consisted of four primary components:

- A literature review to synthesize scholarship at the intersection of renewable energy development, governance structures, community engagement, and public participation.
- A community inventory to characterize the landscape of communities currently engaged in OSW processes on the U.S. West Coast.
- Peer learning workshops to facilitate interdisciplinary dialogue and institutional capacity-building around community-engaged research.
- Semi-structured interviews with OSW experts across sectors to empirically ground and refine framework components.

The research was guided by four key research questions:

1. What are the key elements of a community-engaged approach to OSW planning and development?
2. Who are the key decision-makers and communities currently engaged in OSW along the U.S. West Coast, and what are their perceived roles and responsibilities?
3. How do governance contexts facilitate or impede public involvement in OSW decision-making?
4. What opportunities exist at different points within the OSW planning and development process to incorporate community perspectives?

#### 3.2. Community inventory

To develop a preliminary understanding of who participates in West Coast OSW governance and how, we compiled a community inventory based on publicly available information. While there is no OSW currently operating on the West Coast, local communities, governments, and organizations are already participating in planning discussions. Understanding who these entities are, and what they are interested in, can help shape future engagement.

We cataloged communities' participation in BOEM and OSW developer outreach activities using several sources of information: public

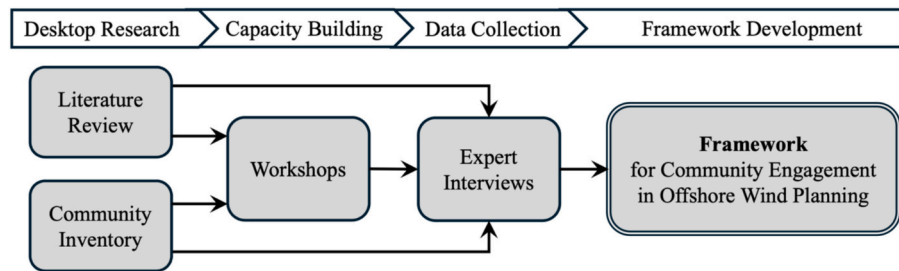


Fig. 3. Methodological approach to developing conceptual framework.

comments from four public comment periods, three engagement reports, two unsolicited lease requests, two membership lists for maritime coalitions, and one environmental assessment. All communities identified by these sources were included, and duplicate entries were merged to account for cases where one community participated in multiple activities. After identifying the list of communities, they were characterized by attributes such as geographic location, sectoral affiliation, thematic interests, and modes of engagement.

We gathered attribute data through targeted website searches and compiled them into a structured database. Community type was defined using two categorizations. The first identified whether the community was primarily geographic, thematic, or both. The second identified the sector, whether civic (e.g., non-profit organization), private (e.g., project developer, maritime business), or public (e.g., city, port, university). Periodic peer review and discussions were used to improve attribute categorizations. This inventory provides contextual grounding for the interview analysis and conceptual framework, but it is not a source of validated empirical data.

### 3.3. Peer workshops

We conducted two participatory workshops to foster interdisciplinary co-learning around community engagement in OSW development. The first was conducted virtually ( $n = 36$  participants), and the second was conducted as a hybrid event ( $n = 20$  participants). Workshops engaged researchers, practitioners, and policymakers across fields such as ecology, engineering, energy policy, and social science.

The workshops<sup>3</sup> were designed to (1) facilitate knowledge exchange about best practices for community engagement, (2) discuss challenges unique to OSW development, and (3) gather feedback on early iterations of the proposed framework. Structured dialogues, interactive sessions, and participant reflections informed revisions to the framework, ensuring its relevance across disciplinary perspectives.

### 3.4. Semi-structured interviews

To empirically ground the engagement framework, we conducted 25 semi-structured interviews with OSW experts between July and November 2023 (Fig. 4). Participants represented a purposive sample [62] across government agencies, NGOs, Tribal representatives (members and staff), developers, consultants, and researchers. We contacted 32 individuals, identified through professional networks and referrals by interviewees, who could provide perspectives on community engagement in the context of OSW. Among those contacted, 25 agreed to participate (78%), two declined, and five did not respond. Each interview lasted approximately one hour and was recorded and transcribed

<sup>3</sup> Although reporting formal analysis from the workshops is outside the scope of this paper, they provided foundational insights through peer-to-peer learning that shaped the interview sampling strategy, shaped the authors' perspectives, refined and validated our coding and analysis approach, and helped define critical community dimensions for the engagement framework.

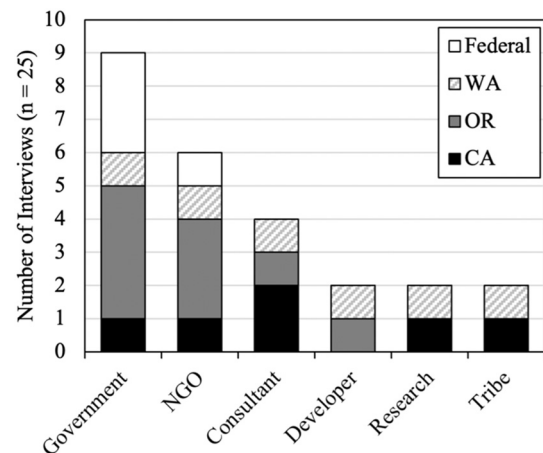


Fig. 4. Number of interviews from different sectors and locations. NGO indicates non-governmental organization.

with participant consent using Microsoft Teams. All interview protocols were reviewed and approved by the Pacific Northwest National Laboratory Institutional Review Board.

Interview questions explored three primary topical areas:

1. Participants' roles and experiences with OSW development;
2. Barriers and opportunities for community engagement in OSW; and
3. The relationship between OSW development and broader energy transitions.

Interview transcripts were analyzed using a qualitative coding approach that combined deductive and inductive strategies [63]. Initial codes were developed based on the research questions and interview topics, then refined through an iterative coding process. Four authors coded the same transcript and met to discuss code definitions and applications, which resulted in a consensus set of 16 thematic codes. We independently coded the remaining transcripts, meeting periodically to address emergent questions and challenges. Throughout this process, we wrote memos to provide a rationale for each code and track initial impressions. After all transcripts were coded, we assigned codes for thematic analysis with overlap among team members to account for differences in analytical frames. Team members were responsible for summarizing the major patterns and themes for their codes, including differences across sectors and geographies. As a team, we drew on these notes, coding memos, and exemplary quotes to construct narrative summaries that responded to the research questions. While we took steps to ensure reliable and valid interpretations, our interview sample is not intended to represent the full social landscape of OSW nor the perspectives and experiences of communities involved. That said, findings from the interview analysis provide ample data to directly inform the structure and content of the proposed community engagement framework.

## 4. Results and discussion

### 4.1. Framework for community-centered engagement in offshore wind

Our framework for community engagement in OSW development (Fig. 5) builds on interview findings and existing scholarly models of public participation. We extend previous models for public participation, drawing primarily from Arnstein's [30] ladder and the IAP2 spectrum [32], creating a structured framework for explicitly operationalizing community participation in OSW. Existing participation frameworks primarily categorize modes of engagement according to degrees of influence or empowerment, but they are largely decoupled from specific decision points, institutional authority, and regulatory constraints. In contrast, the framework presented here explicitly aligns levels of public participation with discrete stages of the OSW project lifecycle and the decisions that occur within them, clarifying where engagement can meaningfully shape outcomes versus where authority remains centralized.

Designed to be practical yet flexible, the framework integrates three core dimensions: (1) the OSW project lifecycle, (2) the spectrum of public participation, and (3) the context-specific community and governance factors that shape engagement outcomes. The framework aligns six core phases of the OSW project lifecycle (conception, planning, siting, implementation, operation, and decommissioning) with tiers of public participation: inform, consult, involve, collaborate, and empower [32]. The six-phase lifecycle for OSW reflects engagement-relevant decision points rather than mapping one-to-one with the BOEM leasing and permitting process. Several BOEM phases consolidate activities that are disaggregated here to highlight their importance for community engagement. This matrix-based structure emphasizes that engagement mechanisms must be sensitive to processes, local contexts, values, and capacities. Early engagement, particularly in the conception and planning phases before leasing begins, is critical for establishing trust, legitimacy, and social license [39,64–66]. Research across energy and environmental governance suggests that decisions made without community input early on are more likely to encounter opposition later [52,67,68]. Further, public participation processes that are viewed as cursory, insincere, or unaligned with community values and capacities are likely to catalyze opposition to development [5,69].

Engagement can serve both instrumental and normative purposes

[70], and the framework aims to reconcile tensions inherent in working within a prescribed regulatory process that limits public involvement with shifting expectations for environmental governance to provide greater community participation. To effectively achieve this, communities need timely, accessible information and genuine opportunities to shape project visioning long before decisions are finalized. While the multi-phase federal leasing and permitting process for OSW can span several years, key decision points, such as wind energy area designations and lease auctions, are often made on condensed timelines with limited windows for public input. The framework therefore emphasizes timing as a central design principle: opportunities for meaningful engagement typically diminish as projects progress, yet most communities only become aware of proposals later in the process [25,71]. Although we avoid prescribing fixed timeframes for each phase, the principle of "early and often" is embedded throughout the framework.

Operationalizing this framework requires attention to contextual factors that shape engagement success or failure. These include community characteristics (e.g., demographics, culture, history, values, etc.), legacies of mistrust toward federal agencies, varying local capacities, and jurisdictional complexity. Example mechanisms illustrate the diversity of engagement approaches but are not exhaustive or universally applicable. In the "inform" tier of public participation, mechanisms involve one-way information sharing such as social media updates, advertisements, educational brochures, or reports. For example, during early project development, the framework identifies social media or public service announcements which might introduce the project to the community, while maintenance updates or progress reports may be shared during construction and operation. While it can be efficient and effective when sustained public input is not needed to meet engagement goals, inform-based engagement is often criticized for its lack of responsiveness [72].

Importantly, the framework moves beyond participation quantity to emphasize participatory influence – i.e., the degree to which engagement efforts enable community input to shape decisions. Without meaningful influence, participation risks being perceived as a means to an end (e.g., regulatory compliance) rather than genuine [69]. This critique echoes broader findings in participatory governance, which emphasize the need for institutional mechanisms that translate input into outcomes [7,73,74]. Therefore, the framework enables the identification of structured mechanisms by decision-makers that both solicit

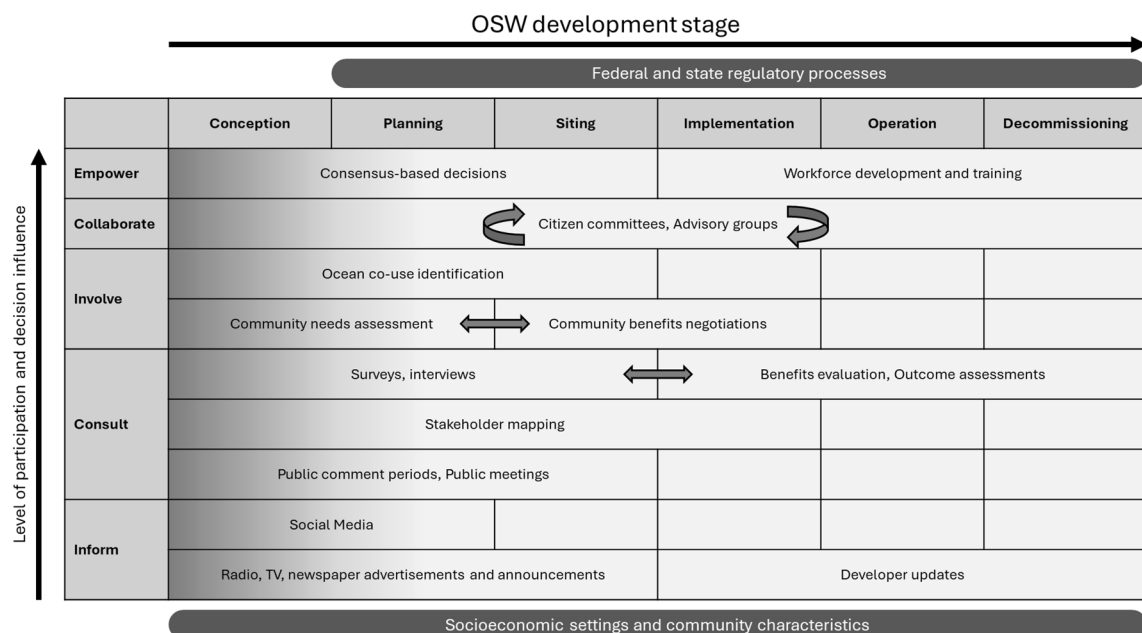


Fig. 5. Framework for community engagement in offshore wind.

input and embed it into decision-making processes [33,34,65,75]. Such mechanisms might include co-designed working groups, community advisory councils, and participatory mapping tools. These types of engagement mechanisms fall further along the participation spectrum (e.g., involve, collaborate, empower) and may be useful for integrating local knowledge into development decisions [39,76]. For example, involving fishers in marine spatial planning activities can help clarify tradeoffs between conflicting ocean uses, improve transparency, and quantify the impact of competing alternatives [77].

The framework also supports adaptive governance by encouraging feedback and iterative engagement throughout the development lifecycle. Tools such as marine spatial planning and scenario-based dialogue can help communities visualize trade-offs and build shared understanding of spatial conflicts [65,77]. Furthermore, by making space for locally defined values, the framework recognizes that equity and justice are as essential to engagement as technical soundness [17,40].

The utility of this framework extends across institutional scales. Developers can use it to identify social risks and calibrate their outreach strategies. Federal and state agencies, including BOEM, can integrate the framework into public participation plans and permitting guidelines, as well as communicate when engagement goes above and beyond regulatory mandates. Local governments, NGOs, and Tribal representatives can use it to advocate for more inclusive and just processes. Further, the framework foregrounds issues of energy justice as criteria for evaluating engagement design. Rather than treating participation as a uniform spectrum applied equally across actors, the framework allows communities and decision-makers to differentiate engagement pathways based on decision authority, transparency, place-based knowledge, and diverse values. Ultimately, by offering a structured yet adaptable guide, the framework seeks to reconcile top-down energy policy goals with bottom-up community organizing, helping to mitigate project risks, strengthen legitimacy, and advance place-based energy solutions.

The framework provides a conceptual basis for structuring community engagement in OSW, but its relevance and utility are shaped by how real-world actors interpret and implement engagement in practice. To further ground the framework in lived experience, we present findings from 25 interviews with subject matter experts across sectors and geographies. These interviews reveal how roles, expectations, and institutional constraints affect the delivery of engagement on the ground and point to critical tensions and opportunities across the OSW lifecycle.

#### 4.2. Inventory of communities engaged in offshore wind

We compiled an inventory of 432 communities who participated in BOEM and OSW developer outreach activities across the West Coast from 2013 to 2022 (Fig. 6). The type of communities that engaged and how was dependent on the state and status of OSW in that state. Overall, public sector entities (e.g., cities and ports) represent the largest proportion of engaged communities. While public and private (e.g., developer, business) sectors showed similar levels of engagement across the West Coast, California had more civic (e.g., nonprofit) sector and Tribal engagement. In turn, California had more engagement from regional or county-level groups, whereas Oregon and Washington had more engagement from state-based entities. Engagement also differed by thematic interest or mission. Community engagement in California was driven by conservation and political entities, whereas fishing and maritime entities made up a larger proportion of community engagement in Washington and Oregon. The thematic interests of communities engaging in formal, mandated engagement, such as public comments, were like those engaged in more informal industry outreach; however, political entities tended to engage less in formal engagement, and energy companies tended to engage more. While this inventory is based on publicly available information and needs validation, it provides important context for differences in developmental contexts and place-based engagement opportunities and needs across the West Coast.

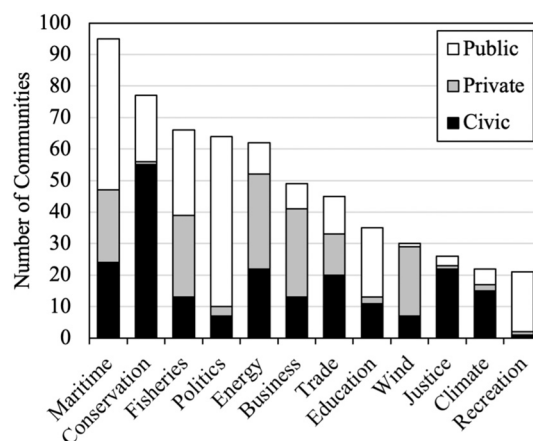


Fig. 6. Number of communities by type (public, private, civic) and interest (categories along the x-axis). Public communities are comprised of public sector entities such as cities and ports. Private communities are private sector entities such as developers and industries. Civic communities include non-profit organizations. See footnote 1 for definition of community.

#### 4.3. Interviews with offshore wind experts

This section presents the core findings from 25 semi-structured interviews, which form the empirical foundation of our proposed framework for community-centered OSW engagement. Participants reflected a wide range of perspectives and levels of support or skepticism toward OSW, offering insights shaped by their professional roles, geographic contexts, and direct experiences with engagement processes.

Several cross-cutting themes emerged from these interviews, including the need for stronger alignment between federal and state governance, earlier and more consistent community engagement, and clearer roles and expectations among all actors involved. Interviewees also highlighted persistent barriers, such as lack of transparency, misinformation, and limited local capacity, as well as promising strategies for fostering trust, collaboration, and inclusive decision-making. The sections below elaborate on these findings through four central themes: understanding the community, roles and responsibilities, barriers and enablers to effective engagement, and governance and policy considerations.

##### 4.3.1. Understanding the community

Effective community engagement in OSW development on the U.S. West Coast hinges on understanding the diverse and context-specific characteristics of affected communities. Communities are not monolithic; they include geographically bound populations as well as communities of practice such as fishers and conservation organizations. Interviewees emphasized that these groups bring distinct place-based experiences, socio-economic conditions, and forms of expertise to engagement processes. As one California-based OSW researcher observed, “you’ve got your coastal residents... But then you’ve got kind of communities of practice... affected groups that have a certain stake in the process.”

Historical and institutional contexts further shape how communities engage with OSW. In some cases, legacies of extractive resource development and past energy projects contribute to skepticism and mistrust toward new infrastructure. These dynamics are compounded in rural communities with limited capacity to engage in technically complex regulatory processes. As one Oregon official noted, “there’s a lot of limited capacity to respond to political processes and timelines that are just very fast.” For such communities, the pace and structure of OSW planning can reinforce existing inequities.

Distinct considerations also apply to communities with unique rights, livelihoods, and cultural ties to marine spaces. Tribal

representatives emphasized the need for processes that reflect their sovereign status and intergenerational stewardship responsibilities. “We [Tribe] never sell all of our cultural values and our heart and soul for money,” stated one Tribal member, highlighting a general resistance to approaches that frame engagement primarily in economic terms. For fishing communities, concerns centered on livelihoods, access to resources, and cultural identity rooted in generational practices. These issues were particularly salient in Oregon, where, as one developer noted, “Fishing makes up a much greater percentage of Oregon’s economy than fishing does in California,” contributing to greater visibility and influence of fishing communities in OSW planning.

#### 4.3.2. Roles and responsibilities

Interviewees identified a wide range of roles in the OSW engagement ecosystem, encompassing advocacy, education, convening, bridging, and fulfilling official duties. Table 1 illustrates the typology of engagement roles identified through the interviews. NGOs, consultants, universities, and SeaGrant programs often act as trusted intermediaries or “bridgers,” connecting state and federal actors to local communities. These third-party roles were widely viewed as essential for fostering trust and delivering credible information, supporting findings from previous research [57,78]. One interviewee emphasized the absence of these roles, noting, “That trusted voice, neutral third party... there’s an absence of that voice in these conversations.” In general, there is a perception that local governmental representatives are more trusted by local communities than state or federal government, indicating a key role for local government in providing information and building participation at the community level. However, municipalities and local governments can be sidestepped in the formal leasing and permitting process, leading to frustration as a primary point of contact with local community members looking for reliable information and opportunities to participate in the process [57].

The engagement experience is shaped by how well roles are understood, coordinated, and operationalized through formal (e.g., participation through public comment, public meetings, or working groups) or informal (e.g., participation in conversations) engagement mechanisms (Fig. 5). These engagements can serve different functions, such as compliance, communication, education, relationship building, negotiation, and planning. Inconsistencies between role expectations and engagement experiences can impact who engages, how they engage, and what impact they have [7]. Examining this interaction between expectations and experiences is critical to understanding communities’ access to decision-making opportunities, standing, and influence [79]. A common refrain was that conveners must “show up and be there” and “be willing to be vulnerable and uncomfortable”, especially in spaces where participants may be oppositional. Conveners and educators may also help navigate information asymmetries and provide materials in accessible formats: “Sometimes we have expectations of stakeholders that they be super knowledgeable, and I think that’s unrealistic,” one developer remarked.

A recurring challenge related to roles and responsibilities across interviews was the misalignment of expectations between communities and institutional actors. Participants stressed that engagement outcomes are shaped not only by who participates, but also by whether those participants understand the purpose, scope, and limits of the

engagement. “There are opportunities to have meaningful, actual engagement if you set those expectations in the front end,” noted one Washington-based NGO representative. Others echoed the need for transparency and consistency: “Managing expectations at the start so that stakeholders understand their role and the potential outcomes, timelines, and impacts originating from the engagement.”

Unmet expectations around engagement format and purpose were a recurring source of frustration. One California-based consultant recalled a public meeting where attendees believed they would be able to offer oral comments into the official record: “They expected to be able to speak their mind and have their voice heard, but instead there was a single computer in the back of the room where they could type a comment. It felt like a bait and switch”. This mismatch between community expectations and agency procedure left participants feeling ignored and diminished trust in the process. Another interviewee noted that similar breakdowns can occur when conveners prioritize technical presentations over dialogue: “I’ve seen countless meetings go awry because the presenter felt it was more important for them to put out accurate information than to allow time for the voices in the room to be heard.”

These examples underscore how mismatches between procedural setup and public expectations, particularly about being heard, can backfire, reinforcing perceptions of exclusion or insincerity. It also raises critical questions about who is responsible for clarifying the structure and intent of engagement events. Without early and honest communication about what decisions are open to public influence, engagement processes risk generating confusion and frustration. “Sometimes it’s too much with not enough time: hurry up and rush, and then we don’t hear anything for six months,” shared one Oregon official. “And then it’s like what happened to all that effort?” Within these prescribed forums, there may be a range of ways in which the public can participate. Being clear about the intent of a public meeting, for example, can provide improved transparency for attendees. From a broader perspective, different communities may have different “expectations” on the justification or salience of offshore wind, or how it is relevant to their community.

The interviews further revealed that communities often conflate the roles of federal agencies like BOEM and private developers, leading to misplaced expectations and unclear accountability. This confusion points to the need for clearly articulated roles across agencies and actors: who convenes, who informs, who consults, and who ultimately decides. “There’s just a lot of misinformation about what BOEM’s process is, how much authority they have, and what BOEM actually does. BOEM’s role is to identify wind energy areas, identify areas for lease and manage those leases; they’re not the ones developing [the project]”, clarified one Oregon consultant. State governments have more of a role in the Intergovernmental Renewable Energy Task Forces in California and Oregon, though they are often overburdened with other responsibilities and limited resources, as one government official from Oregon stated: “We never want to turn down an opportunity to participate, but we’ve already got three other things in line for that day... so that’s been challenging.”

These findings align with broader research on environmental governance, which shows that managing expectations is not a peripheral concern, but a core component of building procedural legitimacy and avoiding public backlash [39,57,80]. Expectation-setting must be a deliberate, shared responsibility across conveners, regulators, and developers. This includes not only providing timely and accurate information but ensuring that engagement methods are clearly structured to match community norms, capacities, and assumptions about voice and influence.

When expectations are clearly communicated and engagement is matched to context, outcomes are more likely to be perceived as fair and legitimate, even if all community concerns are not resolved [81]. Conversely, ambiguous or mismatched roles and methods can lead to disengagement, mistrust, or active resistance. Clarifying and aligning roles and responsibilities is thus a foundational step in advancing more

**Table 1**  
Engagement roles described by interviewees.

Role	Description
Advocate	Promote a community, resource, or policy position
Bridger	Facilitate the neutral exchange of interests and information
Convenor	Bring people together to address an issue or opportunity
Educator	Synthesize and present information for diverse audiences
Official	Fulfill legal duties and help others navigate the regulatory process

Note: Many participants in the OSW development process fulfill multiple roles.

equitable, effective, and community-centered OSW governance that achieves its intended energy objectives.

#### 4.3.3. Barriers and enablers to effective community engagement

Barriers to community engagement emerged as a dominant theme across interviews, encompassing logistical, procedural, and relational challenges. A major issue was the lack of early and consistent engagement opportunities. Government agencies are widely seen as opaque, inaccessible, and reactive rather than proactive in their engagement strategies. As one consultant noted, “It’s like a black box where BOEM takes comments and makes the decisions behind the scenes.” Federal and state agencies often lack the capacity or coordination mechanisms to engage communities meaningfully in each phase of the OSW lifecycle as community concerns evolve. Interviewees pointed to gaps in timing, resources, and incentives. For instance, developers have little motivation to build relationships prior to leasing awards, which can fracture trust: “There’s no incentive for [the] developer to put in the work since they may lose the auction.”

Logistical barriers also include scheduling conflicts, particularly for working fishers, digital access issues in rural areas, and insufficient funding for outreach materials. Structural barriers persist for non-federally recognized Tribes and small fishing operations, who may lack a formal seat at the table. Compounding these issues is the prevalence of misinformation and inconsistent messaging, which many interviewees cited as a major barrier to effective engagement. The complex, technical nature of OSW planning, combined with a lack of easily digestible, centralized resources, has left communities vulnerable to misinformation and speculation. As one consultant explained, “There were incongruencies between the way the developer approached the fishing industry and coastal communities and the way they described activities in the formal process. And there was no one there to translate the differences. It led to a complete revolt.” Further, the fishing community expressed a hesitancy to engage in OSW conversations based on past experiences, as noted by an NGO representative: “I think there’s a lot of uncaptured information in fishermen’s heads that’s not given proper or sufficient [consideration]... Why am I showing up to these meetings when I could be fishing?”

The need for information emerged as a barrier in our interviews. Without clear, credible information sources, community members often rely on hearsay or unverified narratives, which can escalate opposition and distrust. One academic lamented, “People are moving in to fill in information. I don’t know who’s trusted anymore.” The fragmentation of communication channels between developers, regulators, and communities, combined with inconsistent or overly technical information, contributed to a sense of alienation and further entrenched skepticism toward decision-makers. Other fishing representatives expressed what they perceived as a double standard applied to OSW and other previous developments, where the standards of evidence for moving forward with OSW are not yet clear. One NGO respondent used the analogy of “trying to build the plane as we fly it”, underscoring the need to approach communities as partners in decision-making rather than coming to the table with outcomes predetermined.

Conversely, successful engagement was characterized by early involvement, responsiveness to feedback, and the use of trusted local entities, such as NGOs, SeaGrant offices, and local fishing commissions, to convene dialogue and interpret complex technical information in accessible ways. Interviewees noted that when developers and regulators attended existing community forums or co-hosted events with local leaders, participation rates improved, and discussions were perceived as more authentic and grounded in local context. The use of consensus-based decision-making processes helped facilitate trust and buy-in among diverse communities, particularly when paired with advisory groups or working groups that had clearly defined influence in decision-making.

Marine spatial planning tools were cited as useful for helping communities visualize trade-offs and understand the spatial footprint of

proposed projects in relation to other ocean uses, such as fishing, shipping, and conservation zones. One respondent highlighted a successful case in California where interactive mapping tools allowed fishers to provide input on proposed lease areas before auctions occurred, resulting in a more transparent and negotiated process. As one interviewee put it, “What worked well was when people could see that their input actually changed something, like the boundaries of a lease area or the timing of a survey. That makes people feel like they matter.” Another example in Oregon showed how WEAs can be amended based on input from the fishing community: “...because of the input received from... the fishing community, BOEM drafted the WEAs, gathered input on those, and winnowed them down further, and they hadn’t done that in the past.” This highlights how relatively minor procedural adjustments can affect the process in meaningful ways while incrementally building stronger relationships with affected communities.

#### 4.3.4. Offshore wind governance and policy

Governance challenges emerged as one of the most significant themes across interviews, revealing a fragmented and often misaligned policy environment for OSW development along the West Coast. Federal, state, and local governments share overlapping yet often poorly coordinated jurisdictional responsibilities, creating gaps in engagement and decision-making authority. Respondents frequently described the OSW governance system as opaque, rigid, and insufficiently adaptable to the socio-political realities of coastal communities. As one developer remarked, “Critiquing the [BOEM] process is kind of like a Sunday afternoon exercise for anyone that’s vaguely opposed to offshore wind”.

The perception that formal processes are inaccessible, legally constrained, and insensitive to local concerns reinforces public skepticism and alienation. While BOEM retains leasing authority under the Energy Policy Act of 2005, states exert influence through Coastal Zone Management Act (CZMA) consistency reviews. Yet, interviewees highlighted that the effectiveness of this influence varies substantially by state. California’s proactive leadership, including stackable point systems in the auction process and legislative prioritization of OSW, has fostered inter-agency coordination and momentum at the local level. In contrast, Oregon’s hesitant state leadership created what one NGO respondent described as a “rudderless voyage,” where “mid-level bureaucrats dominate because no one at the top was setting the direction”.

Washington, still in early planning stages, offers both challenges and opportunities. The state has prioritized Tribal engagement and a slower, more methodical approach. However, interviewees noted a governance vacuum where it’s often unclear who is setting goals and making decisions. Tribal voices are central to governance discussions in Washington, with interviewees highlighting that impacts to marine ecosystems extend beyond state borders, pointing toward implications for both sovereign treaty rights and ocean wildlife: “...everybody needs to be on the same page with their decision making and what they’re doing to the ocean. Because what they do in California will affect Washington, and what we do in Washington will affect Alaska.” Applying a justice-informed lens reveals how engagement requirements differ across communities. For Tribal Nations, early alignment and appropriate consultation tied to siting is critical, as later-stage efforts may be insufficient to address concerns related to cultural resources, treaty rights, or sovereignty. Fisheries communities require engagement that is not only early but ongoing, given the evolving nature of spatial conflicts and economic impacts across the project lifecycle.

At the federal level, respondents called for improved coordination between BOEM and agencies such as the Department of Energy and Bureau of Indian Affairs (BIA). Respondents indicated that current bureaucratic structures replicate legacies of oil and gas development and often fail to address procedural fairness. Respondents criticized structural barriers that limit community participation. BOEM-convened task force meetings can only formally include government representatives, excluding key entities like non-federally recognized Tribes and fisheries groups. As one interviewee explained, “That creates a huge conflict

because the fishing industry isn't a government entity."

Participants also flagged the linear, rigid structure of the regulatory process. "Each step is one-way: you move forward, and there's no going back," noted one respondent. This lack of adaptive feedback mirrors critiques in the literature on participatory environmental governance [17,19]. Traditional, top-down environmental decision-making lacks mechanisms to allow for iterative input and revision, leading to calls for adaptive governance in natural resource management [82–85]. Adaptive management centralizes continuous learning, reflexivity, and flexibility, which are essential for managing complex socio-ecological systems under uncertainty [86,87].

Tribal sovereignty remains insufficiently addressed within current governance structures. The lack of adequate integration of Tribal input across agencies like BOEM, BIA, and NOAA can lead to conflict and reduced trust. One Tribal member noted the confounding nature of institutional silos: "That's one of those bureaucratic head scratchers, where the people doing energy are not connected to the Department of Energy". These gaps have material consequences, not just symbolic ones. Participants underscored that failures to respect Tribal sovereignty can erode trust, trigger opposition, and reinforce legacies of extraction and exclusion that have historically marginalized Indigenous communities in marine governance [88].

Despite critiques, interviewees suggested concrete opportunities for improvement. Several proposed adapting the fisheries management council model under the Magnuson-Stevens Act to OSW governance: "People are familiar with council processes [for fisheries], but offshore wind doesn't have that structure yet," observed one participant. Strengthening cross-agency collaboration, particularly mandating cooperation between BOEM and BIA, was another recurring recommendation. "There should be a requirement for BOEM to work with the Bureau of Indian Affairs, not the other way around," one respondent argued. As one interviewee concluded, the future of OSW hinges on leadership willing to invest in authentic engagement: "Without leadership willing to own the decision... this whole thing is going to stall out again." These interview sentiments underscored the need to connect broader marine governance with on-the-ground complexities of engaging with diverse communities through mechanisms like spatial planning [89].

The results from the interviews helped to inform the development of our framework for community-centered engagement in OSW planning and development. By elucidating perceived and lived barriers to effective engagement, interviewees highlighted opportunities for more collaborative governance, such as consensus-based decision-making, ocean co-use identification, and community advisory groups (Fig. 5). Reflecting on the actors and institutions participating in OSW planning and development helped to strengthen our understanding of key decision-makers and communities, their current engagement activities, and their potential roles and responsibilities in increasing the participation, power, and influence of communities in OSW on the West Coast.

#### 4.4. Limitations

Although we were rigorous in our research approach, our interview sample is not intended to be comprehensive or representative of the full social landscape of OSW or the perspectives and experiences of all affected parties. Due to our sampling strategy, governmental respondents are overrepresented, while tribal, research, and developer perspectives are less represented. Applying our qualitative findings to other geographies and contexts should be done cautiously.

While our framework identifies engagement design principles and decision points, it does not assess the causal effects of various engagement strategies or link empirically to particular social or project outcomes, such as improved trust, reduced conflict or litigation, or more equitable decisions. The framework is informed primarily by subject matter experts, which may reflect institutional knowledge and emphasize governance constraints that differ from the lived experiences of

communities affected by OSW development. Although the framework is grounded in OSW governance, its applicability to other technologies and contexts should be the subject of further research.

Additionally, this research acknowledges the sovereignty of Tribal Nations and their treaty-reserved rights. Our discussion of community engagement does not aim to provide guidance on required government-to-government consultation. While Tribal members and staff contributed to this research, the diversity of Tribal cultures and perspectives cannot be fully represented here. Formal consultation processes and the elevation of Indigenous Knowledge must be central to ensuring Tribal sovereignty, self-determination, and equitable decision-making in energy development.

## 5. Conclusions and policy implications

This study offers a grounded, empirical framework for community-centered engagement in OSW development, with specific attention to the distinct social, cultural, and political contexts of the U.S. West Coast. Our results demonstrate that going beyond perfunctory consultation involves integrating community engagement throughout all stages of the OSW lifecycle, from pre-planning through decommissioning.

This framework provides inspiration and guidance for different actors and entities involved in OSW. For state governments, it identifies mechanisms to engage communities before initiating the BOEM process. For BOEM and other federal agencies involved in offshore energy development, it suggests informal adaptations to engagement strategies, such as incorporating pre-planning phases like scoping and ideation. Developers can use the framework to evaluate risk and identify locations where social acceptance is more likely to be obtained. By clarifying its role and investing in transparent, ongoing engagement each actor can build the trust that fosters mutually beneficial outcomes.

Policy implications of this work include the need for stronger support for co-management models that enable shared authority and stewardship between government agencies and local communities, especially in areas with longstanding cultural and economic connections to marine resources and livelihoods. Strengthening inter-agency coordination mechanisms can reduce redundancy, clarify roles, and help streamline engagement processes, ensuring that community voices are not lost in jurisdictional confusion. For example, state task forces or regional coordinating bodies with sustained community representation could help bridge the gap between industry, commercial interests, and local values. More broadly, the findings underscore that developing new energy resources requires not only technical innovation but also social innovation in governance, equity, and participation.

Importantly, while fostering participation through well-designed engagement is essential, it is not sufficient to ensure trust and legitimacy between communities and decision-makers. The effectiveness of engagement may depend on whether it is designed to address power dynamics, redistribute decision-making authority, or meaningfully incorporate diverse and representative community perspectives. As Bennett and Satterfield [16] argue, there is value in critically examining how governance structures align with broader social objectives. OSW presents an opportunity to explore new models of engagement that reflect the complex dynamics of energy development. However, shifting federal priorities create additional policy uncertainty and may further constrain momentum for community-centered OSW development, accentuating the importance of resilient, state-led, and community-driven strategies to pursue resilient energy futures.

Future research should continue refining and testing this framework across diverse geographic, institutional, and community contexts. Comparative case studies of engagement in early-stage versus post-lease OSW projects could help assess how timing and process design affect outcomes. Additional work is also needed to evaluate how different engagement mechanisms perform in practice, particularly in relation to participation rates, public satisfaction, and influence on project decisions. Quantitative and mixed-method approaches could complement

the qualitative insights presented here by tracking the efficacy and consistency of engagement over time against key success metrics. Finally, further inquiry into how inter-agency coordination and developer-community interactions evolve across phases of OSW development would offer valuable insights for both practice and policy.

### CRedit authorship contribution statement

**Chris D. Henderson:** Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Conceptualization. **Kevin P. Duffy:** Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Conceptualization. **Deborah Rose:** Writing – review & editing, Methodology, Investigation, Formal analysis. **Mark Severy:** Writing – original draft, Visualization, Funding acquisition, Data curation, Conceptualization. **Mikaela C. Freeman:** Writing – review & editing, Methodology, Investigation, Formal analysis. **Joseph Haxel:** Writing – review & editing, Supervision, Resources, Funding acquisition, Conceptualization. **Laura Nelson:** Resources, Methodology, Conceptualization. **Christopher Rumble:** Writing – review & editing, Formal analysis, Conceptualization. **Diana Rucavado Rojas:** Writing – review & editing. **Maxwell Perkins:** Formal analysis. **Katie Arkema:** Writing – review & editing, Supervision, Resources, Project administration, Methodology, Funding acquisition, Conceptualization.

### Declaration of Generative AI and AI-assisted technologies in the writing process

During the final phase of preparation of this work, the authors used ChatGPT (GPT-5.2) to reduce word count and improve the readability and language in select sections of the manuscript. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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### Data availability

The data that has been used is confidential.

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