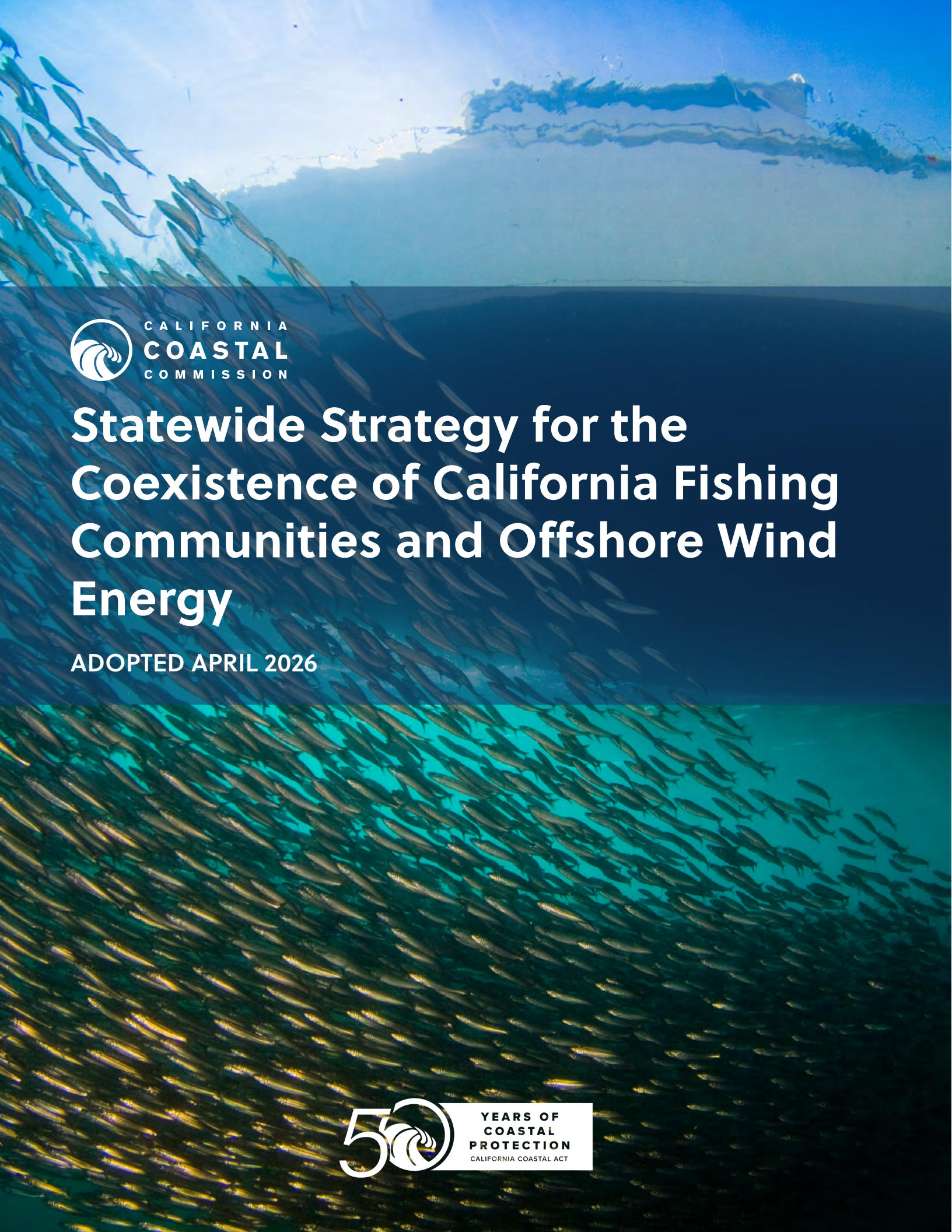

CALIFORNIA COASTAL COMMISSION

Statewide Strategy for the Coexistence of California Fishing Communities and Offshore Wind Energy

ADOPTED APRIL 2026

50 YEARS OF COASTAL PROTECTION
CALIFORNIA COASTAL ACT

To foster connection with the state's coast and ocean, the California Coastal Commission's Public Education Program offers three annual contests: Coastal Art & Poetry Contest for students in kindergarten through 12th grade, Climate Storytelling Contest for students in middle and high school, and the Ocean & Coastal Amateur Photography Contest for all ages.

Photographs and Artworks in This Report

Front cover:	Brian Friedman, Large School of Mackerel Under Sundiver Dive Boat (2011)
Chapter 1 cover:	Douglas Klug, The Greeter (2023)
Chapter 2 cover:	Carol Walker, Surf Fishing (2001)
Chapter 3 cover:	Chrystal Yen, California Dusk (2011)
Chapter 4 cover:	Sara Jain, The Serene Coast (2014)
Chapter 5 cover:	Amy Wann, California Spiny Lobster in the Coral (2010)
Chapter 6 cover:	Ronnie Goyette, Breaching Humpback Whale (2021)
Chapter 7 cover:	David Schuessler, Monterey Kelp Forest (2025)

Acknowledgements

The development of the Statewide Strategy for the Coexistence of California Fishing Communities and Offshore Wind would not have been possible without the dedication, insights, and collaboration of the California Offshore Wind Energy Fisheries Working Group. We extend our sincere appreciation for the time and thought each member contributed throughout this process. Their collective experience, perspectives, and problem solving were essential in shaping this Statewide Strategy.

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The Statewide Strategy for the Coexistence of California Fishing Communities and Offshore Wind was unanimously adopted by the California Coastal Commission on April 16, 2026.

Commissioners:	Megan Harmon (Chair), Dr. Caryl Hart (Vice Chair), Dayna Bochco, Linda Escalante, Raymond A. Jackson, Ariel Kelley, Jamie Lee, Christopher Lopez, Susan Lowenberg, Ann Notthoff, Jose Preciado, Mike Wilson
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Ex Officio Members:	Wade Crowfoot/Jenn Eckerle/Christopher Calfee, Malia M. Cohen/Kristina Kunkel, Toks Omishakin/Scott Williams/Jeremiah Ketchum

How to Use This Document

This document is guidance; it is not regulations.

This Statewide Strategy is guidance and not a regulatory document or legal standard of review for the actions that the Commission or local governments may take under the Coastal Act or California Coastal Management Program. Instead, this Statewide Strategy fulfills the Commission's duty, pursuant to Public Resources Code Section 30616, to convene a working group and develop a Statewide Strategy for ensuring that offshore wind energy projects avoid and minimize impacts to ocean fisheries to the maximum extent possible; avoid, minimize, and mitigate impacts to fishing communities and fisheries in a manner that prioritizes fishery productivity, viability, and long-term resilience; and fairly and reasonably compensate persons engaged in the commercial and recreational fishing industries and tribal fisheries for economic impacts to ocean fisheries resulting from offshore wind energy projects.

This document is dynamic; it is not static.

This Statewide Strategy is a living document that can be altered and amended by the Commission to improve its efficacy in supporting coexistence between fishing communities and the offshore wind industry. The Commission will review the Statewide Strategy, as needed, to determine if any changes to it are necessary as more experience and understanding are gained around floating offshore wind development in California and elsewhere. Should the Commission determine that changes to the Statewide Strategy are necessary to achieve its purpose, staff may propose that the Commission authorize staff to engage in a process with the Working Group to develop recommendations for revisions.

This document is a statewide framework; it is not a project-specific checklist.

Since this document is intended for use across California, it does not focus on any single geographic area or offshore wind development project. As such, not all content will be relevant to every user. Readers should interpret the guidance as applicable where appropriate, rather than as a prescriptive list of required actions.

Reading Tips

- The introduction contains background information and context that is important to all subsequent chapters and should therefore be read first.
- Each chapter of the Statewide Strategy builds upon the previous to form a comprehensive approach for avoiding, minimizing, and mitigating the impacts of offshore wind energy development on fishing communities. Chapters are not intended to stand alone.

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ABBREVIATIONS

AIS	Automatic Identification Systems
AMMM(s)	Avoidance, Minimization, and Mitigation Measure(s)
BIA	Bureau of Indian Affairs
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CBI	Consensus Building Institute
CCMP	California Coastal Management Plan
CDFW	California Department of Fish and Wildlife
CDP	Coastal Development Permit
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CFGC	California Fish and Game Commission
CFR	Code of Federal Regulations
Commission	California Coastal Commission
COP	Construction and Operations Plan
CPFV	Commercial Passenger Fishing Vessel
CSLC	California State Lands Commission
CZMA	Coastal Zone Management Act
DIER	Draft Environmental Impact Report
DEIS	Draft Environmental Impact Statement
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FCP	Fisheries Communication Plan
FLiDAR	Floating Light Detection and Ranging
GPS	Global Positioning System

JOFLO	Joint Oil and Fisheries Liaison Office
K&W	Kearns and West
MCC	Marine Coordination Center
Metocean	Meteorology and Oceanography
NAHC	Native American Heritage Commission
NATCP	Native American Tribes Communication Plan
NEPA	National Environmental Policy Act
NM	Nautical Mile
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
OCS	Outer Continental Shelf
OFL	Onboard/Offshore Fisheries Liaison
OPC	California Ocean Protection Council
OSW	Offshore Wind
PATON	Private Aid to Navigation
PEIS	Programmatic Environmental Impact Statement
PRC	California Public Resources Code
RAE	Regional Administrative Entity
ROD	Record of Decision
RRC	Regional Resiliency Committee
SB	Senate Bill
SCP	Scientific Collecting Permit
USCG	United States Coast Guard
VHF	Very High Frequency
VMS	Vessel Monitoring System
WEA	Wind Energy Area

Executive Summary

California has identified offshore wind energy as a critical component of its strategy to reduce greenhouse gas emissions, achieve carbon neutrality, and support long-term climate goals. Five offshore wind energy leases located in federal waters off the coast of California have been issued by the Bureau of Ocean Energy Management (BOEM): two offshore of Humboldt County, and three offshore of San Luis Obispo County. Development of offshore wind energy would occur alongside existing uses of the ocean, including tribal, commercial, and recreational fishing.

California's tribal, commercial, and recreational fisheries are integral to the state's food security, economy, culture, and coastal identity. In recognition of this, Condition 7c of the Coastal Commission's concurrences with BOEM's lease sales, and State Senate Bill 286 (2023) called for the development of the Statewide Strategy for the Coexistence of California Fishing Communities and Offshore Wind Energy (Statewide Strategy).[1,2]

The Statewide Strategy provides a guiding framework for offshore wind development to proceed in a manner that recognizes and protects California's fishing communities.[3] It presents a roadmap for proposed offshore wind projects to become consistent with California's relevant Coastal Act policies that recognize and protect marine resources, commercial and recreational fishing industries, tribal fisheries and associated facilities and activities. While the Statewide Strategy is not a regulatory document or an enforceable policy of the Coastal Act, it is a tool offshore wind energy developers use on a project-by-project basis when planning and preparing a Construction and Operations Plan (COP) and consistency certification and coastal development permit submittal for Commission review. Not all measures and best practices of the Statewide Strategy may be applicable to a specific project.

The Statewide Strategy was developed by the California Offshore Wind Energy Fisheries Working Group (Working Group) which includes representatives from California Native American Tribes, fishing sectors, seafood processors, offshore wind leaseholders, and state and federal agencies.

To support the coexistence of offshore wind projects and fishing communities, the Statewide Strategy addresses key issues identified in Senate Bill 286, which include:

- Best practices for communication

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[1] BOEM's lease sales were considered under consistency determinations CD-0001-22 (Humboldt Wind Energy Area) and CD-0004-22 (Morro Bay Wind Energy Area).

[2] California Senate Bill 286, McGuire, Chapter 386, Statutes of 2023. Bill text: https://legiscan.com/CA/text/SB286/2023.

[3] As defined by the Magnuson-Stevens Act, fishing community means a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community. Tribal fishing communities are included in this definition.

- Best practices for site surveys and data collection
- Potential avoidance and minimization measures
- A method for a socioeconomic analysis of project-level impacts
- A framework for reasonable compensatory mitigation
- Unique considerations for tribal fisheries
- Template agreements to memorialize relevant sections of the Statewide Strategy

Each of these topics is addressed in the chapters and appendices of the Statewide Strategy, with summaries provided below.

COMMUNICATION BEST PRACTICES

Effective communication between California's offshore wind developers and fishing communities is critical for responsible project development and long-term coexistence. Chapter 2 provides a set of best practices for adaptable, inclusive, and responsive communication strategies that aim to minimize conflict and foster mutual understanding.

The best practices provide seven foundational communication principles: prioritizing information related to safety, initiating early and transparent dialogue, ensuring efficiency, fostering collaboration, adapting to feedback, promoting inclusivity, and maintaining mutual respect. These principles are operationalized through objectives such as conducting fisheries characterizations, developing communication plans, tailoring communication to project phases, and building long-term, trust-based relationships with fishing communities.

A variety of communication methods are recommended, including meetings, digital platforms, and traditional notices, to conduct broad and timely outreach. Feedback loops, such as surveys and one-on-one meetings, can help continuously refine engagement strategies and address emerging concerns.

Key communication roles are highlighted, including Fisheries Liaisons, Fisheries Representatives, fisheries organizations, and tribal fisheries representatives. These individuals and organizations serve as trusted intermediaries, ensuring that local knowledge and cultural values are respected and integrated. Their involvement in the various phases of offshore wind project planning and implementation is critical to building durable partnerships and supporting the long-term coexistence of offshore wind development and California's fishing communities.

BEST PRACTICES FOR SURVEYS AND DATA COLLECTION

To collect information necessary for permitting, designing, constructing, and operating an offshore wind project, a developer conducts a variety of site assessment activities

within their lease area and along potential cable corridors from the lease area to shore. These activities can include geophysical surveys, geotechnical sampling, benthic surveys, and the deployment of instrumented buoys to measure prevailing ocean and weather conditions. Best practices identified and described in Chapter 3 are designed to avoid and minimize disruption to fisheries during site assessment activities.

Before initiating site assessment activities, developers should conduct a fisheries characterization study to understand the nature and operations of fisheries in the project area. This study should identify gear types, fishing seasons, spatial use patterns, and associated infrastructure. The characterization should be informed by direct engagement with fishing communities and best available information. The findings from this fisheries characterization should serve as the foundation for building Fisheries Communication Plans (FCPs) and identifying effective strategies to avoid or minimize impacts on fishing.

Planning for site assessment activities should include early outreach and integration of impact avoidance and minimization measures tailored to the specific project site and fisheries context. For example, if static fishing gear is expected in the area, pre-survey scouting should be conducted. Where spatial and temporal coordination with fisheries is necessary, developers should prepare coordination plans and communicate them well in advance. This allows fishermen adequate time to plan and, if needed, remove gear from survey areas. These plans should also specify reasonable buffer zones around survey operations.

A fisheries liaison should be present onboard survey vessels to maintain direct communication and monitor for fishing gear and activity as needed. In the event that fishing gear is lost or damaged by site assessment activities, developers should maintain a publicly available claims process as part of their FCP. All fisheries-specific measures should be implemented in a manner that balances the needs of fishing communities with health, safety, and environmental considerations.

BEST PRACTICES FOR AVOIDING AND MINIMIZING IMPACTS

Avoiding and minimizing impacts to fishing communities is a critical component of the responsible development of offshore wind energy projects. Chapter 4 presents a comprehensive set of best practices and mitigation measures designed to reduce potential adverse effects on commercial, recreational, and tribal fisheries. These measures should be adapted to reflect the specific conditions of each project site, including local fisheries, environmental characteristics, and project design.

The chapter presents a series of tables organized by project phase—site assessment and design, construction, operations, and decommissioning. An additional table highlights potential measures that could be implemented by entities other than offshore wind developers. For example, the last table notes that port and harbor authorities should establish communication plans with port users to facilitate continued fishing

landings in the presence of offshore wind vessels. Each table identifies potential adverse impacts, the fisheries that may be affected, and feasible avoidance and minimization strategies.

The impacts and measures presented were developed using current knowledge of West Coast fishing communities and fisheries, existing offshore wind infrastructure and activities in other regions, and a range of environmental review documents and databases. As floating offshore wind development progresses, new information, technologies, and experiences will inform updates to these measures.

In addition to the direct impacts summarized in the tables, the chapter also addresses secondary (indirect) impacts that may result from offshore wind development. While these impacts are not included in the tables—due to the lack of direct avoidance or minimization measures—they can be addressed by reducing direct impacts and, where necessary, through compensatory mitigation.

The chapter also emphasizes the importance of adaptive management. Developers are encouraged to incorporate adaptive strategies into their Construction and Operations Plans (COPs) to respond to evolving conditions. Overall, this chapter serves as a foundational guide for integrating fisheries considerations into the planning and permitting of offshore wind projects in California, supporting a responsible and collaborative approach to development.

SOCIOECONOMIC ANALYSIS OF IMPACTS TO FISHERIES

Socioeconomic impacts to commercial and for-hire recreational fisheries and fishing communities may remain after all other avoidance and minimization measures are adopted. Chapter 5 presents a framework and methodology to assess project-level socioeconomic impacts to commercial and for-hire recreational fisheries to help inform negotiations on compensatory mitigation to offset economic losses to fishermen and fishing communities.

The methodology—developed by Northern Economics, Inc., with input from the Working Group—offers a structured approach to evaluating reasonably foreseeable, unavoidable socioeconomic impacts. It is designed to be flexible and iterative, incorporating updated project information and stakeholder input over time. The methodology includes three iterative components designed to evaluate the impacts of a project on commercial, for-hire, and shoreside fishing businesses. Step 1 estimates fishing community income impacts, Step 2 assesses community and fleet vulnerability, and Step 3 explores uncertainties and refines estimates of income and distribution of impacts using the best available information. These steps build upon one another to offer a comprehensive understanding of the project's impacts, using existing data and analyses where appropriate.

Developers, state agencies, and fishermen and fishing communities each play a distinct role in ensuring that a socioeconomic analysis accurately captures potential impacts. Developers lead the analysis, engage fisheries stakeholders, and incorporate feedback. The Coastal Commission and other state agencies review and evaluate that analysis to ensure consistency with policy and facilitate structured engagement with fishing communities. Fishing communities contribute local knowledge, identify data gaps, and review the assumptions and findings of the analysis.

Effective fishing community engagement on the development, refinement, and review of a socioeconomic analysis is essential to ensure the analysis reflects real-world conditions. Engagement should begin after lease acquisition and be comprehensive, timely, transparent and inclusive, welcome diverse perspectives, allow adequate time for review and input, and be considerate of fishing seasons. Information should be presented clearly and include explanations of data, assumptions, and methods. The process should enable stakeholders to follow how input is considered and integrated to inform the socioeconomic analysis.

To provide focused input on key issues during its federal consistency review, including on the socioeconomic analysis, the Coastal Commission will convene a Fishermen's Working Group. This group will include representatives from potentially affected regions and fisheries and will meet at key points to offer structured, timely feedback. Meetings will be designed to balance effectiveness with respect for participants' time and will include an invitation for interested stakeholders to listen to the discussion. The role of the Fishermen's Working Group in compensatory mitigation discussions is further detailed in Chapter 6.

Ultimately, the socioeconomic analysis will guide discussions between developers and the California Coastal Commission on appropriate compensatory mitigation to be implemented through the compensatory mitigation framework in Chapter 6.

COMPENSATORY MITIGATION FRAMEWORK

Compensatory mitigation is the final tier in the impact mitigation hierarchy—following avoidance and minimization—and should only be considered when offshore wind project impacts cannot be otherwise prevented. Chapter 6 provides structured guidance for establishing fair and effective compensation programs for fishermen and fishing communities unavoidably affected by offshore wind energy projects.

The framework consists of two primary components: direct compensation and fishing community resiliency funds. Direct compensation aims to offset economic losses experienced by fisheries businesses—such as vessel owners, operators, and seafood processors—due to offshore wind development. In contrast, resiliency funds are intended to address broader, community-level impacts by supporting adaptation and sustainability of fishing communities. Together, these components aim to promote coexistence between the fishing and offshore wind industries, ensure continued fishing activity, and strengthen the long-term vitality of coastal communities.

Compensation measures are negotiated between a developer and the Coastal Commission during the federal consistency review of a project's Construction and Operations Plan (COP). These negotiations are informed by the best available information, including the socioeconomic analysis of project impacts discussed in Chapter 5. The Fishermen's Working Group (also discussed in Chapter 5) plays a key advisory role in this process, offering input on socioeconomic analyses, funding allocations, and program design. Once finalized, compensatory mitigation measures are incorporated into project approvals and regulatory decisions.

Once compensation is negotiated, the Statewide Strategy provides frameworks for implementation through two distinct mechanisms: direct compensation and resiliency funds. Direct compensation is administered through a claims-based process managed by an independent fund administrator. Eligible applicants should demonstrate unrecovered income or increased costs directly attributable to offshore wind activities. The framework provides guidance on defining eligibility, selecting qualified fund administrators, and establishing transparent reporting and appeals processes. Programs are expected to be fair, efficient, and accessible, with minimal administrative burden for claimants.

Resiliency funds are managed by a Resiliency Administrative Entity (RAE), while funding decisions are made by a Regional Resiliency Committee (RRC) composed of fishing community representatives. Resiliency funds may support a wide range of initiatives, including port infrastructure upgrades, safety and navigation equipment, training programs, and support for community organizations. The framework outlines principles for fund use, governance structures, and the selection and operation of RAEs and RRCs. It emphasizes community-led decision-making, fiscal transparency, and minimizing overhead to ensure that funds are used effectively and equitably.

To support implementation, Appendix C of the Statewide Strategy provides three outline templates:

I. A Fisheries Compensation Agreement between the developer and the Coastal Commission to formalize mitigation commitments.
II. A Resiliency Fund Agreement between the Commission and the selected RAE to govern fund administration.
III. A Regional Resiliency Committee Charter to define the structure, responsibilities, and procedures of the RRC.

Each template is designed to ensure transparency, accountability, and alignment with regulatory requirements, while allowing for project-specific customization.

Overall, the framework aims to foster coexistence between offshore wind development and California's fishing industry. By providing structured, equitable, and community-driven compensation mechanisms, it seeks to mitigate economic harm, support continued fishing activity, and promote the long-term resilience and sustainability of coastal communities.

UNIQUE CONSIDERATIONS FOR TRIBAL FISHERIES

Tribal fisheries—encompassing subsistence, cultural, recreational, and commercial practices—are deeply connected to the cultural identity, traditions, and intergenerational knowledge of California Native American Tribes. Chapter 7 is intended to facilitate engagement on the topic of tribal fisheries between California Native American Tribes, the Commission, and developers. It provides guidance on how offshore wind projects can be designed and implemented in ways that minimize unique impacts to tribal fisheries and uphold tribal sovereignty.

The chapter emphasizes the importance of building long-term, trust-based relationships between developers and Tribes. It outlines best practices for communication, including early and consistent engagement, cultural awareness, and support for tribal capacity. To address potential impacts, the chapter provides potential avoidance and minimization measures for each phase of offshore wind development—from site assessment through decommissioning. These include aligning project activities to avoid tribal fishing and cultural seasons, protecting sensitive areas, and minimizing displacement from traditional fishing grounds. Developers are encouraged to collaborate with Tribes to tailor these measures to specific tribal contexts.

To assess effects of project-level impacts on tribal fisheries that cannot otherwise be avoided, this chapter includes a flexible socioeconomic impact methodology developed by Northern Economics, Inc. This methodology suggests analytical approaches that consider possible data and information sources and limitations and working with Tribes to evaluate potential impacts. The analysis will support decision-making and help ensure that tribal perspectives are integrated into impact assessments.

The chapter includes a template for voluntary tribal fisheries agreements between Tribes and developers that emphasize mutual understanding, respect for data sovereignty, and shared goals. It outlines best practices for agreement development, implementation, and long-term collaboration, while recognizing the diversity of tribal governance structures and engagement preferences.

Overall, the framework seeks to ensure that offshore wind development proceeds in a way that respects tribal rights, protects cultural and subsistence practices, and fosters equitable, long-term partnerships with California Native American Tribes.

CONCLUSION

At its core, the Statewide Strategy seeks to support balanced, structured, working relationships between fishing communities and offshore wind developers, and strengthen long-term resilience of California fishing communities. As a living document, the Statewide Strategy will be reviewed and updated by the Commission as new experience and knowledge emerges around floating offshore wind development. The

Statewide Strategy will serve as a valuable tool for offshore wind developers, fishing communities, and regulatory agencies to ensure offshore wind projects are compatible with California's rich fishing heritage and coastal resources.

1 INTRODUCTION

1. Introduction

The State of California has identified offshore wind energy as a key renewable energy resource to be added to its energy portfolio to help achieve the state's mandated reduction in greenhouse gas emissions, reach carbon neutrality, and eventually become a net negative carbon emitter.[4,5,6] Recognizing that offshore wind energy can advance progress toward achieving California's statutory renewable energy and climate mandates, the California Energy Commission (CEC) developed an Offshore Wind Energy Strategic Plan (strategic plan) for offshore wind energy development installed in federal waters off the California coast.[7] The 2024 strategic plan evaluated and quantified the maximum feasible capacity of offshore wind energy generation to achieve reliability, ratepayer, employment, and decarbonization benefits. The strategic plan additionally established offshore wind planning goals: 2-5 gigawatts (GW) of offshore wind energy generation capacity by 2030 and 25 GW by 2045.[8] At the time of writing (2025), the Bureau of Ocean Energy Management (BOEM) has issued five offshore leases in two wind energy areas (WEAs) in federal waters off the coast of California; one area starts approximately 20 miles off the coast of Humboldt County in Northern California and the other area is a similar distance off the coast of San Luis Obispo County in Central California.[9,10] The potential development of these lease areas would occur alongside the other existing uses of the ocean, including tribal, commercial, and recreational fishing.

The Statewide Strategy for the Coexistence of California Fishing Communities and Offshore Wind Energy (Statewide Strategy) provides guidance for the coexistence of California's fishing communities and proposed floating offshore wind projects to minimize potential effects on tribal fisheries and the commercial and recreational fishing industries. The Statewide Strategy focuses on the events that occur after offshore leases have been issued. However, it should be noted that thoughtful siting of areas

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[4] The Global Warming Solutions Act required a reduction in greenhouse gas emissions to the 1990 level by 2020 (Nunez, Chapter 488, Statutes of 2006). The mandated to reduce greenhouse gasses was modified by Senate Bill 32, the current target is 40 percent below the 1990 level by 2030 (Pavley, Chapter 249, Statutes of 2016).

[5] California Executive Order No. B-55-18 (2018) to achieve carbon neutrality no later than 2045 and achieve and maintain net negative emissions thereafter.

[6] The 100 Percent Clean Energy Act of 2018 (California Senate Bill 100, 2018) establishes a target for renewable and zero-carbon resources to supply 100 percent of retail sales and electricity procured to serve all state agencies by 2045.

[7] California Assembly Bill 525 Reports on Offshore Renewable Energy: https://www.energy.ca.gov/data-reports/reports/ab-525-reports-offshore-renewable-energy.

[8] California Assembly Bill 525 (2021) requires the CEC to develop a permitting roadmap for offshore wind energy facilities off the California coast in federal waters.

[9] Information about the California leases can be found on BOEM's website: https://www.boem.gov/renewable-energy/state-activities/california-activities.

[10] The California leases included three bidding credits as part of the bidding process. More information about the bid credits can be found at: https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/BOEM-Pacific-CBA-Factsheet.pdf.

available for lease to wind energy projects is among the most effective ways to avoid and minimize impacts.[11] This Statewide Strategy was developed by the California Offshore Wind Energy Fisheries Working Group (Working Group) with representatives from California Native American Tribes, commercial and recreational fishermen and fishermen's associations, seafood processors, and offshore wind leaseholders. At the heart of the best practices, methodologies, and frameworks of the Statewide Strategy is the desire to create solutions that promote structured, working relationships and to promote the viability and long-term resilience of California fishing communities. The Statewide Strategy will serve as a valuable tool for offshore wind developers, fishing communities, and regulatory agencies as offshore wind energy projects are designed, developed, operated, and ultimately decommissioned.

OVERVIEW OF CALIFORNIA FISHERIES

California's tribal, commercial, and recreational fisheries are integral to the state's food security, economy, culture, and coastal identity. Tribal fisheries have sustained Indigenous peoples since time immemorial, providing food security, cultural identity, and a spiritual connection to ocean and river ecosystems. These fisheries remain central to the way of life for Tribes today. Commercial fishing has been part of California's coastal identity since the 1800s, supporting generations of fishing families, providing seafood products to local and global markets, and helping to build the economies of working waterfronts up and down the California coast. Recreational fisheries offer Californians and visitors a connection to the ocean, contributing to coastal tourism and providing valuable opportunities for access to, and public engagement with, marine resources. Together, these fisheries support a network of shoreside businesses such as fish processors, marine suppliers, restaurants, boat and equipment repair services, and more, all of which depend on access to fishing grounds, healthy fish stocks and ecosystems, and working waterfronts.

California's most valuable commercial fisheries vary by region. In Northern California, from the San Francisco Bay Area to the Oregon border, Dungeness crab and Chinook salmon have historically been two of the region's most economically valuable fisheries. However, both have faced challenges in the past decade due to closures and truncated fishing seasons.[12,13] In recent years, groundfish and highly migratory species (including albacore) have regained economic importance along the North Coast. Along the Central Coast and in the Southern California Bight, salmon, Dungeness and rock crab, among others, are also fished. The market squid fishery consistently ranks among the state's most valuable fisheries, with peak activity centered around Monterey Bay and Southern

[11] As noted further below, the Commission conducted reviews of BOEM's proposal to lease areas in federal waters for offshore wind development through consistency determinations in 2022 -Humboldt WEA and Morro Bay WEA.

[12] Due to the collapse of California's Chinook salmon stocks, commercial and recreational fishing for Chinook salmon was closed statewide from 2023 through the time this document was written in 2025, except for a limited recreational season in 2025.

[13] Over the past 20 years, the opening and closing dates of California's Dungeness crab seasons have become more variable from year to year. These fluctuations are often due to the presence of migratory whale species, concerns over crab meat quality, and public health risks such as elevated levels of domoic acid.

California. Southern California also supports important fisheries for highly migratory species such as tunas and swordfish, as well as spiny lobster and sea urchin. Groundfish are harvested statewide, contributing to the economic stability of many fishing communities. While these fisheries represent some of California's most valuable commercial species, the state also supports a wide diversity of other fisheries that hold substantial economic, social, and cultural importance to coastal communities.

Commercial and recreational fisheries operate under complex state and federal management systems intended to ensure the long-term sustainability of fish stocks and ecosystems. In contrast, tribal fisheries are co-managed by Tribal nations along with state and federal governments. The management of California fisheries is largely dependent on their location. Within three nautical miles of shore, fisheries are generally managed and regulated by the state—the California Department of Fish and Wildlife (CDFW) and California Fish and Game Commission (CFGC). In federal waters from 3 to 200 nautical miles offshore, fisheries are managed by the federal government—the National Marine Fisheries Service (NMFS) under the National Oceanic and Atmospheric Administration (NOAA)—typically in accordance with recommendations from the Pacific Fishery Management Council (PFMC).[14] Some species that move along the entire U.S. West Coast, like sardines, are managed at the federal level even though they are caught primarily in state waters. In certain cases, fisheries are also subject to international treaties, regulations, and management agreements (such as Pacific halibut, tunas, and salmon) which are then codified in state and federal laws and regulations.

INITIATION OF THE STATEWIDE STRATEGY

Recognizing the potential impacts of offshore wind projects on fishermen, the fishing industry, fishing communities, tribal fishing and tribal fishing communities, California initiated the creation of a statewide strategy. To begin to address these potential impacts, the California Coastal Commission (Commission) included conditions in its concurrences to BOEM's consistency determinations for its Humboldt WEA and Morro Bay WEA lease sales (Consistency Determinations).[15,16] Condition 7(c) focused on addressing potential impacts to fisheries and the fishing industry in California from the construction and operation of offshore wind farms in the two WEAs and called for the formation of a working group to develop a strategy to address those potential impacts.

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[14] The state-federal offshore boundary was delineated in 2014 by an order entered by the United States Supreme Court in the case of *United States of America v. State of California*, (2014) 574 U.S. 105, 257. This action by the United States Supreme Court permanently fixes the offshore boundary between the United States and California along a defined boundary approximately 3 nautical miles off the coast.

[15] Staff report for the BOEM lease sale off the coast of Humboldt County, CD-0001-22 (Th8a-4-2022 Adopted Findings: https://documents.coastal.ca.gov/assets/upcoming-projects/offshore-wind/Th8a-4-2022 adopted findings.pdf).

[16] Staff report for the BOEM lease sale off the coast of San Luis Obispo County, CD-0004-22 (W7a-6-2022 Staff Report: https://documents.coastal.ca.gov/assets/upcoming-projects/offshore-wind/W7a-6-2022-AdoptedFindings.pdf).

California Senate Bill 286 (SB 286, 2023) codified the working group requirement in Condition 7(c) within the California Public Resources Code.[17] It directed the Commission, in coordination with CDFW, to convene the California Offshore Wind Energy Fisheries Working Group (Working Group) to develop the Statewide Strategy. Once the Statewide Strategy is completed by the Working Group, "the Commission shall review for consistency with the Chapter 3 (commencing with Section 30200), modify as necessary, and adopt, the Statewide Strategy including the framework for reasonable compensatory mitigation for unavoidable impacts, on or before May 1, 2026."

The development of the Statewide Strategy was well timed because the floating offshore wind industry off the coast of California is only just emerging. Some developers have conducted geophysical surveys within lease areas; however, the submission of permit applications to construct offshore wind projects remains years away. The Statewide Strategy provides guidance and best practices to avoid and minimize impacts to ocean fisheries from constructing, operating, and decommissioning of offshore wind projects to the maximum extent possible. The Statewide Strategy additionally provides guidance and approaches to fairly and reasonably compensate persons engaged in commercial, recreational, and tribal fishing for economic impacts that cannot be avoided.

CONTENTS OF THE STATEWIDE STRATEGY

As described in SB 286, the Statewide Strategy:

> *shall include best practices for addressing impacts to the commercial and recreational fishing industries, tribal fisheries, and environmental resources associated with offshore wind energy projects, including, but not limited to, the following:*
>
> - *Protocols for communication among impacted parties.*
> - *A methodology for a comprehensive project-level socioeconomic analysis of direct and indirect impacts to commercial and recreational fishing industries and tribal fisheries.*
> - *Best practices for offshore surveys and data collection to assess impacts.*
> - *Best practices for avoidance and minimization of impacts, including the use of evidence-informed adaptive management.*
> - *A template for a fishing agreement that includes all relevant elements of the statewide strategy.*
> - *A template for an agreement addressing tribal fishing interests that includes all relevant elements of the statewide strategy.*

[17] California Senate Bill 286, McGuire, Chapter 386, Statutes of 2023. https://legiscan.com/CA/text/SB286/2023.

- *A framework for reasonable compensatory mitigation for unavoidable impacts to the commercial and recreational fishing industries and tribal fisheries.*[18]
- *A recognition of locally negotiated agreement between the fishing industry and offshore wind energy leaseholders.*

The Working Group addressed these key elements in the development of the chapters and appendices of this Statewide Strategy.

CALIFORNIA OFFSHORE WIND ENERGY FISHERIES WORKING GROUP

The Statewide Strategy was developed by the Working Group, which is "composed of representatives of the Commission, the Department of Fish and Wildlife, the State Lands Commission, and the Ocean Protection Council, representatives of the commercial and recreational fishing industry, the offshore wind energy industry, representatives from relevant federal agencies, representatives from California Native American Tribes with affected tribal fisheries and other stakeholders as appropriate, as determined by the Commission."[19] The formation of the Working Group, its guiding charter, and the methods of developing the chapters of the Statewide Strategy are detailed in the following sections.

FORMATION OF THE WORKING GROUP

Working Group members were appointed by Commission staff from nominated individuals based on support from the fishing community, relevant expertise, experience, and willingness to solve problems creatively. The combined membership has exceptional knowledge of California fisheries and fishing communities, coastal resources, and offshore wind development. The Working Group is composed of eight fisheries representatives, five lessee representatives, three representatives from California Native American Tribes, and three representatives from fisheries organizations. Each Working Group member appointed an alternate who could step in when the primary working group member was unavailable. Fisheries representatives have experience in one or more of the following fisheries, gear types, or fishing industries in central and northern California:

- Trawl
- Salmon
- Crab
- Coastal Pelagic Species – purse seine, lampara net, and brail

[18] Requirements for this framework may be found in California Public Resources Code (PRC) 30616(c)(7)(B)(i-v), as described in SB 286: https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=PRC&sectionNum=30616.

[19] California PRC 30616(a)(1).

- Groundfish, other gear
- Highly Migratory Species – purse seine, pole-and-line, drift gill net, and deep-set buoy gear
- Trap (Hagfish and Spot Prawn)
- Recreational/Charter
- Seafood Processing

The Tribal members represent California Tribes with fisheries that may be affected by offshore wind development. Commission staff requested nominations for Tribal representatives from Tribes traditionally and culturally affiliated with regions near the leased areas. Three Tribal representatives were then selected by Commission staff from the nominated individuals. Lessee representatives are comprised of one representative from each of the five companies that hold the existing leases. Lessee representatives have a range of positions such as fisheries manager, project director, marine affairs manager, and tribal liaison.

The Working Group is supported by staff from state and federal agencies (partner agencies) and a facilitation team. Agency representatives serve in an advisory role (i.e., nonvoting) and include staff from the Commission, BOEM, California State Lands Commission, CDFW, California Ocean Protection Council (OPC), and NMFS.[20] The facilitation team includes mediators from Kearns & West (K&W) and the Consensus Building Institute (CBI). Working Group members developed the Statewide Strategy in accordance with the principles described in the Working Group Charter.

Working Group Charter

The Working Group Charter (Charter) outlined the procedures and protocols by which all Working Group members agreed to operate. The Charter was a living document that described meeting formats, decision-making processes, operating protocols, and ground rules.

Roles and Responsibilities

Working Group members, Commission staff, partner agency staff, and the facilitation team contributed to the development of the Statewide Strategy in accordance with their roles and responsibilities described below.

[20] The ability of federal agency staff to participate was limited after January 2025.

Planning Team and Co-Chairs

The planning team was comprised of Commission and partner agency staff, the facilitation team, and the two Working Group co-chairs.[21] The planning team scheduled and set the agendas for Working Group meetings and coordinated the timeline for development of individual chapters to ensure the Statewide Strategy was completed by the statutory deadline. Members of the planning team also supported the Working Group process by providing and compiling information and preparing draft documents based on discussions from Working Group meetings or from the subgroups that were created to develop individual chapters of the Statewide Strategy.

Facilitation team responsibilities were generally divided between Working Group meetings and subgroup meetings. K&W was primarily responsible for planning and facilitating the quarterly Working Group meetings and supporting subgroup meetings with logistical and notetaking support. CBI joined the facilitation team in 2024 to plan and facilitate subgroup meetings that occurred between the quarterly Working Group meetings. To ensure an effective process, K&W and CBI coordinated regularly and the CBI facilitators attended the quarterly Working Group meetings to provide subgroup updates.

Working Group Members

Working Group members were responsible for attending all Working Group meetings. Some Working Group members additionally volunteered to serve on subgroups dedicated to developing specific chapters of the Statewide Strategy. Working Group members contributed to discussions and supported the development of the Statewide Strategy. If a Working Group member was unable to attend a Working Group meeting or subgroup meeting, the member's designated/appointed alternate was expected to attend Working Group and subgroup meetings in their place.

Partner Agency Staff

The partner agency staff (see above) attended Working Group meetings as advisory members of the Working Group and did not provide formal recommendations or approval of the Statewide Strategy. They were responsible for offering insights during Working Group meetings and providing advice and expertise into the drafting of the individual chapters of the Statewide Strategy.

Northern Economics

To meet the SB 286 directive to develop a methodology for a comprehensive, project-level socioeconomic analysis of potential impacts to fishing industries and tribal fisheries, the Working Group sought the assistance of an economics expert consultant,

[21] Commission staff selected the two Working Group co-chairs based on leadership and collaboration experience and included one Commission staff member and one fisheries association representative. The co-chairs served as liaisons between the Working Group, Commission staff, and the facilitation team. They played a central role in guiding the Working Group process by focusing members on the development of deliverables for the Statewide Strategy.

Northern Economics, Inc. Working Group members from both the fishing and offshore wind energy sectors recommended Northern Economics assist with the development of the Statewide Strategy. Northern Economics attended Working Group and subgroup meetings to present their work and get feedback from the Working Group members. Northern Economics developed two socioeconomic methodologies, one for the commercial and recreational fishing industries (Appendix A) and one for tribal fisheries (Appendix B).

PROCESS OF STATEWIDE STRATEGY DEVELOPMENT

The Statewide Strategy was developed via an iterative process of deliberating, drafting, editing, and revising. Working Group members agreed to refrain from sharing drafts and specific information outside of the Working Group to ensure that the members could be as candid as necessary to achieve optimal outcomes without the risk of public scrutiny, which could hamper discourse and participation during the drafting process. At times, Working Group members needed to vet draft documents, concepts, or text with others outside of the Working Group. In such cases, permission was granted to share draft documents, and those external individuals were asked to adhere to the Working Group's confidentiality protocols and refrain from sharing those documents with outside entities.

WORKING GROUP AND SUBGROUP MEETINGS

The Working Group met approximately quarterly over a two-year period between December 2023 and December 2025, with a total of eight meetings. Subgroups convened between Working Group meetings to develop each of the eight chapters of the Statewide Strategy. Working Group and subgroup meeting materials, objectives, and agendas were provided in advance of each meeting and made available for comments and feedback from Working Group members. The initial drafting of content, deliberation, discussion, and feedback occurred in subgroup meetings. Once a draft chapter had general support in a subgroup, it was shared with the full Working Group for further review, deliberation, and recommendations for inclusion in the Statewide Strategy (see below for details on decision-making).

Individual Working Group members were invited to attend and participate in subgroup meetings to help inform and draft chapters based on the discussion and direction provided by the full Working Group. The subgroup meetings had facilitation support from K&W, CBI, the co-chairs, and agency staff. The work done in subgroup meetings was integral to the drafting, development, and discussion of chapters prior to their presentation to the full Working Group for deliberation, modification, and approval.

A subgroup of tribal representatives and developers drafted Chapter 7, which discusses unique considerations for tribal fisheries, with input gathered through tribal consultation and roundtable discussions. Updates on the development of the chapter were provided to the full Working Group. Decisions about the content and scope of the tribal fisheries

chapter were made within the subgroup. Please reference the tribal fisheries chapter for more information about its development.

Decision-Making

As described above, the Working Group was tasked with developing the Statewide Strategy for review, consideration, and adoption by the Commission. The Working Group sought to produce a draft Statewide Strategy that had broad agreement among Working Group members. The process used in the development of the Statewide Strategy strove to earn broad-based and cross-sector support from Working Group members. As a first step of this consensus-building process, Working Group members drafted the chapter text. These draft chapters were discussed at length during both subgroup and full Working Group meetings. Draft chapters were also made available for written comments outside the meetings. Once most of the significant issues and concerns raised by Working Group members were addressed by the subgroups, revised drafts were brought to the full Working Group for formal recommendation of inclusion in the Statewide Strategy. The decision to bring a draft to the full Working Group was made by Commission staff, co-chairs, the planning team, and subgroup members. Working Group members were given time to consider and provide feedback on the draft chapters prior to formal decision-making. When a draft chapter was ready for formal consideration, Working Group members were asked to express their level of support for the document. The levels of support included:

- General support (“I like it”)
- Qualified support (“I have some issues with it, but I can live with it”)
- Fundamental disagreement (“I don’t like it and cannot live with it”)

Each Working Group member’s level of support was recorded along with a summary of points of agreement and disagreement. When all Working Group members could provide at least qualified support, the chapter was recommended for inclusion in the Statewide Strategy. For items with fundamental disagreement, the group was asked to continue working. If, after repeated efforts, the Working Group was not able to achieve general or qualified support for a particular item from all Working Group members, staff noted competing opinions along with rationales. Chapter development often occurred across several Working Group meetings, with time for discussion and to work through concerns, in order to achieve broad support. The Unique Considerations for Tribal Fisheries chapter received levels of support only from Tribal representatives and lessees, because the Working Group agreed it was not appropriate to have all members give levels of support for that chapter. By the final Working Group meeting, all the chapters of the Statewide Strategy and templates for agreements received general or qualified support from all Working Group members.

Following the final Working Group meeting, Working Group members reviewed the unified chapters of the Statewide Strategy to confirm final editorial changes from Commission staff did not alter intended meaning of the approved chapters. Per SB 286, the Commission shall review the Statewide Strategy and may modify as necessary to

ensure alignment with the Chapter 3 policies of the Coastal Act prior to adoption of the Statewide Strategy.[22] The Commission is required to consider adopting the Statewide Strategy by May 1, 2026. See below for mechanisms to revise the Statewide Strategy after adoption.

AUTHORITIES RELATED TO OFFSHORE WIND ENERGY PROJECTS

The California Coastal Act authorizes the California Coastal Commission (Commission) to regulate development within California's coastal zone to ensure that it is consistent with the Coastal Act's resource protection policies.[15] The Statewide Strategy provides guidance on how to address potential effects of offshore wind energy development on California's fishing resources and activities. The Commission expects that, where appropriate, impacts will be addressed in line with the Statewide Strategy guidance. The Statewide Strategy is not, however, a regulatory document.

On the federal level, NOAA certified the Chapter 3 policies of the Coastal Act as part of the enforceable policies of the California Coastal Management Program (CCMP) under the Coastal Zone Management Act of 1972 (CZMA). This federal law gives the Commission review authority over (a) federal agency activities (as defined in the CZMA regulations) and (b) federal permit or license activities (as defined in the CZMA regulations), when a federal agency activity or project requiring a federal agency permit or license would affect any land or water use or natural resource of the coastal zone of that state.[23,24] The development of offshore wind energy projects in federal waters offshore of California could have reasonably foreseeable effects on California's tribal, commercial, and recreational fisheries, which are considered coastal resources. BOEM's leasing of offshore wind energy areas in federal waters is a federal agency activity that could affect coastal resources and thus triggers the Commission's federal consistency review authority under CZMA. As such, the Commission in 2022 reviewed

[22] Public Resources Code §§ 30000 *et seq*

[23] §307, 16 U.S.C. §1456 (c)(1)(A): "Each Federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs."

[24] The Commission has a federally approved list of federal licenses and permits subject to certification for consistency (https://coast.noaa.gov/data/czm/consistency/media/ccc.pdf). For federal approvals not on the list, the Commission may still request approval to review an unlisted permit or activity for which coastal effects are reasonably foreseeable. 15 C.F.R. § 930.54(b).

and concurred with BOEM's consistency determinations for wind energy area leases near Humboldt County and San Luis Obispo County.[25,26]

Additionally, the federal permits and approvals necessary for construction of offshore wind projects will trigger the Commission's federal consistency review authority over federally-permitted projects, and its coastal development permit authority under the Coastal Act for proposed development in the Commission's state permitting jurisdiction (i.e., in state waters and certain onshore areas within the coastal zone). For both federal agency activities and federally permitted projects, the Commission conducts a similar review process, evaluating whether a project or activity is consistent with the enforceable policies of the CCMP (Chapter 3 of the Coastal Act).[27] Both processes are discussed below.

Federal Consistency Review Under the Coastal Zone Management Act

Offshore wind developers must secure various approvals from federal agencies before they can build offshore wind farms in their respective lease areas. BOEM reviews; assesses the potential environmental, social, and economic impacts; and acts on a developer's Construction and Operations Plan (COP) to construct, operate, maintain, and decommission wind turbines and associated facilities in their lease areas and associated easements.[28] This is the most comprehensive federal agency approval that would trigger the Commission's federal consistency review under CZMA. The COP will describe in detail the facilities that will be constructed and operated and maintained as well as the onshore and offshore construction processes. The COP will also analyze a project's potential environmental impacts and propose avoidance, minimization, and mitigation measures to address them. Along with preparation of the COP, developers would also prepare a consistency certification for state review, demonstrating that the proposed activities described in the COP are consistent with the enforceable policies of the CCMP.[29] Other federal permits, federal licenses, or federal agency activities

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[25] Coastal Commission staff report related to the Consistency Determination for leasing wind energy areas near San Luis Obispo County (CD-0004-22): https://documents.coastal.ca.gov/assets/upcoming-projects/offshore-wind/W7a-6-2022-AdoptedFindings.pdf.

[26] Coastal Commission staff report related to the Consistency Determination for leasing wind energy areas near Humboldt County (CD-0001-22): https://documents.coastal.ca.gov/assets/upcoming-projects/offshore-wind/Th8a-4-2022 adopted findings.pdf.

[27] Additional information about the Commission's federal consistency review process can be found at https://www.coastal.ca.gov/fedcd/fedcndx.html.

[28] This review occurs under the National Environmental Policy Act (NEPA).

[29] If a consistency certification for unlisted federal actions is not voluntarily submitted to the Commission by an offshore wind leaseholder, the Commission "shall notify Federal agencies, applicants, and the Director [of the NOAA Office of Ocean and Coastal Resource Management] of unlisted activities affecting any coastal use or resource which require State agency review within 30 days from notice of the license or permit application." "If the Director approves the State agency's request, the Federal agency and applicant must comply with the consistency certification procedures" Title 15 CFR §930.54.

necessary for development of the lease areas may also trigger federal consistency review.

In California, the Coastal Commission is the state entity responsible for conducting the federal consistency review that federal permitting of offshore wind projects will trigger under CZMA. To do so, the Commission will assess the consistency certification prepared with the COP and evaluate the proposed activities, their potential impacts on coastal uses and resources, and the proposed avoidance, minimization, and mitigation measures to determine the consistency of the federal permitting of the project with the enforceable policies of the CCMP, consisting of Chapter 3 of the Coastal Act. The Coastal Act Chapter 3 policies related to the marine environment are listed in Article 4 and include policies related to fishing:

> *Section 30230: Marine resources shall be maintained, enhanced, and, where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.*
>
> *Section 30234: Facilities serving the commercial fishing and recreational boating industries shall be protected and, where feasible, upgraded. Existing commercial fishing and recreational boating harbor space shall not be reduced unless the demand for those facilities no longer exists or adequate substitute space has been provided. Proposed recreational boating facilities shall, where feasible, be designed and located in such a fashion as not to interfere with the needs of the commercial fishing industry.*
>
> *Section 30234.5: The economic, commercial, and recreational importance of fishing activities shall be recognized and protected.*

Because the Coastal Act (and, by extension, the CCMP) requires commercial and recreational fishing to be protected, potential effects to these resources need to be considered as part of the Commission's federal consistency review (as well as its coastal development permit process under the California Coastal Act—see State Permit Review below).

The Commission's federal consistency and coastal development permit review processes would begin after the appropriate Environmental Assessment Draft Environmental Impact Statement (DEIS), if required, has been published for a project's COP.[30] The project's consistency certification must include necessary data and information to support the project's consistency with the relevant enforceable policies of the CCMP. The COP, DEIS, and potentially a draft environmental impact report (DEIR), could be included to supplement the consistency certification with analyses and

[30] 30 CFR 585 subpart G-585.628 c)

mitigation measures to further support the project's consistency.[31] Once a complete consistency certification is submitted for Coastal Commission review, that review must be concluded within six months, unless extended by mutual agreement of the Commission and the applicant.

The Commission can concur, conditionally concur, or object to a consistency certification. A concurrence decision by the Commission can be achieved when a project is found to be consistent with the enforceable policies of the CCMP or when an applicant and the Commission agree to project modifications that are found to be necessary to ensure policy consistency. This includes agreeing to or voluntarily proposing additional mitigation measures to achieve consistency. As provided under the CZMA regulations, if the Commission concurs (including conditional concurrence) with an applicant's consistency certification, federal agencies with permit or authorization authority (including BOEM) may then proceed to finalize its COP review process and may approve, reject, or approve the COP with modifications.

If agreement cannot be reached to modify a project sufficiently to achieve consistency, the Commission can add conditions to its concurrence and an explanation of why the conditions are necessary to achieve consistency with the CCMP. The project description and related applications for federal authorization would then be modified to include these conditions and the federal agency would approve them as part of its authorization. If the conditions are not met or the federal agency will not approve the application as amended by the Commission's conditions, the Commission's conditional concurrence would become an objection to a project. Following receipt of the Commission's objection to a consistency certification, a federal agency cannot issue the federal license or permit unless the objection is appealed and overridden. The applicant can appeal the Commission's objection to the Secretary of Commerce, who may override the objection if the Secretary finds that the proposed activities are consistent with the objectives of the CZMA or are otherwise necessary in the interest of national security.

State Permit Review Under the Coastal Act

Within California's coastal zone, the Commission has direct coastal development permit (CDP) authority over development associated with, appurtenant to, or necessary for offshore wind energy projects, and transmission facilities needed for those projects, that are within state waters, and onshore work that falls within the Commission's jurisdiction and areas subject to consolidated CDP coastal development permit process under section 30601.4 of the Coastal Act. [32,33] CDP applications would provide the data,

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[31] An environmental impact report (EIR) is one type of document contemplated under the California Environmental Quality Act (CEQA) for activities considered a project and not otherwise exempt. CEQA compliance is necessary for the state to issue permits, leases, or other entitlements.

[32] California's coastal zone varies along California's coastline but generally extends three nautical miles seaward and 1,000 yards inland from the mean high tide line.

[33] Portions of the onshore development may fall within the permit jurisdiction of a local government with a certified local coastal program, SB 286 requires the Commission process a consolidated coastal development permit after consultation with relevant local government agencies.

information, analyses, and mitigation measures, specific to the activities proposed within the coastal zone, necessary to support the Commission's review.

Within the state's coastal zone, the Chapter 3 policies are legally binding policies by which the state, through its coastal development permitting process, ensures proposed development activities do not adversely affect coastal resources and uses. While Commission review of specific offshore wind projects may occur through a combined consistency certification and CDP process, there is a distinction between (a) the Commission's authority over offshore wind activities proposed in state waters for conformance with state laws and (b) federal consistency reviews for offshore wind activities in federal waters.

Commission Staff Roles in Federal Consistency and Coastal Development Permit Review

Consistency certifications and CDP applications are reviewed by Commission staff who provide a report and recommendation on the project's consistency with Chapter 3 enforceable policies and/or compliance with the Coastal Act, which includes additional policies to those approved by NOAA as "enforceable policies" under the CZMA (for proposed activities in state waters).[34] This report and recommendation are provided for public review and comment and presented to the Commission for consideration at one of its publicly noticed, regular meetings. The Commission has discretion to follow the staff recommendation or deviate from it. Commission staff's typical review role includes:

- Ensuring application materials are complete with the necessary data and information to support the consistency analysis and CDP review process.
- Consulting with California Native American Tribes that are traditionally and culturally affiliated with a project area.[35]
- Conducting outreach to and coordinating with partner agencies, interested and affected parties, local governments, and stakeholder groups as part of the public process.
- Analyzing a project's consistency with the Coastal Act Chapter 3 enforceable policies and developing a staff recommendation, including any conditions needed to ensure consistency.
- Providing staff recommendations and findings for Commission consideration and public input prior to Commission hearing.

[34] Per 16 U.S.C. § 1453(6a), CZMA defines an "enforceable policy" as "state policies which are legally binding through constitutional provisions, laws, regulations, land use plans, ordinances, or judicial or administrative decisions, by which a State exerts control over private and public land and water uses and natural resources in the coastal zone."

[35] Affiliated Tribes are identified by the California Native American Heritage Commission. https://nahc.ca.gov/.

California Environmental Quality Act Review

SB 286 designates the California State Lands Commission (CSLC) as the lead agency for California Environmental Quality Act (CEQA) review, with limited exceptions, for offshore wind energy projects taking place in the State. Projects involving improvements or activities on state tidelands and submerged lands require the applicant to submit a lease application for those project components; the lease application will trigger CEQA review.[36,37] Depending on the location of project components, CSLC or a legislatively authorized local government that manages public trust lands within its jurisdiction will process the application in conformance with agency policies and legal requirements, including but not limited to, the Public Trust Doctrine.[38,39] SB 286 further requires the CSLC and local trustees of granted public trust lands to consider including reasonable compensatory mitigation for unavoidable impacts to fishing and Tribal interests pursuant to section 30616 of the Coastal Act when issuing a lease "for purposes of an offshore wind energy project."[40,41] SB 286 states that these entities are required to consider the recommendations for reasonable compensatory mitigation for unavoidable impacts made by the California Offshore Wind Energy Fisheries Working Group through the development of this Statewide Strategy. If CSLC or local trustees of granted public trust lands include compensatory mitigation when issuing a lease, the scope of the compensatory mitigation would be limited to impacts projected to occur within the specific geographic jurisdiction of the leasing entity and the area of the lease premises. The developer would not need to mitigate more than once for the same impact.

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[36] CEQA Guidelines section 15378 requires review of the project under CEQA to investigate the "whole of the action"; which, in the case of an offshore wind energy project is likely to encompass the geographic area from the offshore turbines to the point of first interconnect with the larger electrical grid.

[37] Federal National Environmental Policy Act (NEPA)/CEQA review may be conducted jointly to maximize efficiency.

[38] Typically, the CSLC considers adoption or certification of a CEQA document (e.g., mitigated negative declaration or environmental impact report), adoption of a mitigation monitoring program, and authorization of a lease concurrently at one of the CSLC's public meetings, held approximately every other month. Criteria considered in lease issuance includes whether the project is 1) consistent with the Public Trust Doctrine, 2) is in the best interests of the state, and 3) is consistent with CSLC's Tribal Consultation and Environmental Justice policies. Approval or denial of a lease application is a discretionary action by the State Lands Commission. Each time the CSLC approves or rejects a use of sovereign land, it exercises legislatively delegated authority and responsibility as trustee of the State's Public Trust lands as authorized by law.

CSLC Tribal Consultation Policy: https://slcprdwordpressstorage.blob.core.windows.net/wordpressdata/2018/07/Tribal.pdf.

CSLC Environmental Justice Policies: https://www.slc.ca.gov/environmental-justice/.

[39] For specific geographic areas along the coast, the legislature has enacted statutes that grant sovereign public trust lands to local municipalities. Over 80 local municipalities have this responsibility to manage these lands in trust for the people of California. For more information, please see: https://www.slc.ca.gov/granted_lands/.

[40] Cal. Pub. Res. Code § 7100(b)

[41] CEQA Guidelines section 15126.4 requires an Environmental Impact Report (EIR) to describe feasible measures which could minimize significant adverse environmental impacts. Mitigation measures described in the Statewide Strategy may be considered for incorporation into an EIR's Mitigation Monitoring Program if the relevant mitigation measure addresses an environmental impact identified in the EIR. Each OSW project will be unique in terms of the environmental setting, project description, and potential environmental impacts.

STATEWIDE STRATEGY IMPLEMENTATION

The Statewide Strategy identifies best practices and methods to address potential impacts from floating offshore wind development on fishing communities and fishery resources. Specifically, the Statewide Strategy presents a roadmap for offshore wind projects to become consistent with the CCMP's enforceable and state policies that recognize and protect marine resources, commercial and recreational fishing industries, tribal fisheries, and associated facilities and activities. The Statewide Strategy is not a regulatory document nor an enforceable policy of the Coastal Act.

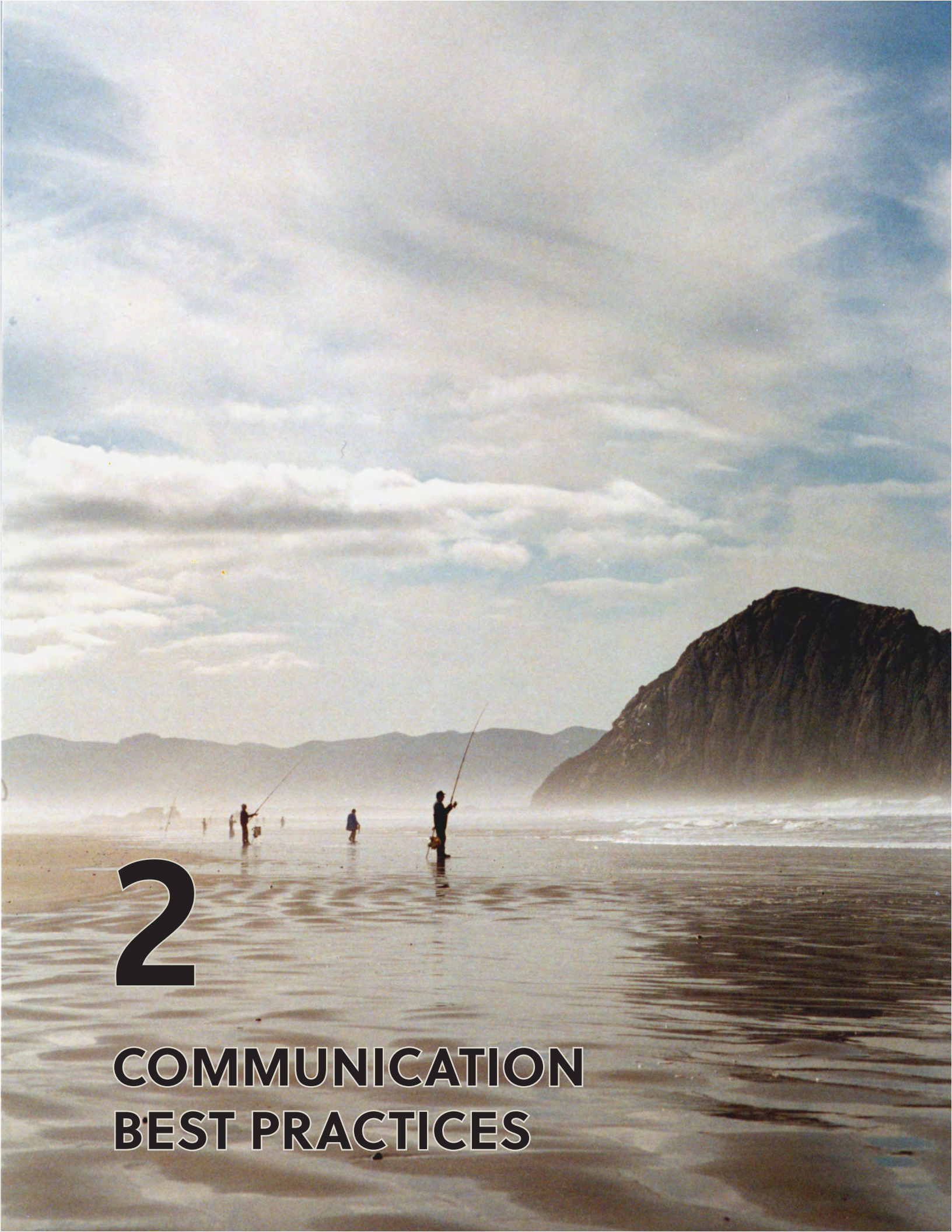
Offshore wind developers use the Statewide Strategy on a project-by-project basis when drafting a COP and, relatedly, when they prepare a consistency certification for submission to the Commission. In conjunction with the Statewide Strategy, input from groups knowledgeable about fishing, fisheries management and data, and fisheries regulation will help ensure that any analyses include all necessary data and information and that proposed project elements will be effective in addressing impacts. Offshore wind energy projects will first seek to avoid and minimize impacts to ocean fishing activities and facilities that serve commercial, recreational, and tribal fishing communities to the maximum extent practicable and then propose mitigation measures for unavoidable impacts. Priorities in the development of mitigation measures should include fishery productivity, viability, and long-term resilience, where applicable. The Statewide Strategy provides both guidance on impact avoidance and minimization measures and a framework for compensatory mitigation. The framework for compensatory mitigation includes avenues for both direct payments to affected fishermen and resiliency funds to support fisheries resiliency that could be used to resolve inconsistencies with the CCMP policies/impacts that cannot be sufficiently avoided. Not all measures and best practices of the Statewide Strategy may be applicable to a specific project. Project-specific characteristics and challenges may warrant alternative measures to those described in the Statewide Strategy; alternatives would need to be presented with sufficient data and information to show that the project is consistent with applicable Chapter 3 policies of the Coastal Act. The Statewide Strategy is nevertheless intended to serve as a guiding framework to inform the responsible development of offshore wind energy projects and promote successful coexistence between the offshore wind industry and California's fishing communities.

REVISING AND UPDATING THE STATEWIDE STRATEGY

The Statewide Strategy should be considered a living document that may be altered and amended by the Commission to improve its efficacy in supporting coexistence between fishing communities and the offshore wind industry. The Statewide Strategy was intentionally developed prior to the design, construction, and operation of offshore wind projects in California to provide meaningful guidance and direction for addressing potential impacts to fishing communities from those projects. Upon completion of the Statewide Strategy and its approval by the Commission, the construction of offshore

wind projects is estimated to be five to ten years in the future. Much of the engineering, design, and project details have not yet been determined. To remain useful and salient, the Commission will, as needed, review the Statewide Strategy to determine if any changes are necessary as more experience and understanding are gained around floating offshore wind development in California and elsewhere.

Should the Commission determine that changes to the Statewide Strategy are necessary to achieve its purpose, staff may propose that the Commission authorize staff to engage in a process with the Working Group to develop recommendations for revisions. As stated in SB 286, the Commission “may by resolution, authorize the reconvening of the Working Group” to address the necessary changes to the Statewide Strategy.



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COMMUNICATION BEST PRACTICES

2. Communication Best Practices

INTRODUCTION

Effective communication between the fishing community and offshore wind developers is essential to the responsible development, construction, and operation of offshore wind projects. Communication plays a critical role in fostering coexistence and is emphasized throughout the chapters of the Statewide Strategy. This chapter draws on the experiences of Working Group members to provide best practices for communication strategies that are adaptable, inclusive, and responsive to the needs of both industries.[42]

Communication strategies are documented in Fisheries Communication Plans (FCPs), which each developer is required by BOEM to prepare. FCPs are intended to promote proactive engagement and minimize conflicts with commercial and recreational fishing activities. FCPs are living documents that evolve throughout the life of a project, incorporating feedback from the fishing community and adapting to project-specific conditions and phases.

COMMUNICATION PRINCIPLES

Minimizing conflict between offshore wind development and commercial and recreational fishing activities relies on proactive, transparent, and inclusive engagement. The following principles form the foundation for all communication efforts aiming to build a strong, cooperative relationship between both industries, ensuring that concerns are effectively addressed and fostering a supportive environment.

Safety First

Communications should prioritize the safety of all ocean users throughout the lifecycle of offshore wind projects, from site investigation and planning through decommissioning.

Early, Transparent, and Responsive

[42] This chapter draws on Working Group input and the strengths of four existing Fisheries Communication Plans: RWE, Canopy Wind LLC & Vineyard Offshore Joint Plan https://americas.rwe.com/-/media/RWE/RWE-USA/documents/rwe-vineyard-offshore-joint-fcp.pdf; Equinor US, Atlas Wind https://atlasoffshorewind.com/wp-content/uploads/2024/01/20231222_Atlas-Wind-OCS-P-0563_Fisheries-Communication-Plan_Rev1_clean-Dec-2023.pdf; Invenergy, Even Keel Wind https://evenkeelwind.invenergy.com/documents/fisheries-communication-plan; Golden State Wind LLC https://www.goldenstatewind.com/wp-content/uploads/2024/07/GSW_Fisheries-Comms-Plan_4.pdf

Engagement should begin early, be transparent, and remain responsive. Developers should provide timely information about project activities as early as practicable in the project planning process to promote informed decision-making. Developers and the fishing community should ensure that inquiries and concerns are addressed in a timely and effective manner.

Efficiency and Coordination

Communications should be clear, concise, and coordinated to reduce the burden on the fishing community. Developers are encouraged to coordinate and streamline communications—such as through joint FCPs or regional points of contact—to avoid duplication and promote consistency.

Collaboration and Joint Problem-Solving

Both industries should work together to identify concerns and develop viable solutions. A collaborative environment where the fishing community's input is valued and considered builds trust and improves project outcomes.

Continuous Improvement and Adaptability

Communication protocols and FCPs should be regularly reviewed and updated based on feedback and lessons learned. Engagement approaches should evolve to meet changing needs and conditions.

Tailored, Inclusive, and Equitable

Communication strategies should be inclusive and tailored to the diverse needs of fishing communities. This includes ensuring that tribal fishermen and underrepresented groups within the fishing community are appropriately included. All fishing community participants should have equitable opportunities to engage.

Mutual Respect

Communications should be grounded in respect for the cultural, operational, and regional differences among fishing communities and developers alike.

OBJECTIVES

The following objectives should be considered when translating the communication principles into actionable steps.

Develop Comprehensive Fisheries Characterizations

Offshore wind developers should complete a characterization of the local and regional fisheries that the project may interact with to promote efficient, inclusive, and coordinated communication in advance of site assessment activities. The fisheries characterization should provide a comprehensive understanding of the fisheries in and

near the project area and enable developers to tailor their engagement to specific fishing communities. Further best practices for fisheries characterization studies are provided in Chapter 3.

Promote Purposeful, Two-Way Communication

Communications approaches should create opportunities for knowledge exchange and building understanding. Sharing upcoming project activities in advance to allows the fishing community time to provide input on ways to avoid and minimize impacts. Input and feedback from the fishing community should be considered at each project phase to support informed decision-making.

Avoid, Minimize, and Mitigate Potential Impacts or Conflicts

Practice open communication to identify and address potential conflicts between project activities and fisheries operations early. Prioritize coordination between fishing and offshore wind activities to prioritize safety and reduce the risk of accidents or incidents. Develop clear conflict resolution protocols and use feedback to continuously improve communication that supports avoiding impacts. Refer to Chapter 4 for potential avoidance and minimization measures (AMMs).

Implement Phase-Specific Communication Strategies

Tailor communication approaches to meet the distinct needs of both the developers and fishing community at each project phase (i.e., planning, construction, operation, decommissioning) because each phase involves different development or maintenance activities that may shift engagement priorities.

Engage in Inclusive, Long-Term Community-Based Outreach

Build lasting relationships with fishing communities, associations, and organizations. Participate in community events and maintain consistent outreach to develop “neighbor to neighbor” relationships beyond one-time engagements. Use communication platforms and materials that are accessible to all fishing community members and disseminate information clearly and widely to ensure broad awareness and participation.

Build and Maintain Trust

Both industries should establish and maintain trust through consistent, honest, and respectful communication. Developers should provide clear feedback mechanisms to demonstrate how fishing community input is reflected in the development process. Building and maintaining trust involves frequent engagement, transparency, clear information, avoiding surprises, admitting and accepting mistakes, and remedying problems created or identified.

COMMUNICATION METHODS

The following section provides best practices for methods of communication that can support the objectives above. The selection and implementation of communications methods should depend on the needs of the fishing community and the project specifics and may change over the project lifecycle.

Meetings and Workshops

Community meetings and workshops provide a platform for project updates, discussions, and feedback. Workshops can facilitate collaborative problem solving on specific project aspects, for example identifying the most effective actions to avoid gear interactions. Meeting topics, formats, and cadence should be collaboratively identified between the fishing community and developers. Meeting and workshop times and locations may need to vary depending on fishing seasons or project phase.

Communication Platforms

A variety of communications channels should be used to reach the fishing community effectively. Information—such as announcements of upcoming activities, project updates, and designation of safety zones—is important for helping fishermen plan their operations. Recommended digital platforms include project websites, social media, communication apps, emails, e-newsletters, e-bulletins, and listservs. For time-sensitive communication, phones calls, text messages, and very high frequency (VHF) radio broadcasts are effective tools. Traditional methods such as Local Notices to Mariners, Broadcast Notices to Mariners, and bulletins posted around ports and harbors should also be used to ensure information reaches a wide audience. Using a combination of these tools supports consistent, inclusive, and timely engagement throughout the project lifecycle.

Solicit Feedback

Regularly seeking feedback from the fishing community will help improve communication strategies and maintain effective and responsive engagement. Feedback methods may include surveys, suggestion portals, comment boxes, and one-on-one meetings to gather input on specific issues, concerns, or communication preferences. These tools help identify areas for refinement and build trust through active listening. In cases where persistent communication challenges arise, an independent review of engagement practices may be beneficial to identify barriers and recommend actionable improvements.

COMMUNICATION ROLES

Effective communication depends on clearly defined roles and trusted points of contact. On the developer side, this may include staff or consultants tasked specifically with maintaining regular communication with the fishing community. On the community side,

fisheries organizations and associations frequently serve as key liaisons, offering trusted points of contact for local fishermen. The following section outlines the roles and characteristics of individuals and groups that play critical roles in implementing and sustaining effective communication.

Fisheries Liaisons

A Fisheries Liaison represents the developer and serves as the primary point of contact with the fishing community. They are responsible for maintaining effective two-way communication that facilitates information exchange, coordinating project activities, addressing concerns, and relaying fishing community input back to the project development team. Effective Fisheries Liaisons often have previous experience with fisheries, which may include Fisheries Management Councils or organizations, strong relationships and connections with the fishing community in the region, and a willingness to interact regularly with the community. Fisheries Liaisons should be designated early in the project planning process and maintained throughout all project phases.

Fisheries Representatives

Fisheries Representatives are typically identified in collaboration with the fishing community and compensated by a developer to represent specific fisheries, gear types, regions, or ports. They serve as trusted voices within the fishing community and provide the developer with local and regional fisheries operations, traditions, and trends; insight into potential concerns or conflicts; and recommendations for minimizing impacts and improving engagement. Effective Fisheries Representatives are often active or recently active commercial fishermen (within the past 5 years), or have experience working with fishermen, and have strong peer relationships. Depending on the offshore wind project, multiple Fisheries Representatives may be needed to reflect the diversity of fisheries affected—such as those targeting highly migratory species or operating across multiple ports.

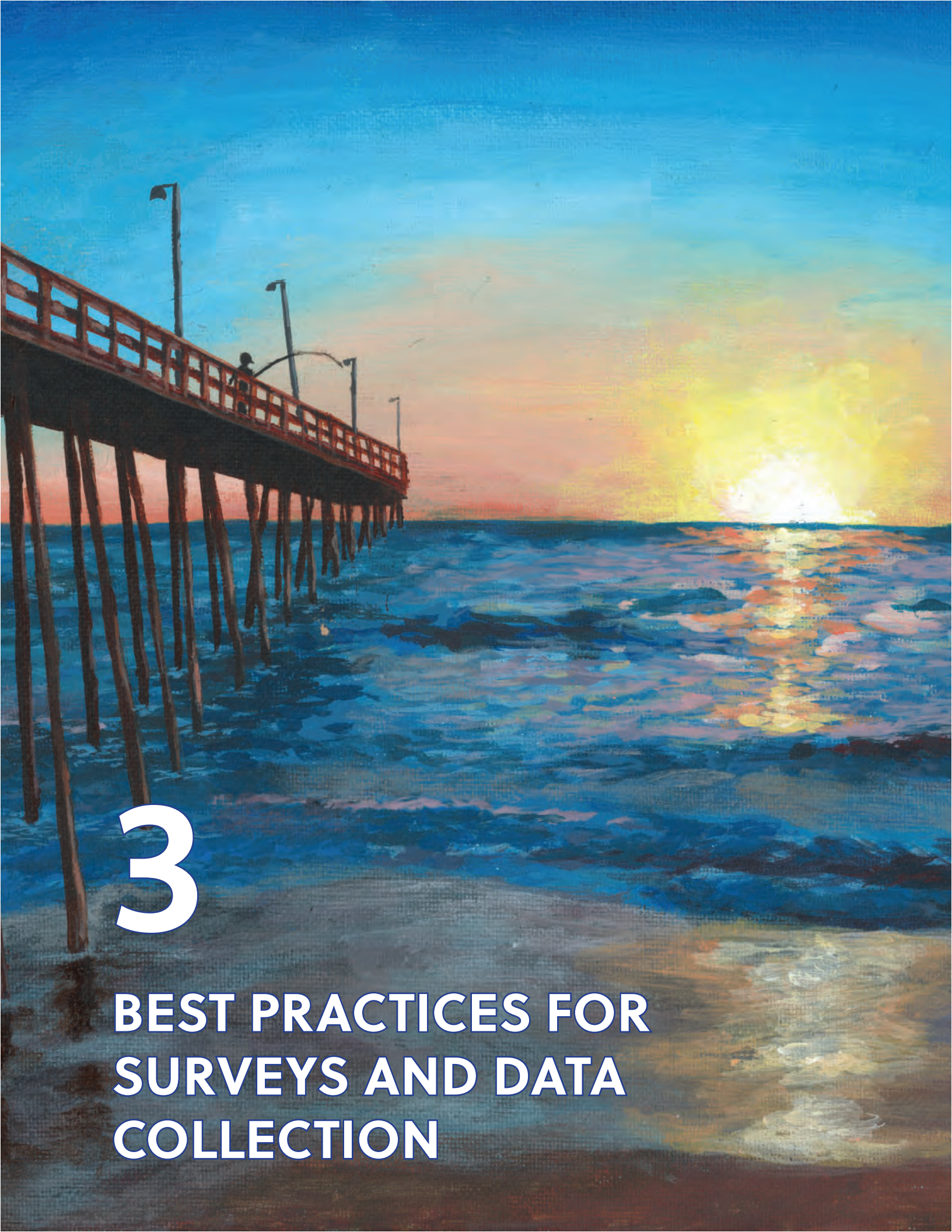
Fisheries Organizations

Fisheries organizations and associations play a vital role in California's fishing communities and are well-positioned to support communication and coordination with developers. Fisheries organizations may provide structured forums for engagement; serve as long-term partners throughout project planning, construction, operations, and decommissioning; help identify appropriate Fisheries Representatives or community contacts; and assist in disseminating project information and gathering feedback. Formal communication relationships with fisheries organizations can enhance transparency, build trust, and support long-term coexistence between offshore wind and fisheries

Tribal Fisheries Contacts

Many California Native American Tribes actively participate in marine fisheries and maintain deep cultural ties to ocean resources. Tribal fisheries contacts may serve as

key connections for communication and coordination with sovereign Tribal governments and should be considered in fisheries communication planning and Native American Tribes Communication Plans (NATCPs). Additional tribal fisheries communication protocols are provided in Chapter 7.



3

BEST PRACTICES FOR SURVEYS AND DATA COLLECTION

3. Best Practices for Surveys and Data Collection

INTRODUCTION

Pursuant to California Senate Bill 286 (SB 286), the Statewide Strategy includes best practices for assessing impacts to fishing communities from data collection efforts and offshore surveys.[43] This chapter describes recommended best practices for avoiding and minimizing the potential impacts on fisheries and fishing communities, including commercial, recreational, and tribal fishing communities, from offshore wind energy site assessment activities. These activities include geophysical surveys, geotechnical sampling, benthic surveys, and deployment of metocean buoys. Potential impacts might include temporary displacement of fishing activity and gear entanglement, among others.

These best practices are intended to be considered proactively—early in the site assessment planning process—and implemented adaptively and as appropriate. In applying these best practices, developers (including all participants in the associated work) should seek to avoid and minimize impacts, considering the specific circumstances of the planned site assessment activities and the fisheries operating in the area at the time. This will be informed by the Fisheries Characterization discussed below, which involves significant engagement and input from the fishing community.

The elements outlined below should be considered as means of avoiding or minimizing potential fishery impacts, while safely collecting the data required to design, permit, construct, and operate offshore wind projects. In some cases, specific elements of the best practices may not be relevant, may be infeasible or impracticable, or may not be the most effective or efficient measure for avoiding or minimizing potential fishery impacts. In those cases, the developer should consider other measures that are feasible, practicable, or more effective or efficient.

This chapter seeks to prevent, minimize or mitigate (through gear loss compensation) impacts to fishing activities during the conduct of site assessment activities, including surveys. This chapter does not address potential impacts of site assessment activities on biological resources. Avoidance and minimization measures that apply to other stages of project development are included in Chapter 4 of this Statewide Strategy. The California Coastal Commission (Commission) and Bureau of Ocean Energy Management (BOEM) review potential impacts from site assessment activities, including surveys, during the leasing phase of offshore wind development. The Commission references and relies on the best available information when reviewing projects. As new information becomes available, the Commission updates its findings

[43] Cal. Pub. Res. Code § 30001.3 (2023)

related to site survey technologies, including the use of Autonomous Underwater and/or Surface Vehicles, and the potential impacts on fish, fish prey, and fishing.

FISHERIES CHARACTERIZATION

Offshore wind developers should conduct a fisheries characterization in advance of site assessment activities to identify the commercial and recreational—including private, for-hire, or commercial passenger fishing vessel (CPFV)—fisheries that may coincide with the project area. The characterization should inform site assessment planning to facilitate the avoidance and minimization of impacts to fisheries. The fisheries characterization should assess the compatibility of each fishery's operations (including fishing activity, port and transit corridor usage, mooring, docking, vessel loading/offloading) with the site assessment activities. The operation of fishing gear and the timing, intensity, and spatial distribution of fisheries activities should be considered to assess compatibility with the site assessment activities and the potential for interactions with fisheries.

Fisheries characterizations should be informed through direct engagement with local and regional fishing communities combined with best available data to provide developers with a comprehensive understanding of the fisheries in the project area. Fisheries characterizations may be informed by federal Environmental Assessments and decision memos, fisheries management plans and reports, economic reports, other scientific reports, regional data portals, and consultation with fisheries managers. The fisheries characterization should provide a foundation for selecting strategies for impact avoidance and minimization during site survey and assessment activities. Offshore wind developers should share information in the fisheries characterization with fishing communities and regulatory agencies to ensure appropriate context and improve precision, accuracy, and completeness.

Elements typically considered in a fisheries characterization of commercial and recreational fisheries within a project area include:

- Target fisheries
- Gear types
- Fisheries operational details
- Overview of fleets active in the area
- Seasonality of fishing activity by fishery and/or gear type
- Spatial characterization of fishing activity
- Trends in commercial or recreational fishing activity and operations
- Associated shoreside infrastructure (marinas, processors, etc.)
- Overview of fisheries management and regulation in the project area

- Identification of regional fisheries surveys active in the project area (e.g., National Marine Fisheries Service [NMFS] surveys)

Fisheries characterizations should also identify the key constituencies within the fisheries and fishing communities operating in the project area to inform the development of the Fisheries Communication Plan (FCP) and the development of the communications strategies and methods to successfully support site assessment activities.

SITE ASSESSMENT ACTIVITY PLANNING AND IMPACT AVOIDANCE MEASURES

Developers' site assessment activity planning and fisheries coordination strategies should include a stepwise approach to promote successful outcomes and avoid and minimize the risk of fishery impacts. A range of measures may be used to avoid and minimize impacts to fisheries and should be informed by the fisheries characterization. A stepwise approach begins with proactive measures, such as early pre-survey communication and engagement with potentially impacted fishing communities, then adds the relevant following specific impact avoidance measures based on the nature of the site assessment activity, the fisheries context, and the potential for interactions to occur during the activity.

Best practices for site assessment activities should be well supported with proactive and robust FCPs and should include the consideration and adaptive deployment of a range of measures to avoid and minimize potential impacts to fisheries to the extent practicable during the site assessment process. The efficacy of these practices relies on two-way communication with the fishing community. This reciprocal communication and cooperation is particularly relevant to ensure safe and effective site assessment activities in situations requiring the relocation of fixed fishing gear.

Table 3.1 Site Assessment Activity Planning and Best Practices

Activity	Site Assessment Best Practices
1. Timing and Coordination	1.1 Select and sequence the timing of site assessment activities to avoid and minimize potential conflicts with fisheries and their uses of lease areas, offshore export cable routes, and ports. 1.2 Select, schedule, and use port areas to reduce disruption of fisheries activities, including port congestion on the water and onshore and loading and offloading of vessels. 1.3 Planning should take into consideration the nature of the planned site assessment activities and anticipated interactions with fisheries activities, including contingencies for unpredictable events, such as weather delays, operation interruptions, and timing of equipment availability.
2. Vessel Equipment and Selection	2.1 Consider equipment, vessel, and technology selections for site assessment activities to minimize potential impacts to fisheries in the project area.
3. Proactive and Sustained Communications	3.1 Early and frequent engagement with potentially impacted fisheries, as identified in the fisheries characterization, in advance of survey campaign (i.e., months in advance) to inform fishermen of planned Site Assessment activities, potential fisheries interactions, etc.[44] 3.2 Fisheries/Mariners notices communicated widely to fishing fleets to allow fishermen to avoid site assessment work and provide adequate time to safely relocate gear that may conflict with site assessment activity. In most cases, this will mean rolling communication with fisheries (targeting two-week notice, as practicable, for relocation requests), as well as ongoing communications with fixed gear fisheries to minimize the duration of any necessary gear relocation. 3.3 Local Notice to Mariners issued to U.S. Coast Guard (USCG) district in advance of geophysical, geotechnical, and benthic surveys at least 2 weeks before activities in federal waters and 3 weeks before activities in state waters. 3.4 Each developer will designate a Fisheries Liaison as the developer's primary point of contact with the fishing community. Fisheries Liaisons should be available (by phone, text, and email) to address any questions and issues that arise during site assessment activities.[45] 3.5 The project website may also be used to provide any information that would be useful for fishery planning to avoid conflicts, including updated Fisheries/Mariners Notices, points of contact for Fisheries Liaisons, and available opportunities to sign up for notifications. 3.6 Fisheries/Mariners notices distributed as appropriate (electronically and hard copy if requested) to notify potentially impacted fishing fleets of any changes (e.g. scope, duration, timing). 3.7 Offer periodic updates to fishing fleets to advise on survey progress, including any estimated timeline in areas requiring spatial coordination between the survey and fisheries.

[44] The current regulation is: 2-week federal minimum and 3-week state minimum.

[45] This is a requirement of BOEM leases.

Activity	Site Assessment Best Practices
3. Proactive and Sustained Communications (continued)	3.8 If site assessment activities are expected to require spatial and temporal coordination with fisheries, coordination plans should be developed and communicated with sufficient advance notice to allow for fishermen to plan and remove gear if necessary and should specify reasonable buffers around operations. Spatial and temporal coordination plans, if needed, should use a rolling plan that minimizes the areas and times when fishermen would be requested to relocate gear. Closest Points of Approach will be established for survey operations and clearly communicated to promote safety with other maritime users, including fisheries. Vessels should observe noticed CPAs and remain a safe distance from survey vessels actively conducting surveying operations and restricted in their ability to maneuver, consistent with Rule 18, USCG Navigation Rules International-Inland.[46] 3.9 Onboard/Offshore Fisheries Liaisons (OFLs) should be used to manage at-sea communications and coordination between the site assessment vessel and the fishing fleet operating in the project area when there is potential for fishery interactions, noting that the use of OFLs may depend on the potential for fisheries interactions, the nature of the site assessment activity, and size of the vessel. 3.10 Fisheries Liaisons or OFLs and fishermen should maintain direct communication as needed to monitor fishing gear and activity. 3.11 Fisheries Liaisons or OFLs should communicate directly with fishing gear owners if any gear is identified that may be at risk during survey operations 3.12. Communications apps, texting services, and other electronic media may also be utilized to facilitate notification and communications regarding site assessment activities. 3.13 Schedule of survey mobilization (and if expected to be disruptive to fishery operations, port calls) should be communicated to the fishing fleet, noting that schedules may change subject to weather and other events. 3.14 Relevant contingencies or changes to planned survey or site assessment activities, such as changes to scope and schedule, should be communicated to the fishing industry as soon as practicable. 3.15 Site assessment vessels and fishing vessels operating in or transiting through project areas should monitor very high frequency (VHF) radio channel 16 as required by FCC Radio Watchkeeping Regulations and be responsive.[47] 3.16 Site assessment vessels should at all times maintain visual and electronic watches to facilitate communications with the fishing fleet during site assessment activities and to identify and avoid fishing gear. 3.17 Real-time communications should be used to ensure that Closest Points of Approach around site assessment operations are maintained and to resolve immediate conflicts or potential conflicts between fishing operations and site assessment operations.

[46] U.S. Coast Guard (2020). Navigational Rules and Regulations Handbook. https://navcen.uscg.gov/sites/default/files/pdf/navRules/Nav%20Rules%20Handbook_27OCT2022_85%20FR%2058268.pdf

[47] FCC 47 CFR §§ 80.148, 80.310, NTIA Manual 8.2.29.6.c(2)(e), ITU RR 31.18, 52.244

Activity	Site Assessment Best Practices
3. Proactive and Sustained Communications (continued)	3.18 Fishing vessels deploying or retrieving fixed gear or otherwise operating within the site assessment area should communicate and coordinate with the site assessment vessel as needed (Survey vessels will monitor VHF 16).
4. Automatic Identification System (AIS)	4.1 AIS will be utilized by survey vessels at all times in accordance with applicable USCG regulations.[48] For optimal communication between vessels, all fishing vessels should monitor AIS while operating within or transiting through survey areas, and those vessels able to transmit AIS should do so while in the survey area. All vessels capable of transmitting AIS are encouraged to do so while in the survey area to facilitate communication and safe operations.
5. Transit Corridors and Spatial Coordination	5.1 If indicated, transit corridors for site assessment vessels (e.g. existing crabber/towboat lane, shipping safety fairways, or new corridors) may be identified by developers in consultation with the fishing industry, communicated, and utilized if beneficial when transiting between port and the project area to minimize interactions with fishing gear and activity. 5.2 Subject to the nature of the survey operation, if a fishery cannot be avoided seasonally, additional spatial and temporal coordination may be required to minimize disruption to survey and fishing operations.
6. Scout Boats	6.1 Areas should be scouted ahead of site assessment activities if static fishing gear is expected to be present in the area unless the activity is not expected to interact with fishing gear. Scouting may be conducted by the survey vessel before survey equipment is deployed or may be conducted by a scout boat.[49] 6.2 Ideally, scout boats are local fishing vessels operated by captains from the local fishing community when available. 6.3 Scout boats are typically required to meet developer's vessel and crewing safety standards and credentialling, including vessel inspections and vessel assurance processes which may vary across companies.
7. Underwater Positioning Systems[50]	7.1 If a survey vessel needs to temporarily deploy equipment such as underwater transponder positioning systems (UTPs) or ultra-short baseline positioning systems (USBLs) on the seabed to calibrate survey equipment or aid in the navigation of Autonomous Underwater and/or Surface Vehicle (AUV/ASV), the location of the equipment will be communicated to the fishing fleet as early as practicable and be removed from the seabed as soon as practicable.

[48] AIS Requirements | Navigation Center (uscg.gov) - https://www.navcen.uscg.gov/ais-requirements

[49] California Code of Regulations, Title 2, section 2100.07(b)(8) applies to geophysical surveys in state waters and requires the survey vessel (or designated vessel) to traverse the proposed survey corridor prior to commencing survey operations to note and record the presence, type, and location of deployed fishing gear. It furthermore prohibits survey lines within 30m of observed fishing gear and prohibits survey crew from removing or relocating any fishing gear.

[50] Placement of a UTP/USBL in state waters may require a state tidelands lease or other entitlement from the California State Lands Commission.

Activity	Site Assessment Best Practices
7. Underwater Positioning Systems (continued)	7.2 If a vessel needs to deploy this equipment on an emergency basis, the location should be communicated to the fishing fleet as soon as possible. 7.3 The equipment should remain on the seabed in one location no longer than two weeks unless weather, operational considerations, or survey design preclude recovery in that timeframe, in which case the survey contractor should make every reasonable effort to recover the UTP, including its mooring, as soon as practicable.
8. Site Assessment Vessels and Equipment	8.1 Untowed survey equipment, including hull-mounted equipment and AUVs/ASVs, may be utilized subject to data collection requirements, survey conditions, feasibility, and availability. 8.2 Use of untowed survey equipment, where practicable and appropriate for the required data acquisition, should be considered when it reduces the likelihood of interaction with fishing gear. 8.3 Vessels may also be selected for endurance to minimize transits to port, subject to feasibility and availability. 8.4 Select vessels and equipment to avoid and minimize impacts, subject to availability, feasibility, and permitting and regulatory approval. 8.5 Report the geographic location of lost components (if known) to fishing vessels through appropriate measures (e.g., issuing a local Notice to Mariners) as soon as feasible after making any required notifications to jurisdictional authorities (e.g., BSEE and USCG), but no later than 24 hours after such required notifications have been made, if the lost components can significantly interfere with ocean users (e.g., are likely to snag or damage fishing equipment, or present a hazard to navigation). Recover marine trash and debris lost or discarded from project infrastructure or vessels in the project area if they can significantly interfere with ocean users (e.g., are likely to snag or damage fishing equipment or present a hazard to navigation). If marine trash or debris cannot be recovered within 48 hours, developers must submit a recovery plan to the applicable regulators.[51] 8.6 Materials, equipment, tools, containers, and other items used in OCS activities, which are of such size, shape, or configuration that they are likely to snag or damage fishing devices, and could be lost or discarded overboard, must be clearly marked with the vessel or facility identification and properly secured to prevent loss overboard. All markings must clearly identify the owner and must be durable enough to resist the effects of the environmental conditions to which they may be exposed.

[51] Established best practices for recovery of marine trash and debris are included in Appendix D of the California Final Environmental Assessment for Commercial Wind Lease and Grant Issuance, and Site Assessment Activities for Humboldt and Morro Bay found here: https://www.boem.gov/renewable-energy/state-activities/humboldt-wind-energy-area

Activity	Site Assessment Best Practices
8. Site Assessment Vessels and Equipment (continued)	8.7 Establish protocols for gear entanglement with offshore wind (OSW) infrastructure and include them in emergency response plans and/or Fisheries Communication Plans as appropriate. Report the geographic location of lost components immediately to the fishing vessels in the vicinity, and more broadly through a notice to mariners within 24 hours. Developers must recover marine trash and debris that is lost or discarded in the marine environment if it can significantly interfere with ocean users (e.g., are likely to snag or damage fishing equipment or present a hazard to navigation). If developers are unable to recover marine trash or debris within 48 hours, the lessee must submit a recovery plan to applicable regulators.[52]
9. Metocean Buoys	9.1 The fishing industry should be consulted on potential metocean buoy locations and metocean buoy siting should consider locations that would avoid or minimize impacts to fishing operations to the extent practicable. 9.2 Metocean buoy locations and deployments should be communicated to the fishing fleet as far in advance as practicable. 9.3 Metocean buoy locations should be marked with AIS if practicable. Buoys that are unable to support AIS must be marked in accordance with USCG requirements and guidelines. 9.4 Metocean buoy mooring systems, including the anchors, should be removed as soon as possible when the buoy is decommissioned.
10. Data Sharing	10.1 Developers and fishermen should consider initiating conversations, together with researchers and others, to discuss opportunities to share non-proprietary data collected during site assessments.

[52] Established best practices for recovery of marine trash and debris are included in Appendix D of the California Final Environmental Assessment for Commercial Wind Lease and Grant Issuance, and Site Assessment Activities for Humboldt and Morro Bay found here: https://www.boem.gov/renewable-energy/state-activities/humboldt-wind-energy-area

GEAR LOSS CLAIMS PROCESS

In the event of gear loss or damage during survey operations, each project should have a publicly available gear loss claims process included in its Fisheries Communication Plan (FCP). Gear loss claims processes should be designed to facilitate a fair and timely resolution of gear loss claims.

The FCPs for the five current California lessees including gear loss claims processes are available online (see footnotes for links). These include:

- The joint FCP from RWE and Vineyard Offshore.[53]
- Even Keel Wind (Invenergy) FCP.[54]
- Atlas Wind Project (Equinor) FCP.[55]
- Golden State Wind FCP.[56]

To support fishermen in the event of gear interactions, Fisheries Liaisons play a key role in guiding claimants through the process. As a best practice, developers should aim to respond to completed claims within 30 days to ensure timely resolution. The claims process itself should be structured to offer two main pathways:

a) A streamlined option requiring minimal documentation, such as compensation based on a fixed percentage of gear replacement value to account for lost income.

b) A more detailed path for substantiated claims that exceed replacement costs, evaluated on a case-by-case basis.

In the event of a gear interaction, the Offshore Fisheries Liaison (OFL), or the Client Representative if an OFL is not available, should promptly notify the project's Fisheries Liaison. The Fisheries Liaison will then work to identify the gear owner if possible and be available to assist them in initiating the claims process.

The number of gear loss claims is reported semiannually to BOEM, as required by lease terms, and these reports are made publicly available. If a project experiences repeated gear losses, or fishing vessel interactions occur during a site assessment campaign, the developer should meet with the relevant fishery participants and/or representatives and,

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[53] https://americas.rwe.com/-/media/RWE/RWE-USA/documents/rwe-vineyard-offshore-joint-fcp.pdf

[54] https://evenkeelwind.invenergy.com/assets/pdfs/leadinglightoffshore/EKW_FisheriesCommunicationsPlan_Revised2023-12-20-002.pdf

[55] https://atlasoffshorewind.com/wp-content/uploads/2024/01/20231222_Atlas-Wind-OCS-P-0563_Fisheries-Communication-Plan_Rev1_clean-Dec-2023.pdf

[56] https://www.goldenstatewind.com/wp-content/uploads/2024/07/GSW_Fisheries-Comms-Plan_4.pdf

if appropriate, revisit its impact avoidance measures and communications with the fishing industry.

Should such a review indicate that feasible and practicable revisions to the communications plan or mitigation measures could further reduce gear loss or damage, those changes should be incorporated into the assessment plan and clearly communicated to the fishing industry.

These best practices are intended to be adaptive and are subject to periodic review as necessary.

ADDITIONAL SITE SURVEY AND ASSESSMENT PERMITTING RESOURCES

I. State Lands Commission's Geophysical Survey Permit Program: https://www.slc.ca.gov/ogpp/

II. The Commission requires Coastal Development Permits for development in the coastal zone, including certain site assessment activities in state waters. The Coastal Act defines development broadly to include typical land development activities such as construction of buildings as well as the placement of structures or fill in the ocean, and changes in the intensity of use of land or water, even where no construction is involved.[57] For more on Coastal Development Permits: https://www.coastal.ca.gov/cdp/cdp-forms.html

III. CDFW requires a Scientific Collecting Permit (SCP) for geotechnical surveys (i.e., benthic grab samples) that target benthic infauna conducted in state waters. An SCP may also be required to transport wildlife species through state waters. Additionally, CDFW requires an SCP for any scientific equipment or sensors installed inside a Marine Protected Area, Marine Managed Area, or Special Closure for the studying or tracking of wildlife or monitoring oceanographic conditions. For more on Scientific Collecting Permits: https://wildlife.ca.gov/Licensing/Scientific-Collecting

IV. BOEM's Regulatory Framework and Guidelines: https://www.boem.gov/renewable-energy/regulatory-framework-and-guidelines.

V. BOEM's California activities web page containing the current California leases, California Environmental Assessments, and California Biological Assessment. The leases describe survey plan requirements: https://www.boem.gov/renewable-energy/state-activities/california

VI. BOEM Renewable Energy Lease and Grant Information: https://www.boem.gov/renewable-energy/lease-and-grant-information

[57] Cal. Pub. Res. Code § 30106.

BEST PRACTICES FOR AVOIDING AND MINIMIZING IMPACTS

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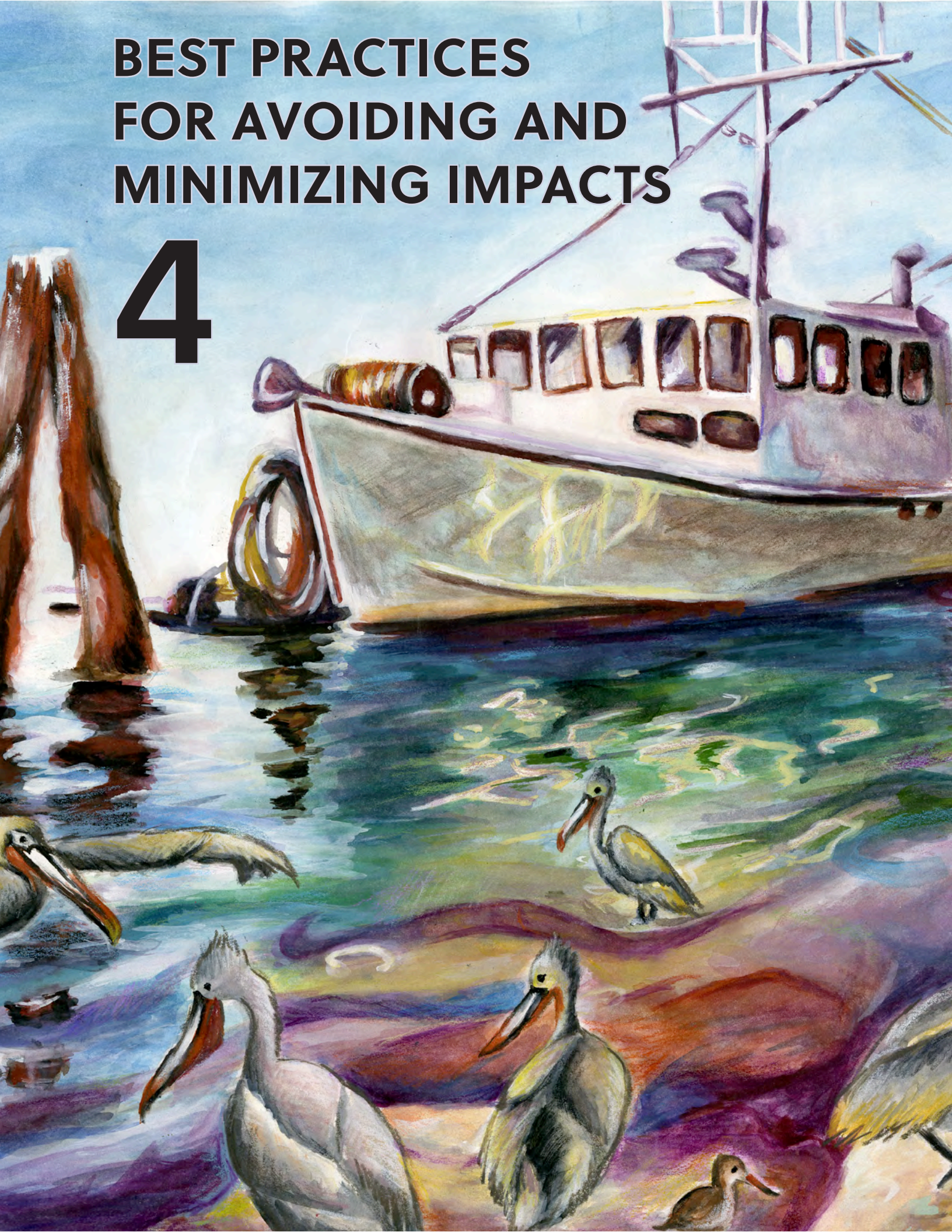

4. Best Practices for Avoiding and Minimizing Impacts

INTRODUCTION

This chapter provides five tables that list potential negative effects to commercial and recreational fisheries that may arise from offshore wind energy projects, along with measures that could be implemented to avoid and minimize such impacts. Representatives of the California Offshore Wind Energy Fisheries Working Group (Working Group) first identified potential adverse impacts to fishing communities and then compiled avoidance and minimization measures (measures) that should be considered to lessen or eliminate these impacts. The measures apply to tribal fisheries to the extent that the identified impacts affect California Native American Tribes. Impacts and measures that are unique to tribal fisheries are discussed in Chapter 7. Potential secondary impacts and ecological impacts (e.g., habitat impacts, impacts to fish biology, etc.) are discussed at the end of this section and are not included in Tables 4.1 through 4.5.

Best practices and avoidance and minimization measures for specific activities are also discussed in other chapters of this Statewide Strategy. Chapter 2 and Chapter 3 of the Statewide Strategy describe communication best practices and best practices for surveys and data collection activities, respectively. Unique communication protocols for tribal fisheries are in Chapter 7, as are unique impacts to tribal fisheries. The measures and best practices from Chapter 2 and Chapter 3 that are referenced in Tables 4.1 through 4.5 should be considered possible measures for addressing relevant potential adverse impacts.

Measures to avoid and minimize impacts to fishing communities will be considered as part of an offshore wind project's state and federal permitting processes, including the California Coastal Commission's (Commission) evaluation of the coastal effects of any project and its consistency with the California Coastal Management Program's enforceable policies.[58] Necessary, appropriate, and workable measures may be included as developer-proposed measures or conditions to agency authorizations. The Commission will work with developers to ensure that any measures pursued through the consistency review process do not conflict with federal or state permitting or regulatory requirements.

Some of the impacts discussed in this chapter may not apply to every project, as they depend on site-specific conditions and project design. In certain cases, technical or economic constraints may require adjustments to proposed actions in order to effectively avoid or minimize impacts while maintaining project feasibility. As

[58] The California Coastal Management Program (CCMP) includes the enforceable policies of Chapter 3 of the California Coastal Act (Cal. Pub. Res. Code §§ 30200-30265.5).

emphasized throughout the Statewide Strategy, ongoing communication and engagement with fishing communities and the Commission are essential to identifying the most suitable fisheries-related mitigation measures—or appropriate alternatives—that best support impact avoidance and minimization for affected communities.

Adverse impacts that cannot be avoided and minimized to a sufficient level using actions outlined in this chapter or other best practice measures may be addressed through compensatory mitigation.[59] Chapter 5 lays out a methodology for a comprehensive project-level socioeconomic analysis of direct and indirect impacts to commercial and recreational fishing communities. This methodology will outline the process for identifying and assessing socioeconomic impacts. Chapter 6 lays out a framework for compensatory mitigation, which includes how compensation will be administered and spent. An additional tribal fisheries framework for mitigation is provided in Chapter 7.

The impacts and measures identified in this chapter were developed by the Working Group based on current knowledge of West Coast fishing communities and fisheries, activities and infrastructure associated with offshore wind energy projects, and available environmental review documents and resources.[60, 61] However, the Working Group notes that the novelty of floating offshore wind infrastructure in California makes it challenging to identify and analyze all potential impacts from development. Some impacts may only become apparent over time (e.g., after completion of project-level environmental impact statements and regulatory authorizations, such as the consistency review). Chapter 1 describes the process for updating this strategy in the future.

POTENTIAL IMPACTS AND AVOIDANCE AND MINIMIZATION MEASURES

Tables 4.1 through 4.4 summarize potential adverse impacts on commercial, tribal, and recreational fisheries and associated avoidance and minimization measures across an offshore wind project's site assessment and design, construction, operations, and decommissioning phases. Some of the measures identified are required under existing

[59] The approach to impact avoidance and minimization is founded upon a mitigation hierarchy. In its simplest form, the mitigation hierarchy includes three stages: (1) avoid creating impacts from the outset, (2) minimize the impacts that cannot be avoided, and (3) compensate for or offset the impacts that cannot be minimized. Avoidance and mitigation measures will be identified by developers with input from relevant federal and state agencies as well as fisheries and other stakeholders, through an iterative process of, for example, project design, offshore export cable routing, timing of works, and consideration of construction and operations methods.

[60] Humboldt Wind Energy Final Environmental Assessment and Morro Bay Final Environmental Assessment.

[61] New York State Energy Research and Development Authority's Mitigation Practices Database Tool https://www.nyetwg.com/mpd-tool; New York Bight PEIS: https://www.boem.gov/renewable-energy/state-activities/new-york-bight-final-programmatic-environmental-impact-statement; Representative Project Design Envelope for Floating OSW Energy: A Focus On the California 2023 Federal Leases: https://www.boem.gov/renewable-energy/state-activities/rdpe-final; and Draft California PEIS: https://www.boem.gov/renewable-energy/state-activities/california-offshore-wind-programmatic-environmental-impact.

federal or state regulations, or encouraged under federal or state guidelines, and/or included as conditions on federal offshore wind leases, as specified in footnotes. Each table includes the following:

- Currently identifiable potential adverse impacts to fishing communities from offshore wind development off the coast of California.[62]
- A preliminary list of fisheries that could potentially be impacted based on the current distribution of fishing effort.
- Avoidance and minimization measures that could be enacted, as feasible and appropriate, by offshore wind developers to address the identified adverse impact.[63]

Table 4.5 describes potential measures to avoid and minimize impacts to fishing communities that could be undertaken by parties other than offshore wind developers. The table's last column specifies the entity or entities that could implement those measures.

As mentioned above, California floating offshore wind development is at the beginning of a decades-long planning and permitting process, and the potential adverse impacts and associated measures identified in this chapter are subject to change based on new or evolving information, knowledge, technology, and experience.

[62] This document uses the words "short-term" and "long-term" to describe the expected duration of some potential impacts. These terms are defined as they are in the Draft California Offshore Wind PEIS. Short-term effects: Effects lasting less than the duration of construction (up to three years). Long-term effects: Effects lasting longer than the duration of construction (three years) but less than the life of the Humboldt and Morro Bay offshore wind projects (35 years). Any potential impacts anticipated to persist for over 35 years would be classified as "permanent".

[63] Chapter 2, Section 30108 of the Coastal Act defines *feasible* as capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, social, and technological factors.

Table 4.1 Site Assessment and Design Phase Potential Impacts and Avoidance and Minimization Measures

Potential Impact		Avoidance and Minimization Measures	Fisheries Potentially Impacted
1.1	Short-term displacement due to the presence of metocean or floating light detection and ranging (FLiDAR) buoys/moorings commissioned by offshore wind developers	Use relevant avoidance and minimization measures identified in Chapter 3. Remove anchors associated with surface metocean and FLiDAR buoys in the lease area when decommissioning.[64] Establish protocols for gear entanglement with offshore wind (OSW) infrastructure and include them in emergency response plans and/or Fisheries Communication Plans as appropriate.	**Lease Area:** Groundfish Fixed Gear, Groundfish Trawl, Highly Migratory Species, Box Crab, Spot Prawn, CPFV and Private Recreational Fishing **Cable Corridor:** Dungeness crab fishery, Groundfish Trawl, Groundfish Fixed Gear, Nearshore Groundfish, Salmon Troll, Shrimp/Prawn Trawl and Traps, Market Squid fishery, Coastal Pelagic Species, Hagfish, CPFV and Private Recreational Fishing, Tribal Fisheries
1.2	Gear entanglement/gear loss from interactions with metocean or FLiDAR buoys, mooring lines, or anchor weights		
1.3	Short-term displacement due to offshore surveys (geophysical, geotechnical, benthic)	Use relevant avoidance and minimization measures identified in Chapter 3. Implement marking and lighting of surface metocean and FLiDAR buoys such that they are visible to fishing vessels and consistent with the U.S. Coast Guard (USCG) Private Aids to Navigation (PATONs) regulations.[65] Establish protocols for gear entanglement with OSW infrastructure and include in emergency response plans and/or Fisheries Communication Plans as appropriate.	
1.4	Gear entanglement/gear loss from interactions with offshore survey equipment (e.g., tow fish, AUVs)		
1.5	Allision with metocean or FLiDAR buoys		
1.6	Collision with offshore survey vessels	Use relevant avoidance and minimization measures identified in Chapter 3. Project-related vessels to follow best practice guidance, including the Convention on the International Regulations for Preventing Collisions at Sea (COLREGS).[66]	

[64] Required in the first five California offshore wind leases. Completed leases found here: https://www.boem.gov/renewable-energy/state-activities/california

[65] PATON Available at: https://www.atlanticarea.uscg.mil/District-8/District-Divisions/Waterways/PATON/ ; FAA regulations available at 14 CFR 77: https://www.ecfr.gov/current/title-14/chapter-I/subchapter-E/part-77

[66] COLREGS are available at: https://www.dco.uscg.mil/NavRules/

Potential Impact		Avoidance and Minimization Measures	Fisheries Potentially Impacted
1.7	Long-term displacement from traditional fishing grounds due to the presence of floating wind turbines/floating offshore substation(s)	In collaborative dialogue with California fishing communities, seek to design OSW infrastructure and project footprints to avoid and/or minimize impacts to fishing activities, in the context of many design considerations and constraints. Seek to design offshore wind projects so facilities can be decommissioned by removal at the end of a project's operating term.	Groundfish Fixed Gear, Groundfish Trawl, Highly Migratory Species, Box Crab, Spot Prawn, CPFV and Private Recreational Fishing, Tribal Fisheries
1.8	Long-term displacement from traditional fishing grounds due to the presence of inter-array cables		
1.9	Long-term displacement from traditional fishing grounds due to the presence of mooring lines and anchors		
1.10	Long-term displacement from traditional fishing grounds due to the presence of offshore export cables	In collaborative dialogue with California fishing communities, seek to design OSW infrastructure and project footprints to avoid and/or minimize impacts to fishing activities, in the context of relevant design considerations and constraints. Where feasible, coordinate transmission routing among projects to use parallel routing, avoid unnecessary cable crossings, and ensure adequate space for safe cable repair activities, and work collaboratively to use seabed space most efficiently. Bury offshore export cables beneath the seafloor to a sufficient depth based on prevailing local physical, oceanographic, and site use conditions, and technical feasibility factors (e.g., thermal conductivity), as informed by a Cable Burial Risk Assessment.[67] Avoid cable installation techniques that result in a long-term increase of the seabed profile, such as the ejection of large, previously buried rocks or boulders onto the sea floor. If raising the profile of the seabed is unavoidable, measures should be included in a project's Construction and Operations Plan (COP) to minimize the total area of impact where bottom-tending fishing gear is actively used, such as through removal or consolidation. If needed, cable protection measures should seek to avoid creating new gear entanglement hazards to the extent feasible. For example, in areas where bottom-tending gear has historically been used, cable protection measures should have tapered or sloped edges to reduce hangs for mobile fishing gear.	Dungeness crab fishery, Groundfish Trawl, Groundfish Fixed Gear, Nearshore Groundfish, Shrimp/Prawn Trawl and Traps, Recreational Fishing, Tribal Fisheries

[67] Cable Burial Risk Assessment is included in BOEM's Final Information Needed for Issuance of a Notice of Intent (NOI) Under the National Environmental Policy Act (NEPA) for a Construction and Operations Plan (COP) guidance document found here: https://www.boem.gov/about-boem/regulations-guidance/guidance-portal

Potential Impact		Avoidance and Minimization Measures	Fisheries Potentially Impacted
1.11	Increased at-sea travel time/distance to avoid offshore wind infrastructure	In collaborative dialogue with California fishing communities, seek to design OSW infrastructure and project footprints to avoid and/or minimize the impacts to fishing vessels that transit through or around developed lease areas, in the context of relevant design considerations and constraints, and within the current USCG regulations.	Groundfish Fixed Gear, Groundfish Trawl, Highly Migratory Species, Box Crab, Spot Prawn, CPFV and Private Recreational Fishing
1.12	Loss of fishing revenue and increased stakeholder fatigue due to lost time engaging with OSW developers, State Agencies, and Federal Agencies	Ensure offshore wind meetings organized by developers are planned and conducted efficiently to minimize the burden of participation by fishing communities, consistent with the communication protocols in Chapter 2 and Tribal communication protocols in Chapter 7. When feasible, offshore wind developers should collaborate when hosting fisheries outreach meetings and port hours.	All Commercial, Recreational, and Tribal Fisheries
1.13	Potential for changes or exclusions to insurance coverage for commercial and charter/recreational fishing vessels that transit through or attempt to fish inside a wind farm	Consult with the fishing and insurance industries and the USCG to identify safety measures, training opportunities, and other measures to promote safe navigation and/or fishing activities in and around offshore wind facilities. Such measures should align with the outcome of any project-specific Navigational Safety Risk Assessment, project-specific permits (e.g., Section 408 permit), and Port Access Route Studies.	All Commercial, Recreational, and Tribal Fisheries
1.14	Interruption to long-term monitoring programs that inform stock assessments and, in turn, impact fisheries management. Interruptions to monitoring programs may cause increased uncertainty and result in reduced harvest quotas	Cooperate with the National Marine Fisheries Service (NMFS) to identify potential impacts to fisheries surveys and develop mitigation strategies to minimize impacts to the scientific integrity of NMFS surveys and the scientific products produced with these survey data, consistent with Research Focus 6 from the agency's strategic plan.[68] Design and implement project-specific fisheries and benthic monitoring (pre-, during, and post-construction) in coordination with NMFS, with the goal of achieving no net loss of confidence in stock assessments from the presence of offshore wind.	All Commercial, Recreational, and Tribal Fisheries

[68] NMFS West Coast Strategic Plan: https://www.fisheries.noaa.gov/resource/document/west-coast-offshore-wind-energy-strategic-science-plan

Table 4.2 Construction Phase Potential Impacts and Avoidance and Minimization Measures

Potential Impact		Avoidance and Minimization Measures	Fisheries Potentially Impacted
2.1	Short-term displacement due to construction activities in the lease area	Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7. Establish a marine coordination center (MCC) to coordinate offshore construction activities.[69] The MCC should communicate and coordinate the scheduling of time windows for construction activities to avoid or minimize significant conflicts with fishing activities whenever feasible. Employ guard/scout vessels as/when appropriate with experience in the project area to avoid and minimize interactions with deployed fishing gear in the lease area and along the cable corridor.	Groundfish Fixed Gear, Groundfish Trawl, Highly Migratory Species, Box Crab, Spot Prawn, CPFV and Private Recreational Fishing
2.2	Short-term displacement due to construction activities in offshore cable corridor (Federal waters)	Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7. Prioritize installation and maintenance techniques that avoid and minimize disruption to fishing activities (e.g., simultaneous cable lay and burial). Establish an MCC to coordinate offshore construction activities. The MCC should communicate and coordinate the scheduling of time windows for construction activities to avoid or minimize significant conflicts with fishing activities whenever feasible. Employ guard/scout vessels with experience in the project area as/when appropriate to avoid and minimize interactions with deployed fishing gear in the lease area and along the offshore cable corridor.	Groundfish Fixed Gear, Groundfish Trawl, Highly Migratory Species, Box Crab, Spot Prawn, CPFV and Private Recreational Fishing
2.3	Short-term displacement due to construction activities in the nearshore offshore cable corridor (State waters)		Dungeness crab fishery, Groundfish Fixed Gear, Nearshore Groundfish, Salmon Troll, Shrimp/Prawn Trawl and Traps, Market Squid fishery, Coastal Pelagic Species, Hagfish, CPFV and Private Recreational Fishing, Tribal Fisheries

[69] An MCC serves as a construction logistics center for offshore wind projects and the single point of contact between onshore office and offshore activities. The MCC will monitor vessel corridors and ports, manage and track all construction vessels, and coordinate logistics; liaise with the USCG, port authorities, and others; coordinate with fishermen and other mariners in advance of cable laying; maintain temporary safety zones around all construction activities; establish a vessel traffic management plan; and coordinate with local pilots during construction. The MCC will also monitor for traffic, safety, intrusion, and environmental permit compliance.

Potential Impact		Avoidance and Minimization Measures	Fisheries Potentially Impacted
2.4	Collision with construction, support, or survey vessels	Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7. Consult with the fishing industry to identify safety measures, training opportunities, and other measures to promote safe navigation in and around offshore wind facilities. Such measures should align with the outcome of any project-specific Navigational Safety Risk Assessment, project-specific permits (e.g., Section 408 permit), and Port Access Route studies. Project-related vessels to follow best practice guidance, including the Convention on the International Regulations for Preventing Collisions at Sea (COLREGS). Create emergency, spill response, and debris recovery plans that comply with federal regulations and permitting requirements and include communication protocols for the fishing community.[70]	All Commercial, Recreational, and Tribal Fisheries
2.5	Allision with partially installed structures (e.g., short-term buoyed anchor or inter-array cable lines, HDD ducts, demarcation buoys, or metocean buoys)	Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7. Implement marking and lighting of project components visible to fishing vessels and consistent with the USCG PATONs and FAA regulations, if applicable. Create emergency, spill response, and debris recovery plans that comply with federal regulations and permitting requirements and include communication protocols for the fishing community.	All Commercial, Recreational, and Tribal Fisheries

[70] Emergency response procedures and an Oil Spill Response Plan are required to be submitted to the Bureau of Safety and Environmental Enforcement Pursuant to 30 CFR 585.627. Regulations found here: https://www.ecfr.gov/current/title-30/chapter-V/subchapter-B/part-585/subpart-G/subject-group-ECFRdad372c92aade13/section-585.627

Potential Impact		Avoidance and Minimization Measures	Fisheries Potentially Impacted
2.6	Gear entanglement/gear loss from interactions with offshore wind project's unexpected dropped objects	Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7. Materials, equipment, tools, containers, and other items used in Outer Continental Shelf (OCS) activities, which are of such size, shape, or configuration that they are likely to snag or damage fishing devices, and could be lost or discarded overboard, must be clearly marked with the vessel or facility identification and properly secured to prevent loss overboard. All markings must clearly identify the owner and must be durable enough to resist the effects of the environmental conditions to which they may be exposed. Establish protocols for gear entanglement with OSW infrastructure to be included in emergency response plans and/or Fisheries Communication Plans as appropriate.	Groundfish Fixed Gear, Groundfish Trawl, Dungeness Crab Fishery, Salmon Troll, Shrimp/Prawn Trawl and Traps, Market Squid fishery, Coastal Pelagic Species, Hagfish, CPFV and Private Recreational Fishing
2.7	Short-term displacement due to the presence of metocean buoys/moorings	See Table 4.1 Item 1.1	Groundfish Fixed Gear, Groundfish Trawl, Highly Migratory Species, Box Crab, Spot Prawn, CPFV and Private Recreational Fishing
2.8	Reduced access to home port/landings port due to the presence of construction vessels	Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7. See Table 4.5 Items 5.1 and 5.2 for additional measures to be implemented by port authorities.	All Commercial, Recreational, and Tribal Fisheries
2.9	Reduced access and increased congestion in ports supporting staging and integration due to turbines being staged in wet storage and towed through the port	Use the MCC to communicate and coordinate wind turbine tow-out activities from port facilities to avoid or minimize significant conflict with fishing (e.g., Dungeness crab opener). Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7.	All Commercial, Recreational, and Tribal Fisheries
2.10	Impacts to fishing activities and gear from vessel traffic to and from lease areas	Where appropriate, transit corridors—e.g., existing crabber/towboat lane, Pacific Coast Port Access Route Study (PAC-PARS) fairways, or new corridors—for project-related vessels traveling between West Coast ports supporting California offshore wind projects will be identified by developers in consultation with the fishing industry and communicated and utilized, if beneficial, when transiting between ports and project areas to minimize interactions with fishing gear and activities.	All Commercial, Recreational, and Tribal Fisheries

Table 4.3 Operations Phase Potential Impacts and Avoidance and Minimization Measures

Potential Impact		Avoidance and Minimization Measures	Fisheries Potentially Impacted
3.1	Collision with Operations & Maintenance vessels	See Table 4.2 Item 2.4	All Commercial, Recreational, and Tribal Fisheries
3.2	Allision with offshore wind farm structures	See Table 4.2 Item 2.5	Groundfish Fixed Gear, Groundfish Trawl, Highly Migratory Species, Box Crab, Spot Prawn, CPFV and Private Recreational Fishing
3.3	Radar interference and reduced navigation capabilities due to the presence of operational wind turbines	Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7. Provide fishing vessels with upgraded radar equipment where appropriate or feasible and necessary. Seek fishing community input in drafting a Lighting and Marking Plan (e.g., identifying offshore wind infrastructure that would be most appropriate for Automatic Identification Systems (AIS) transponders) submitted to the USCG for approval. Chart all cables, facilities, and obstructions, providing data to relevant authorities and the fishing industry. Implement marking and lighting of project components visible to fishing vessels and consistent with the USCG PATONs and FAA regulations.	Groundfish Fixed Gear, Groundfish Trawl, Highly Migratory Species, Salmon Troll, Box Crab, Spot Prawn, CPFV and Private Recreational Fishing
3.4	Potentially increased complexity of Search and Rescue (SAR) missions in wind farm	Consult with the USCG on the development of measures to mitigate impacts to Search and Rescue (SAR) operations, including developer tabletop exercises and self-help capability in emergencies. Consult with the USCG, Tribal fisheries, and the fishing industry in the development of emergency response plans.	Groundfish Fixed Gear, Groundfish Trawl, Highly Migratory Species, Box Crab, Spot Prawn, CPFV and Private Recreational Fishing,
3.5	Gear entanglement/gear loss from interactions with mooring lines and/or anchors	Chart all cables, facilities, and obstructions, providing data to relevant authorities and the fishing industry. Establish protocols for gear entanglement with OSW infrastructure and include them in emergency response plans and/or Fisheries Communication Plans as appropriate.	
3.6	Gear entanglement/gear loss from interactions with inter-array cables		

Potential Impact		Avoidance and Minimization Measures	Fisheries Potentially Impacted
3.7	Gear entanglement/gear loss from interactions with offshore export cables/cable protection	Chart all cables, facilities, and obstructions, providing data to relevant authorities and the fishing industry. Bury offshore export cables beneath the seafloor to a sufficient depth based on prevailing local physical, oceanographic, and site use conditions, and technical feasibility factors (e.g., thermal conductivity), as informed by a Cable Burial Risk Assessment. Avoid cable installation techniques that result in a long-term increase of the seabed profile, such as the ejection of large, previously buried rocks or boulders onto the surface. If raising the profile of the seabed is unavoidable, measures should be included in a project's COP to minimize the total area of impact where bottom-tending fishing gear is actively used, such as through removal or consolidation. If needed, cable protection measures should seek to avoid creating new gear entanglement hazards to the extent feasible. For example, in areas where bottom-tending gear has historically been used, cable protection measures should have tapered or sloped edges. Monitor cables periodically after installation to determine cable location, burial depths, and site conditions to determine if burial conditions have changed and whether remedial action or additional mitigation measures are warranted. Notify the fishing community immediately if cables become unburied or otherwise become hazards to fishing operations. Establish protocols for gear entanglement with OSW infrastructure and include them in emergency response plans and/or Fisheries Communication Plans as appropriate. Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7.	Groundfish Fixed Gear, Groundfish Trawl, Dungeness Crab Fishery, Shrimp/Prawn Trawl and Traps, Hagfish, CPFV and Private Recreational Fishing, Tribal Fishing
3.8	Short-term displacement from sections of the export cable area due to inspection/maintenance/repair	See Table 4.2 Items 2.2 and 2.3	Groundfish Fixed Gear, Groundfish Trawl, Dungeness Crab Fishery, Salmon Troll, Shrimp/Prawn Trawl and Traps, Market Squid fishery, Coastal Pelagic Species, Hagfish, CPFV and Private Recreational Fishing, Tribal Fishing

Potential Impact		Avoidance and Minimization Measures	Fisheries Potentially Impacted
3.9	Reduced access to home port/landings port due to the presence of Operations & Maintenance vessels	Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7. See Table 4.5 Items 5.1 and 5.2 for additional measures to be implemented by port authorities.	All Commercial, Recreational, and Tribal Fisheries
3.10	Reduced access to ports supporting staging and integration as turbines are being towed in and out of the port for maintenance/repair	Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7. Use the MCC to communicate and coordinate wind turbine tow-out activities from port facilities to avoid or minimize significant conflict with fishing (e.g., Dungeness crab opener).	

Potential Impact		Avoidance and Minimization Measures	Fisheries Potentially Impacted
3.11	Reduced fishing opportunities due to marine pollution/debris from Operations & Maintenance vessels, wind farm structures (e.g., lube oil, vessel fuel, wind farm components)	Report the geographic location of lost components (if known) to fishing vessels through appropriate measures (e.g., communication through the MCC, informing fishing associations, online apps, and Channel 16 on very high frequency [VHF] radio) as soon as feasible after making any required notifications to jurisdictional authorities (e.g., BSEE and USCG), but no later than 24 hours after such required notifications have been made, if the lost components can significantly interfere with ocean users (e.g., are likely to snag or damage fishing equipment, or present a hazard to navigation). Recover marine trash and debris from project infrastructure or vessels that are lost or discarded in the project area if they can significantly interfere with ocean users (e.g., are likely to snag or damage fishing equipment or present a hazard to navigation). If marine trash or debris cannot be recovered within 48 hours, developers must submit a recovery plan to the applicable regulators.[71] Materials, equipment, tools, containers, and other items used in Outer Continental Shelf (OCS) activities, which are of such size, shape, or configuration that they are likely to snag or damage fishing devices, and could be lost or discarded overboard, must be clearly marked with the vessel or facility identification and properly secured to prevent loss overboard. All markings must clearly identify the owner and must be durable enough to resist the effects of the environmental conditions to which they may be exposed. Create emergency, spill prevention and response, and debris recovery plans that comply with federal regulations and permitting requirements and include communication protocols for the fishing community. Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7.	All Commercial, Recreational, and Tribal Fisheries
3.12	Short-term displacement from the offshore wind farm area for safety reasons due to extraordinary events such as a major infrastructure failure (e.g., damaged blades, fire, mooring failure)		

[71] Established best practices for recovery of marine trash and debris are included in Appendix D of the California Final Environmental Assessment for Commercial Wind Lease and Grant Issuance, and Site Assessment Activities for Humboldt and Morro Bay found here: https://www.boem.gov/renewable-energy/state-activities/humboldt-wind-energy-area

Potential Impact		Avoidance and Minimization Measures	Fisheries Potentially Impacted
3.13	Gear entanglement/gear loss from interactions with offshore wind project debris or other objects accidentally dropped or abandoned at sea	Report the geographic location of lost components (if known) to fishing vessels through appropriate measures (e.g., issuing a local Notice to Mariners) as soon as feasible after making any required notifications to jurisdictional authorities (e.g., BSEE and USCG), but no later than 24 hours after such required notifications have been made, if the lost components can significantly interfere with ocean users (e.g., are likely to snag or damage fishing equipment, or present a hazard to navigation). Recover marine trash and debris from project infrastructure or vessels that are lost or discarded in the project area if they can significantly interfere with ocean users (e.g., are likely to snag or damage fishing equipment or present a hazard to navigation). If marine trash or debris cannot be recovered within 48 hours, developers must submit a recovery plan to the applicable regulators. Materials, equipment, tools, containers, and other items used in OCS activities, which are of such size, shape, or configuration that they are likely to snag or damage fishing devices, and could be lost or discarded overboard, must be clearly marked with the vessel or facility identification and properly secured to prevent loss overboard. All markings must clearly identify the owner and must be durable enough to resist the effects of the environmental conditions to which they may be exposed. Establish protocols for gear entanglement with OSW infrastructure and include them in emergency response plans and/or Fisheries Communication Plans as appropriate.	All Commercial, Recreational, and Tribal Fisheries
3.14	Long-term displacement from traditional fishing grounds due to the presence of floating wind turbines/floating offshore substation(s)	Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7. Consult with the USCG and commercial, Tribal, and recreational fisheries during the development of USCG navigational guidance (e.g., Navigational and Vessel Inspection Circular [NVIC]) and project-specific Navigational Safety Risk Assessments (NSRAs).	Groundfish Fixed Gear, Groundfish Trawl, Highly Migratory Species, Box Crab, Spot Prawn, CPFV and Private Recreational Fishing
3.15	Long-term displacement from traditional fishing grounds due to presence of inter-array cables		
3.16	Long-term displacement from traditional fishing grounds due to the presence of mooring lines and anchors		

Potential Impact		Avoidance and Minimization Measures	Fisheries Potentially Impacted
3.17	Long-term displacement from traditional fishing grounds due to the presence of offshore export cables,	Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7. Consult with the USCG and commercial, Tribal, and recreational fisheries during the development of USCG navigational guidance (e.g., NVIC) and project-specific NSRAs. Provide the fishing community with recommended practices for fishing operations in areas where offshore export cables have been installed to maintain safety, avoid gear snags, and protect cables.	Dungeness crab fishery, Groundfish Trawl, Groundfish Fixed Gear, Nearshore Groundfish, Salmon Troll, Shrimp/Prawn Trawl and Traps, Market Squid fishery, Coastal Pelagic Species, Hagfish, CPFV and Private Recreational Fishing, Tribal Fisheries
3.18	Vessels fishing within or close to developed lease areas are subject to greater safety hazards	Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7. Consult with the USCG and commercial, Tribal, and recreational fisheries during the development of USCG navigational guidance (e.g., NVIC) and project-specific NSRAs. Chart all cables, facilities, and obstructions, providing data to relevant authorities and the fishing industry. Consider including ladders on floating platforms that extend below the water line to allow survivors of an allision between a vessel and a floating platform an opportunity to climb to safety. Ladders should lead to a safe area where a radio or satellite phone is available to call for help.	Groundfish Fixed Gear, Groundfish Trawl, Highly Migratory Species, Box crab, Spot Prawn, CPFV and Private Recreational Fishing
3.19	Impacts to fishing activities and gear from vessel traffic to and from lease areas	Where appropriate, transit corridors—e.g., existing crabber/towboat lane, Pacific Coast Port Access Route Study (PAC-PARS) fairways, or new corridors—for project-related vessels traveling between West Coast ports supporting California offshore wind projects will be identified by developers in consultation with the fishing industry and communicated and utilized, if beneficial, when transiting between ports and project areas to minimize interactions with fishing gear and activities.	All Commercial, Recreational, and Tribal Fisheries

Table 4.4 Decommissioning Phase Potential Impacts and Avoidance and Minimization Measures

Potential Impact		Avoidance and Minimization Measures	Fisheries Potentially Impacted
4.1	Offshore wind infrastructure abandoned by companies creates hazards for ocean users	Seek to design offshore wind projects so facilities can be decommissioned by removal at the end of a project's operating term. Present a conceptual decommissioning plan that demonstrates financial assurance sufficient to cover the entire cost of decommissioning in accordance with the applicable federal regulatory and lease requirements.[72] Consult with the fishing community prior to the submission of a project-specific decommissioning application to BOEM. Decommission offshore wind projects in accordance with all necessary laws and regulations and an approved decommissioning application. California is strongly committed to the removal of project infrastructure and clearing the seafloor of all obstructions in lease areas and project easements; however, the State recognizes there may be circumstances where removal poses an unreasonable safety risk or an alternative approach provides better environmental outcomes.[73] In an instance where project components cannot be removed, developers will seek to minimize obstructions when feasible. Inspect the seafloor after decommissioning has been completed to confirm the removal of project infrastructure in accordance with an approved decommissioning plan and record the location of infrastructure that was not removed.	All Commercial, Recreational, and Tribal Fisheries

[72] Completed leases language found here: https://www.boem.gov/renewable-energy/state-activities/california

[73] First five California offshore wind leases contain this language: " Unless otherwise authorized by the Lessor, pursuant to the applicable regulations in 30 CFR Part 585, the Lessee must remove or decommission all facilities, projects, cables, pipelines, and obstructions and clear the seafloor of all obstructions created by activities on the leased area and project easement(s) within two years following lease termination, whether by expiration, cancellation, contraction, or relinquishment, in accordance with any approved SAP, COP, or approved Decommissioning Application, and applicable regulations in 30 CFR Part 585." Completed leases language found here: https://www.boem.gov/renewable-energy/state-activities/california

Potential Impact		Avoidance and Minimization Measures	Fisheries Potentially Impacted
4.2	Short-term displacement due to decommissioning activities in the lease area	Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7. Prioritize time windows for cable decommissioning activities to avoid and minimize significant conflicts with fishing activities. Employ guard/scout vessels with experience in the project area to avoid and minimize interactions with deployed fishing gear along the offshore cable corridor.	Groundfish Fixed Gear, Groundfish Trawl, Highly Migratory Species, Box Crab, Spot Prawn, CPFV and Private Recreational Fishing
4.3	Short-term displacement due to decommissioning activities in offshore cable corridor (3NM/30 fathoms+)		Groundfish Fixed Gear, Groundfish Trawl, Dungeness Crab Fishery, Salmon Troll, Shrimp/Prawn Trawl and Traps, Market Squid fishery, Coastal Pelagic Species, CPFV and Private Recreational Fishing, Tribal Fishing
4.4	Short-term displacement due to decommissioning activities in the nearshore offshore cable corridor (landfall to 3NM/30 fathoms)	Implement relevant communication protocols outlined in Chapter 2 and relevant unique Tribal communication protocols outlined in Chapter 7. Prioritize time windows for cable decommissioning activities to avoid and minimize significant conflicts with fishing activity. Employ guard/scout vessels with experience in the project area to avoid and minimize interactions with deployed fishing gear along the offshore cable corridor.	Groundfish Fixed Gear, Groundfish Trawl, Dungeness Crab Fishery, Salmon Troll, Shrimp/Prawn Trawl and Traps, Market Squid fishery, Coastal Pelagic Species, Hagfish, CPFV and Private Recreational Fishing, Tribal Fishing

Table 4.5 Impacts and Avoidance and Minimization Measures Potentially Implemented by a Third Party
The following measures are presented as ideas; however, the implementing parties have not been part of this Working Group process.

Potential Impact		Avoidance and Minimization Measures*	Fisheries Potentially Impacted	Implementing Parties
5.1	Reduced access to home port/landings port due to the presence of offshore wind vessels	In collaboration with fishing communities, establish a communication plan between port authorities, offshore wind developers, and fishing communities. Designate the number of slips to be utilized by transient fishing vessels based on port size and need. If available, designate specific fuel docks and other shoreside services utilized by both the fishing industry and offshore wind industry to be used only by the fishing industry. If shoreside services are limited, designate specific times when those services are only available to the fishing community. Seek mechanisms to control the costs of port services that may increase as a result of offshore wind activities.	All Commercial, Recreational, and Tribal Fisheries	Port authorities/port developers California Coastal Commission Developers should support these measures, when feasible
5.2	Commercial and recreational fishing vessels transiting through ports supporting offshore wind are exposed to increased safety hazards	In collaboration with fishing communities, establish a communication plan between port authorities and fishing communities. Site and design offshore wind port infrastructure, sinking basins, and wet storage areas to reduce conflicts with fishing communities. Conduct a comprehensive risk assessment analysis.	All Commercial, Recreational, and Tribal Fisheries	Port authorities/port developers California Coastal Commission
5.3	Additional West Coast offshore wind lease areas could lead to cascading cumulative economic impacts on fishing communities	Collaborate with fishing communities early in the offshore wind planning process. Site future Wind Energy Areas to avoid valuable fishing grounds and consider fishing vessel transit routes and fisheries surveys supporting stock assessments.	All Commercial, Recreational, and Tribal Fisheries	BOEM California State Agencies

Potential Impact		Avoidance and Minimization Measures*	Fisheries Potentially Impacted	Implementing Parties
5.4	Short-term displacement due to the presence of metocean or FLiDAR buoys/moorings deployed by entities not contracted by developers	Companies deploying metocean or FLiDAR buoys/moorings outside of lease areas should implement the same anchor removal practices as developers inside lease areas. When feasible and when there is a commercial or scientific relationship between the parties, developers should request the removal of metocean buoy anchors and moorings installed outside their lease areas. Permitting authorities should require full removal of metocean or FLiDAR buoys/moorings at the conclusion of their operating term. Metocean or FLiDAR buoys/moorings should be marked with AIS if feasible. Buoys that are unable to support AIS must be marked in accordance with USCG requirements and guidelines.	All Commercial, Recreational, and Tribal Fisheries	Companies deploying metocean Buoys Permitting authorities (e.g. U.S. Army Corps of Engineers)
5.5	Transiting through wind developments presents increased safety hazards and increased transit times for fishing vessels	Provide timely guidelines for safe navigation in and around wind developments and along offshore cable corridors.	All Commercial, Recreational, and Tribal Fisheries	USCG

SECONDARY IMPACTS AND IMPACTS TO FISH ECOLOGY AND ECOSYSTEMS

Secondary impacts, also known as indirect impacts, are not included in Tables 4.1 through 4.5. For the purposes of this Statewide Strategy, secondary impacts are defined as reasonably foreseeable indirect consequences resulting from the direct impacts of a project.

Secondary impacts are important to identify and may be significant. However, there are no direct measures for avoiding and minimizing these impacts. Instead, they can be addressed by avoiding and minimizing the direct impacts listed in Tables 4.1 through 4.5 or compensatory mitigation (discussed in Chapter 5 and Chapter 6). Several secondary impacts to fishing communities from offshore wind development were identified as part of this process, including:

- Compaction of fishing effort in remaining available fishing grounds as a result of potential exclusion from lease areas, cable corridors, and transit lanes.
- Indirect job losses of tribal, commercial and charter fishing businesses, vessel crew, fishing gear manufacturers, and shoreside businesses like fish processing plants.
- Loss of value of capital (e.g., vessels, processing plants, equipment).
- Loss of limited entry permit value.
- Increased uncertainty about the viability of the fishing industry, leading to difficult business planning and decreased future participation.
- Impacts to coastal tourism tied to locally and sustainably harvested seafood.

Avoiding and minimizing direct impacts and creating a resilient environment that supports a healthy fishing industry are key factors in addressing secondary impacts.

This chapter also does not address the potential impacts of offshore wind development on fish ecology, fish stocks, or ecosystems, including potential impacts to the California Current Large Marine Ecosystem. Healthy fish stocks are inherently connected to viable fisheries; biological and habitat experts will be essential for providing recommendations for monitoring and mitigating offshore wind impacts to fisheries species and ecosystems.[74] However, the Working Group has preliminarily identified the following ecological and ecosystem impacts that are particularly concerning to the fishing community:

- Potential ecosystem impacts from increased sound in the ocean.

[74] The California Ocean Protection Council provided funding to develop guidance for environmental monitoring of offshore wind. More information on the Offshore Wind Monitoring Guidance funded by the Ocean Protection Council found here: https://www.californiamsf.org/offshorewind

- Potential ecosystem impacts from electromagnetic fields.
- Potential ecosystem impacts from changes to oceanographic processes (e.g., upwelling).
- Potential ecosystem impacts from intake and discharge systems associated with offshore converter substations.
- Potential impacts to marine mammal migration routes that could interact with fishing gear, reduce fishing quotas, or shift the timing or length of fishing seasons.
- Cumulative impacts on fish and invertebrate habitats and ecosystems from West Coast offshore wind development.

ADAPTIVE MANAGEMENT

In creating monitoring plans, as part of a project's COP, developers should include adaptive management strategies that would serve to mitigate potential adverse impacts.[75] In the context of the Statewide Strategy, the framework for compensatory mitigation (see Chapter 6) provides flexibility for the fishing industry to adapt to changing conditions via resiliency funds.

[75] Included as a recommendation in BOEM's Information Guidelines for a Renewable Energy Construction and Operations Plan (COP) found here: https://www.boem.gov/about-boem/regulations-guidance/guidance-portal and https://www.boem.gov/sites/default/files/documents/about-boem/COP%20Guidelines_Technical_Corrections.pdf.

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SOCIOECONOMIC ANALYSIS OF FISHERIES IMPACTS

5. Socioeconomic Analysis of Fisheries Impacts

INTRODUCTION

This chapter presents a methodology to inform project-level socioeconomic analyses of potential direct and indirect impacts to commercial and for-hire recreational fisheries and fishing communities from offshore wind development. The output of the analyses will inform negotiations on the amount of compensatory mitigation to offset economic losses to fishermen and fishing communities. The proposed approach serves as guidance for conducting thorough and objective evaluations of potential impacts from offshore wind developments that may remain after all other avoidance, minimization, and mitigation measures (AMMMs) are considered (see Chapter 4 for AMMMs). Separate guidance on assessing socioeconomic impacts to tribal fisheries is provided in the tribal fisheries chapter (see Chapter 7).

The analysis of an offshore wind project's potential socioeconomic impacts is an iterative, multi-year process that begins during Construction and Operations Plan (COP) preparation by integrating environmental, spatial, and socioeconomic data alongside stakeholder input. Federal and state regulatory processes provide the framework and scope for an offshore wind project's socioeconomic review. Under the National Environmental Policy Act (NEPA), the Bureau of Ocean Energy Management (BOEM) prepares draft and final Environmental Impact Statements (EISs) evaluate the potential impacts of an offshore wind project during construction, operations, and decommissioning phases, considering both ecological and economic effects. Under the Coastal Zone Management Act (CZMA), affected states concurrently perform a consistency review to evaluate a project's alignment with state enforceable coastal management policies, incorporating socioeconomic findings and stakeholder input to further guide AMMMs and, where necessary, compensatory measures.[76]

The methodology here therefore focuses on a comprehensive evaluation of reasonably foreseeable socioeconomic impacts to fisheries and fishing communities associated with a planned offshore wind development, using the best available information. It is generalizable and flexible—capable of using best available data and science—but detailed enough to allow for ease of use and provide a consistent reference. The methodology is intended to support the development of a project-level socioeconomic analysis, including efforts to refine an analysis over time by incorporating updated project information and input from fisheries stakeholders. Impacts considered as part of

[76] This chapter is not intended to address the impacts of site assessment activities. BOEM evaluates the potential for such impacts during the offshore wind leasing process, and the Commission reviews how these activities may affect coastal resources, including commercial and recreational fishing. As part of its concurrence, the Commission may recommend mitigation measures, which BOEM would then incorporate into a lease as binding stipulations. Chapter 3 and 4 outline best practices for conducting site assessment activities.

this process should be limited to the range of reasonably foreseeable, unavoidable impacts, such as those identified in a project's COP and draft Environmental Impact Statement (EIS) and during federal consistency review. This approach aligns with the Coastal Act's focus on identifying and addressing significant adverse effects on coastal resources.

Inputs to the socioeconomic analysis will draw on both quantitative and qualitative data. Key information sources will include desktop reviews of state and federal data sets, modelled analyses based on best available data, and input from potentially impacted fisheries and fishing communities. The foundation for this analysis will be developed and refined during COP preparation and through the NEPA environmental review process. The analysis will provide project-level information about the magnitude of potential socioeconomic impacts and characterize the fisheries and fishing communities that may experience those impacts. The review that occurs under federal consistency may include additional information to address data gaps, account for changing conditions, and/or quantify potential effects. Ultimately, the socioeconomic analysis will help inform discussions between a developer and the Coastal Commission (Commission) on reasonable compensation funding amounts that may be negotiated during a federal consistency review process (see Chapter 6 for more information about the negotiation process).

Fisheries engagement is central to the development and regulatory review of a project-level socioeconomic analysis—local fishing community (including individuals, associations, organizations, etc.) knowledge and feedback informs and improves its accuracy, credibility, and transparency. As such, this chapter also provides guidance on how developers and the Commission should solicit input, build shared understanding, and integrate fisheries stakeholder feedback during federal consistency review. By combining a comprehensive socioeconomic methodology with meaningful fishing community participation, the guidance in this chapter will support the thorough consideration and evaluation of an offshore wind project's potential impacts to fisheries and fishing communities in California.

SOCIOECONOMIC ANALYSIS OVERVIEW

The socioeconomic analysis of an offshore wind project's potential impacts is a multi-stage process spanning several years. It begins with establishing a baseline characterization of the fisheries within and around an offshore wind project area, incorporates multiple assessments over time, and supports the identification of AMMMs. The analysis also informs decision-making during federal and state permitting and regulatory reviews, including the development of compensatory mitigation programs. A summary of this process in relation to federal and state permitting and regulatory reviews is provided below.

Federal Regulatory Review

An offshore wind project's COP is required to evaluate the potential economic impacts to commercial and recreational fisheries from a proposed project, including the extent to which fishing activities may be displaced from traditional fishing grounds within or near an offshore wind project area. This evaluation considers both direct economic effects and indirect socioeconomic impacts. The analysis is typically informed by spatial data on fishing effort, state and federal landings records, input from fishermen and fishing communities, as well as Bureau of Ocean Energy Management (BOEM) and National Marine Fisheries Service (NMFS) socioeconomic data. Identifying and quantifying these potential impacts helps inform the design of AMMMs, including compensatory mitigation.[77] The socioeconomic methodology described in this chapter provides valuable guidance for analysis of potential economic impacts to commercial and recreational fisheries in the COP.

The Environmental Impact Statement (EIS) process conducted under NEPA builds upon the COP analysis to provide a comprehensive evaluation of how the construction, operation, and decommissioning of an offshore wind project may affect fisheries and fishing communities:

- **Construction Phase**: Assess potential short-term disruptions such as temporary exclusion from fishing grounds, increased vessel traffic, underwater noise, sediment disturbance, and risks of gear damage or loss.
- **Operations Phase**: Examine longer-term changes to fishing access and navigational safety, potential displacement or redistribution of fishing effort, and the implications of habitat alteration or electromagnetic fields from subsea cables on target fish species. Economic outcomes would also be considered, including potential revenue loss, changes in operating costs, and community-level impacts in ports and seafood-dependent businesses.
- **Decommissioning Phase**: Evaluate similar types of temporary effects as those seen during construction, as well as any potential long-term impacts—e.g., from structures on the sea floor.

Throughout the process, the EIS integrates ecological and socioeconomic data to characterize both direct and indirect effects and ensure that the cumulative impacts on fisheries, marine habitats, and dependent communities are clearly understood and transparently communicated to decision-makers and stakeholders.

[77] As per BOEM (2025) guidance, "The scope of impacts or losses that should be addressed by compensatory mitigation should be based on the impacts identified in the lessee's COP and BOEM's assessments analyzing the potential effects of the lessee's submitted plans, including various documents like the Environmental Impact Statement for the COP."

Coastal Commission Review

Under the CZMA, offshore wind projects located in federal waters must demonstrate that their activities are consistent with the enforceable policies of the affected state's federally approved Coastal Management Program.[78] As discussed in Chapter 1, for any offshore wind project components located in state waters, developers must demonstrate conformance with the Coastal Act and receive a coastal development permit. As part of this federal consistency and Coastal Act review process, the socioeconomic analysis plays a critical role in evaluating how a proposed project may affect coastal communities, including those that depend on commercial and recreational fisheries.

The socioeconomic analysis provided in the COP and draft EIS serve as the analytical foundation for the Commission to determine whether a project's expected impacts to fisheries and fishing communities are consistent with state coastal management policies. It includes evaluations of displacement from fishing grounds, changes in catch and revenue, and effects on shoreside industries such as seafood processing.

During Commission review, use of the socioeconomic methodology described in this chapter will assist the Commission and the developer to identify potential data gaps, determine fisheries and fishing communities dependent on an offshore wind project area, and quantify potential effects. Ultimately, the analysis submitted by a developer as part of their federal consistency certification and coastal development permit application will help the Commission understand the scale and distribution of socioeconomic impacts. The analysis will also support negotiations that occur between the Commission and developers regarding the adequacy of AMMMs in the COP. Where unmitigated impacts remain, the analysis will inform the discussion regarding the amount of compensatory mitigation appropriate to offset economic losses to fisheries and fishing communities.

SOCIOECONOMIC METHODOLOGY

Northern Economics Inc. developed a socioeconomic methodology for fisheries and offshore wind projects with input from the Working Group (Appendix A). Northern Economics' team members have technical expertise in economic analysis and were requested by the Working Group to develop the methodology. The work was funded by a grant from the California Ocean Protection Council (OPC).

The Commission expects that the analysis included in a COP and submitted as part of a federal consistency certification and coastal development permit application should be

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See United States Department of Commerce combined State of California Coastal Management Program and Final Environmental Impact Statement, August 1977. Note that NOAA/OCM has approved program updates that are not represented in the 1977 document.

informed by the guidance methodology. While some components outlined in the methodology may be more appropriately addressed by Commission staff, developers are expected to use the methodology to the extent appropriate for a given project. Commission staff will collaborate with developers to ensure that the project-specific analysis is sufficiently robust to support a comprehensive review of the potential socioeconomic effects associated with each offshore wind energy development project.

Roles of the Parties

Developers, the state, and fishermen and fishing communities each play a distinct role in ensuring that a socioeconomic analysis accurately captures potential impacts to fisheries and fishing communities and informs decision-making. Table 5.1 summarizes the responsibilities and contributions of each participant in reviewing and refining the socioeconomic analysis over the course of a project's development and permitting phase.

Table 5.1 Socioeconomic Analysis Roles and Responsibilities

Party	Role in Socioeconomic Review	Key Responsibilities and Actions
Developers	Lead preparation and submission of the analysis	Collect and integrate environmental, spatial, and socioeconomic data Conduct baseline studies and identify potential impacts to fisheries and fishing communities Engage fishermen and stakeholders to gather local knowledge and identify data gaps and impacts Conduct socioeconomic analysis for inclusion in the COP and EIS Respond to state and stakeholder feedback to refine the analysis
State / Commission	Regulatory review and guidance	Evaluate the submitted socioeconomic analysis for completeness and consistency with state coastal management policies under CZMA Assess potential impacts on fisheries and fishing communities Provide comments, request additional information, and recommend avoidance, minimization, or mitigation measures Facilitate stakeholder engagement opportunities and ensure transparency in the review process Ensure continuous engagement of Commission and relevant state agency staff to maintain process integrity and continuity
Fishermen / Fishing Communities	Provide local knowledge and feedback and advise on methodology/analysis	Share insights on fishing activity, seasonal patterns, and community dependence on fisheries based on lived experience Identify data limitations or challenges; aid in providing data for data limited and data poor fisheries Identify the potential impacts of offshore wind projects on operations and income Review and comment on assumptions and analyses providing evidence, data, and a clear rationale Participate in working groups, workshops, or meetings to inform both developers and the state

FISHERIES ENGAGEMENT

Fisheries engagement is a key component in the development, refinement, and review of a comprehensive socioeconomic analysis. Early and ongoing interaction by developers with fishermen, fishing communities, and other fisheries stakeholders will

help ensure that an analysis accurately reflects an offshore wind project's potential impacts. For the Commission, fisheries engagement during federal consistency review is essential to understand stakeholder priorities, ensure concerns are considered in decision-making, and support a successful review process.

In recognition of this, the Statewide Strategy includes a set of principles to guide the fisheries engagement efforts of both developers and the Commission. These principles are designed to ensure that fisheries engagement is meaningful, effective, and allows interested parties to understand and participate in the socioeconomic analysis process:

- **Comprehensive and Local:** Engagement should include stakeholders from affected fisheries, fishing communities, and relevant agencies and occur in the geographic area of impacted fisheries/fishing communities.
- **Timely and Accessible:** Engagement should occur early and often enough to allow stakeholders sufficient time to review materials, build understanding, and provide meaningful input. Overly-constrained windows for comment and dialogue should be avoided, fishing seasons should be considered, and a variety of outreach tools should be used to ensure all fishermen and other stakeholders are aware of, and have the opportunity to participate in, the process.
- **Transparent and Understandable:** All calculations, assumptions, data sources, and methods used in an analysis should be clearly explained in a way that is accessible to diverse audiences. Building a shared understanding may require education and dialogue.
- **Sequenced and Logical:** Information should be shared in a logical sequence so stakeholders can follow how data is used, which impact factors and assumptions are applied, and how inputs are translated into impact estimates.
- **Accountable and Responsive:** Fishing community comments and concerns should be taken seriously, with clear explanations provided when suggestions are not taken forward. Both the Commission and developers should be able to demonstrate how feedback was considered.
- **Voluntary and Inclusive:** Participation by fisheries stakeholders is voluntary. If stakeholders choose not to engage, the process may continue without their input, although their perspectives remain welcome at any stage.

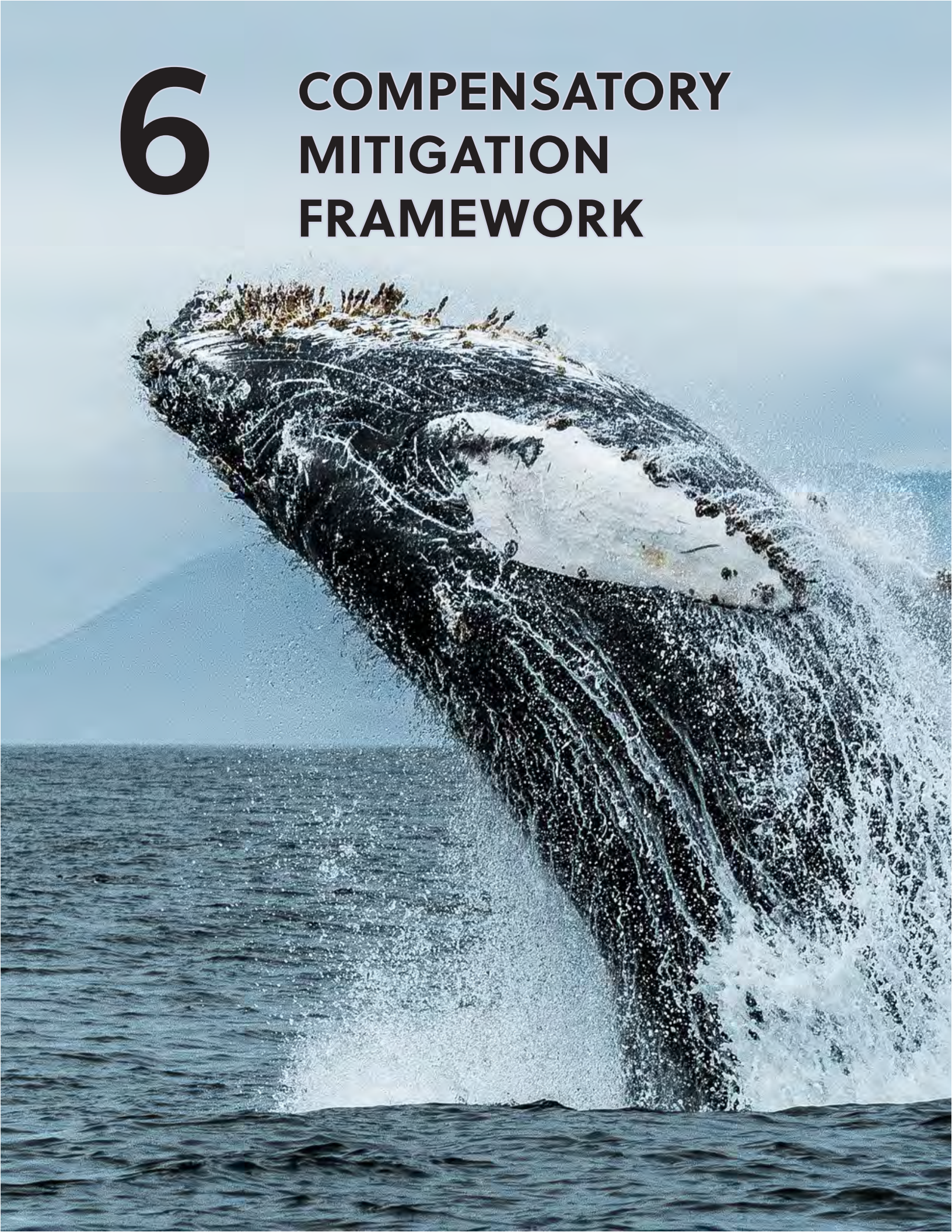
It is imperative that a developer maintains appropriate and effective engagement during the development of a socioeconomic analysis. Additionally, aspects of this engagement should include developer and Commission staff coordination. For example, engagement to understand fisheries dynamics in an offshore wind project area and engagement to ensure fisheries stakeholders understand a socioeconomic analysis should include both the developer and the Commission.

Developer engagement with local fisheries and fishing communities begins after a lease is acquired at the lease sale and continues throughout the life of the project. Early engagement with local and regional fisheries is foundational and informs the

developer's baseline characterization of fisheries activity within the offshore wind project area and broader region. Engagement with fisheries is a requirement of a developer's lease with BOEM and such engagement will be reflected in a project's COP and draft EIS analysis. As described in Chapter 2, the identification and establishment of communication protocols with fisheries stakeholders will assist in effective communication during this period.

To further support fisheries engagement and input, the Commission will convene a Fishermen's Working Group to solicit focused input during its review, including input on the socioeconomic analysis. The Commission and developer should identify when key input is needed from the Fishermen's Working Group to ensure foundational understanding and incorporation of feedback. Meetings of the Fishermen's Working Group will be held when timely, meaningful, structured, and focused input is needed, as determined by the Commission and informed by fisheries stakeholders. Fishermen's Working Group membership will include representatives from the regional area(s), communities, and fisheries potentially affected by an offshore wind project. Meetings will be designed to balance effectiveness with consideration of participants' time and effort and will include an invitation for any interested stakeholder to listen to the discussion. The role of the Fishermen's Working Group in the compensatory mitigation negotiation process is discussed further in Chapter 6.

6 COMPENSATORY MITIGATION FRAMEWORK



6. Compensatory Mitigation Framework

INTRODUCTION

This chapter provides a guiding framework for establishing fair compensation programs to fishermen and fishing communities for unavoidable impacts resulting from offshore wind energy projects. As the last step in the mitigation hierarchy, fisheries compensation should only be considered when impacts from offshore wind cannot be otherwise avoided. For the Statewide Strategy, fisheries compensatory mitigation includes gear loss/damage compensation, direct compensation to affected fishermen and processors, and fishing community resiliency funding. Compensation for Tribal fishermen that participate in commercial and for-hire recreational fisheries should be addressed under the framework in this chapter. Chapter 7 of this Statewide Strategy outlines additional guidance for identifying, understanding, and addressing potential impacts to tribal fisheries that are not associated with the commercial and for-hire recreational fishing sectors. As outlined in Chapter 3, compensation for gear loss/damage resulting from interactions with offshore wind project vessels/equipment or infrastructure is typically a claims-based process managed by developers that is established shortly after a developer secures a lease. Developers' Fisheries Communication Plans detail the process for gear loss/damage claims; therefore, this chapter does not address gear loss/damage compensation. Instead, this chapter provides a framework for direct compensation and fishing community resiliency funding. The chapter also outlines the parameters and recommended elements of a compensatory mitigation approach that allows flexibility, adaptability, and tailoring of processes to offshore wind projects over time.

Direct compensation and fishing community resiliency funds should be designed to work in coordination. Direct compensation is intended to provide financial compensation to fisheries businesses that experience economic losses or costs directly resulting from offshore wind construction, operations, and/or decommissioning. Resiliency funds are intended to help potentially affected fishing communities respond and adapt to offshore wind projects and thereby support the continued economic viability of fishing and sustainability of fishing communities. Together, these forms of compensatory mitigation, along with gear loss programs, aim to compensate for impacts, facilitate coexistence between the fishing and offshore wind industries, promote continued fishing, and support the vitality and durability of local fishing communities.

NEGOTIATING COMPENSATORY MITIGATION

The need for compensatory mitigation, including the dollar amount, will be determined during a project's federal and state permitting and regulatory review process.[79] Compensatory mitigation measures are mutually agreed upon by a developer and the California Coastal Commission (Commission), for the purposes of the Commission's review.[80] Compensatory mitigation is memorialized in the federal consistency certification (and coastal development permit [CDP], if applicable) decision and incorporated into the Bureau of Ocean Energy Management's (BOEM) Record of Decision (ROD) and the conditions of approval for an offshore wind project Construction and Operations Plan (COP).

The developer and the Commission will use best available information to negotiate fair and reasonable compensation for unavoidable impacts attributable to offshore wind energy projects. Analyses developed for the COP (including National Environmental Policy Act documents) and submitted by a developer as part of their federal consistency certification and CDP application will support review of the adequacy of avoidance, minimization, and mitigation measures (AMMMs) in a COP. Where unmitigated impacts remain, the socioeconomic analysis will inform the negotiation regarding the amount of compensatory mitigation to offset economic losses to fisheries and fishing communities. See Chapter 5 for guidance on a methodology for a project-level socioeconomic analysis. The output of the socioeconomic analysis will provide valuable information to inform negotiations on the compensatory mitigation—that analysis will not be the sole determinant of compensatory mitigation.

To solicit focused input during consistency review, including compensatory negotiations, the Commission will convene a Fishermen's Working Group. See Chapter 5 for more information on the formation of the Fishermen's Working Group and its role in the socioeconomic analysis. The Fishermen's Working Group should provide information and advice to Commission staff during consistency review. The Commission, working with the Fishermen's Working Group as necessary, may also convene fishing community meetings where fisheries' stakeholders would be invited to participate. The Fishermen's Working Group is likely to provide input on the socioeconomic analysis, additional considerations to inform negotiations, the proposed split between resiliency and direct compensation, and any parameters of direct and resiliency programs outlined during consistency review. The ideas, comments, and concerns of the Fishermen's Working Group must be thoughtfully considered and incorporated, where appropriate, into the Commission's deliberations on compensatory mitigation with an offshore wind

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[79] California Public Resources Code Section 7100(b) states, with regards to state waters, "The commission [CSLC] or a local trustee of granted public trust lands, when issuing a lease for purposes of an offshore wind energy project, shall consider including within the lease reasonable compensatory mitigation for unavoidable impacts to fishing and tribal interests pursuant to Section 30616."

[80] Impacts addressed through compensatory mitigation are evaluated based on information provided in the Construction and Operations Plan (COP) and environmental review documents, and analysis of the project's consistency with the enforceable polices of the California Coastal Management Program.

developer. The Commission will bilaterally negotiate with the project developer to reach a voluntary agreement on compensation. At its discretion, the Commission will consult with fisheries stakeholders, beyond the Fishermen's Task Force and community members, during this process. Upon completion of a compensation agreement, that agreement will be prepared for Commission consideration as part of the consistency review process. Fishermen and others may comment during formal public Commission deliberations and decision-making proceedings.

ALLOCATING DIRECT COMPENSATION AND RESILIENCY FUNDS

In addition to negotiating the compensatory mitigation amount, the developer and the Commission will need to determine the funding allocation between direct compensation and resiliency funds during consistency review. Information from the project-level socioeconomic analysis (Chapter 5) can inform this decision. However, the socioeconomic analysis is not expected to prescribe the allocation of funds between direct compensation and resiliency funds. Instead, judgement guided by data, fisheries input, and completed analyses should inform funding allocations.

An overall compensation program encompassing direct compensation and resiliency funds should:

- Ensure that fishing businesses that experience substantial economic losses/costs because of the project receive direct compensation.
- Use resiliency funds to address broader fishing community impacts and potentially less quantifiable losses/costs.
- Ensure payment schedules and fund structures support successful operation of the program and then consider mechanisms to reallocate unspent direct compensation funds to resiliency programs after a defined period. These elements should be explicitly defined in a compensatory mitigation agreement between a developer and the Commission
- Avoid approaches or program designs that create counterproductive incentives that are contrary to the goal of the compensation program.

In considering the allocation between direct compensation and resiliency funds, the following questions should be considered:

- What potential secondary impacts may occur in the future that are not covered by the direct compensation program?
- How can allocations be fair and equitable to address impacts to both individuals and fishing communities?
- Do fishermen have reasonable access to sufficient data to demonstrate substantial costs or losses for direct compensation claims?

- What tradeoffs should be considered when allocating funds between direct compensation and resiliency funds, and how could those tradeoffs affect the purpose and goals of the compensatory mitigation program?

The Statewide Strategy recommends the following be considered for allocating funds:

1. **Use Direct Compensation for Measurable Losses**

   - Address costs and losses that individual fishing operations/processors experience and can demonstrate through a direct compensation program.
   - Estimate projected direct compensation funding needs based on the socioeconomic analysis and other relevant information, considering likely economic impacts related to displacement from, and dependence on, fishing grounds.
   - Allocate sufficient funds to fully cover anticipated claims over the life of the program.

2. **Use Resiliency Funds to Address Broader or Less Quantifiable Impacts**

   - Address costs and losses that are less specific to individual fishing businesses, or difficult to incorporate into a direct compensation program, through resiliency funding. Some adaptation costs, as one example, may better be handled through resiliency funds.
   - Resiliency funds complement direct compensation and are not intended to replace it.

3. **Use a Data-Driven, Transparent Approach that Relies On:**

   - Socioeconomic analysis and fisheries data
   - Input from fishing communities
   - Experience and lessons learned from other offshore wind projects in the United States

The guidance above is intended to ensure that compensatory mitigation funds are allocated in a manner that is transparent, responsive to both potential individual and community-level impacts and appropriately considers fishing community input.

Direct Compensation

PURPOSE OF DIRECT COMPENSATION

Direct compensation refers to financial compensation provided to fisheries businesses that experience economic losses directly resulting from offshore wind construction, operations, and/or decommissioning (as demonstrated by meeting the relevant criteria established for individual direct compensation programs). Fisheries businesses could include vessel owners or operators and first point-of-sale or transfer shoreside seafood processors. Direct compensation may address both long-term and short-term impacts. For example, long-term impacts may include loss of access to historical fishing grounds within the project area, and short-term impacts may include displacement due to construction activities or cable-laying operations (see Chapter 4 for more information). An offshore wind developer's commitment to provide direct compensation funds and establish a direct compensation program is an outcome of an offshore wind project's permitting and regulatory review processes. While fund amounts and high-level requirements for a direct compensation program are identified during regulatory review processes, program design typically occurs after BOEM issues a Record of Decision and the terms and conditions of a project's approved COP.

Direct compensation is intended to provide reasonable financial compensation for unavoidable economic impacts to individual businesses and is often complemented with fishing community resiliency funds. Direct compensation should be distributed through a claims-based program. Programs will be designed by developers, in consultation with relevant agencies and fishing communities, considering guidance from this chapter and in accordance with the state and federal permitting requirements of an offshore wind project. Broadly, eligibility criteria would be established for each direct compensation program to define who is eligible to submit compensation claims. An independent fund administrator would evaluate any claim submitted, and valid claims would be paid. Direct compensation funds and programs would be established at some point after a project achieves financial close and before offshore construction activities commence to ensure access to the program begins before or at construction.[81] The following sections provide guidance on direct compensation program design—specifically, how to define eligible fishing vessel owner/operators, how to select qualified direct compensation fund administrator(s), and reporting mechanisms.

[81] Financial close is the point when a developer has secured the funds necessary to construct an offshore wind project, confirming its financial viability. Financial close can thus offer a helpful reference point for the formation and implementation of compensatory mitigation programs.

DIRECT COMPENSATION PROGRAM DESIGN PRINCIPLES

Direct compensation programs should be designed to uphold principles of fairness, efficiency, and transparency while maximizing the funds that reach impacted members of the fishing industry (i.e., minimizing overhead). The programs should be considered and developed with a contextual understanding of the other mitigation measures incorporated in an offshore wind project, including resiliency funds. The programs should seek to incentivize and support the continued operation of California's fisheries through effective program design. The ability of a fishing business to respond and adapt to offshore wind development, as well as the associated costs of that adaptation, should be considered when designing direct compensation programs, recognizing that some adaptation costs may be better compensated through the resiliency fund.

The following design principles are recommended to guide the development of future direct compensation programs:

- Programs should be designed to be fair, timely, simple, efficient, and transparent.
- Programs should be evidence-based and utilize the best available data to determine eligibility and payment amounts.
- Overhead and administrative costs should be minimized to the greatest extent practicable.
- Administrative burdens (e.g., submitting a claim, processing a claim, etc.) should be limited for all parties to the extent practicable.
- Application/claim requirements should be appropriate to the scale and scope of the impact being claimed and should avoid unnecessary paperwork.
- Compensation claims should be processed and disbursed in a timely manner.
- The claims application process should not be overly complex nor burdensome for the claimants or the administrator.
- Eligibility criteria, claims application procedures, and the claims process should be clearly communicated in plain language. Materials should be translated into relevant languages and available both online and in hard copy. Assistance should be available to help claimants understand the process and complete their applications.
- Programs should include a process for claimants to appeal eligibility and compensation determinations.
- Programs should draw upon lessons learned from other fisheries compensatory mitigation programs developed for United States offshore wind projects, while recognizing differences in West Coast offshore wind development and fishing.
- Programs should allow for flexibility in how eligibility and compensation are determined for different categories of impacts (e.g., temporary impacts

associated with offshore export cable installations versus long-term displacement).

- Programs should limit opportunities for manipulation and fraud and avoid creating counterproductive incentives. Programs should reinforce incentives to keep fishermen fishing and avoid creating incentives that could cause fishermen not to fish or to land less fish.

DIRECT COMPENSATION ELIGIBILITY AND CLAIMS

During consistency review, key eligibility requirements for fisheries business will be defined to ensure the program effectively addresses the impacts it is intended to mitigate. Detailed eligibility criteria will be defined during the direct compensation program design process. To receive compensation, applicants may need to demonstrate that they have experienced unrecovered fishery income losses or experienced increased costs attributable to offshore wind development, such as displacement from fishing grounds, longer travel distances, greater fishing effort, or reduced landings. This section provides guidance on the fishery businesses that may qualify for compensation and the types of information that may be used to support claims.

COMMERCIAL AND FOR-HIRE RECREATIONAL FISHERMEN

Commercial and for-hire recreational fishing vessel owner/operators that can demonstrate a history of fishing effort in an offshore wind project area and a history of landings in California, may be eligible for direct compensation. The direct compensation program may define a qualifying period within which applicants must show a history of fishing in an area (e.g., evidence of fishing in the offshore wind project area during at least three of the last seven years). The qualifying period may be standardized across fisheries or tailored to individual fisheries as circumstances warrant. For example, it may be necessary to account for fisheries management decisions, fishery dynamics, and/or other unique circumstances. A buffer zone beyond the immediate project area may be considered when determining eligibility for certain fisheries if the gear type or method of fishing requires a broader operating area to ensure safety and effectiveness.

Fishing vessels will also need to show a documented history of fisheries landings in California consistent with a program's eligibility criteria. Fishing vessel owners/operators that fish in an offshore wind project area but do not have a record of landings in California will not be eligible for direct compensation in California. However, fishermen who fish in an offshore wind project area but land their catch in other states may be eligible for compensation through other direct compensation programs. The need for other compensation programs would be determined during BOEM's review of a project.

To receive direct compensation, eligible fishing vessel owner/operators would need to submit an application to the independent fund administrator that includes program-

required documentation. The direct compensation fund administrator would review submitted applications to determine whether a claimant meets the established eligibility criteria. If a claimant is eligible, the fund administrator would review the claim for completeness and determine the compensation payment amount. Eligible applicants with valid compensation claims would receive payments from the fund administrator in line with a program's established payment approach or methodology. If a claimant disagrees with the eligibility determination or the compensation payment amount, they should be afforded the opportunity to submit an appeal to the fund administrator through a formal process outlined in the compensation program.

New Entrants and Eligibility

New commercial and for-hire recreational fishing vessel owner/operator entrants who cannot demonstrate a history of fishing in a project area during a direct compensation program's qualifying period generally will not be eligible to participate in a direct compensation program. However, the direct compensation program design process should consider any circumstances that may warrant exceptions. Direct compensation program administrators should also have discretion to qualify new entrants to a fishery for direct compensation on a case-by-case basis to ensure fair outcomes.

The direct compensation program design process should evaluate whether the transfer or sale of a fisheries business or vessel to another party should impact direct compensation program eligibility and whether a transferee/purchaser can make a claim for direct compensation based on the prior history of the transferor/seller. This evaluation should analyze whether the exclusion of such transfers from direct compensation could significantly impact the value of a business being transferred to a successor. Such evaluation should consider program duration (i.e., the number of years direct compensation may be available) and potential actions contrary to the purpose of the program that could result from recognizing or not recognizing such transfers. Notwithstanding the above, transfers to a successor in interest (e.g., acquiring an ownership interest in a fisheries business through an inheritance, divorce, or living trust) during a program's qualifying period should not impact direct compensation program eligibility.

New entrant eligibility limitations, including if/how the transfer of a fisheries business or vessel could impact direct compensation program eligibility, should be clearly communicated during the program implementation process.

Demonstrating Eligibility

To demonstrate eligibility, commercial and for-hire vessel owners/operators may need to provide:

- Valid vessel and operator registrations and permits
- Fishing location data (e.g., logbooks, AIS, VMS, GPS track lines)
- Income verification, sales notes, and business account records

- Validated fisheries landings data

Additional or different documentation requirements may be warranted based on the design of each direct compensation program, as well as data availability when direct compensation programs are established.

Captain and Crew

Individuals employed by commercial and for-hire recreational fishing vessel owner/operators (e.g., captains and crew) may experience economic impacts from offshore wind development. Potential impacts to captain and crew could be addressed either directly through payments to individuals or indirectly through payments to fishing vessel owner/operators. Compensation payments issued only to commercial fishing vessel owner/operators should account for captain and crew salaries and costs. Where appropriate, commercial fishing owner/operators are strongly encouraged to share annual compensation payments with captain and crew.

In determining whether or how to include captains and crew in direct compensation programs, consideration should be given to the likelihood of captains and crew experiencing direct economic impacts from offshore wind projects, their ability to demonstrate such impacts, and the administrative burden associated with submitting and verifying claims. Fishing community resiliency programs that generally support fishery and maritime employment opportunities may be less costly and administratively burdensome, while yielding similar benefits to captain and crew.

Shoreside Seafood Processors

Shoreside seafood processors that rely on catch from offshore wind energy project areas may experience economic impacts from offshore wind development. Potential eligibility criteria may include a documented history of receiving landings from the project area and demonstration (by meeting the relevant criteria established for individual direct compensation programs) of unrecovered losses attributable to an offshore wind project. Shoreside processors located in and around the most highly impacted ports may be prioritized for compensation. Resiliency program funding may also be able to provide benefits to potentially impacted shoreside processors.

DIRECT COMPENSATION FUND ADMINISTRATORS

Independent fund administrators will be responsible for managing direct compensation funds, verifying eligibility, reviewing claims, disbursing payments, and providing regular reporting and outreach. Qualified and independent fund administrators will play a critical role in ensuring the successful implementation of direct compensation programs. To effectively carry out these responsibilities, the fund administrator must be credible and possess specific capabilities.

The following subsections outline key fund administrator qualifications, summarize the core responsibilities, and provide options for selecting the entities that will serve in this role. This framework is intended to provide flexible guidance that can be tailored to the specific needs of each offshore wind project and compensation program.

QUALIFICATIONS

The direct compensation fund administrator should have the following characteristics and qualifications:

- For-profit or not-for-profit legal status (e.g., law firms, government-affiliated or quasi-government agencies, or others)
- Established fiscal controls, legal authority to administer direct compensation funds and conflict-of-interest policies
- Experience managing claims-based funds, which may include programs established beyond pre-determined, court-mandated programs
- Expertise in, or access to, accounting, legal, and record-keeping services
- Credibility, or the ability to establish credibility, among the fishing community they will serve
- Experience working with the fishing industry or related sectors
- Capability to manage funds in line with an offshore wind project's permit requirements, commitments, and/or agreements
- Based on the West Coast, preferably, for ease of administration
- Capacity to conduct an appropriate level of outreach to fishermen/shoreside processors and be able to provide technical assistance to entities seeking compensation throughout the claims process.

SELECTION PROCESS

Offshore wind developers will be responsible for establishing and implementing a direct compensation program. As such, developers are expected to be primarily responsible for selecting direct compensation fund administrators. Selection of the fund administrator should be sufficiently transparent to maintain stakeholder confidence in direct compensation programs and ensure alignment with the Statewide Strategy's guidance on direct compensation, where appropriate. The following have been identified as potential options for offshore wind developers to select qualified fund administrators:

- **Competitive solicitation:** The developer may conduct a competitive bidding process to select the fund administrator. This process should include meaningful participation and consultation with the Commission and representatives from the fishing community. For example, the Commission and industry representatives could participate in an evaluation committee that reviews and scores submitted bids.

- **Mutual agreement:** The fund administrator may be selected through mutual agreement between a developer, relevant regulatory agencies, and fishing community representatives.
- **Other mechanisms:** In certain circumstances, an alternative selection approach may be appropriate if it meets the transparency and stakeholder engagement goals described in this framework.

Responsibilities

Direct compensation fund administrators will be entrusted with managing the day-to-day operations of direct compensation programs, including managing and distributing funds, reviewing claims, and providing clear communication and assistance to potential applicants. The core responsibilities summarized below should be carried out independently and in accordance with program criteria.

- **Manage funds:** Manage funds paid into the direct compensation program from offshore wind developers or oversee a financial institution serving in this role.
- **Review, verify, and process claims:** Assess submitted applications and claims for completeness and accuracy, utilizing fisheries data to validate fishing activity, fishing income, and economic losses, as necessary.
- **Disburse payments:** Direct or issue timely compensation payments to eligible claimants in line with program and permitting requirements.
- **Conduct outreach and provide technical assistance:** Ensure the fishing community is aware of the direct compensation program, including key deadlines, and offer technical support to entities throughout the claims process.
- **Maintain records and reporting:** Keep comprehensive records of all transactions and activity and meet any reporting requirements.
- **Process appeals:** Assess and process allowable appeals, including consideration of additional applicant information, from applicants who wish to contest the outcome of a compensation decision.
- **Protect information:** Maintain confidentiality, cybersecurity, and other safeguards to ensure private information remains private (i.e., including but not limited to financial records, individual vessel VMS, logbooks, or other vessel-identified records).

Reporting Mechanisms for Direct Compensation Programs

Fund administrators must be able to implement direct compensation programs independently of offshore wind developers, fisheries stakeholders, and government agencies. At the same time, they must be accountable to offshore wind developers who are ultimately responsible for ensuring that direct compensation programs are successfully established and implemented. Additionally, information about direct

compensation programs should be publicly available to ensure they are working as intended.

In recognition of this, direct compensation programs should include appropriate reporting mechanisms to ensure transparency and accountability. Such mechanisms, in addition to any oversight (e.g., auditing) and reporting obligations that a fund administrator has to an offshore wind developer, may be agreed to during an offshore wind project's permitting and regulatory review processes. These mechanisms could include the following:

- **Reporting requirements:** Direct compensation programs should publicly report, at least annually, on the status of program implementation. Such reports should include metrics that provide useful information on the effectiveness of the program. The metrics may include the number and types of claims received, claims approved or denied, total payments made, administrative costs incurred, funds remaining, and a summary of outreach and technical assistance activities. Information on appeals filed, the results of the appeals, and the time taken to adjudicate an appeal may also be helpful metrics to gauge a program's performance. The report may include additional information as necessary to summarize or contextualize the effectiveness and efficiency of the direct compensation program. This report could also include a discussion of any procedural changes, lessons learned, and recommendations for improving fund operations.
- **Agency reporting:** Before being released publicly, reports should be submitted to relevant regulatory agencies for review. Agencies would have the opportunity to ask questions, request clarifications, and make recommendations on report content. Once agencies have completed their review, reports would be posted publicly online and shared through other appropriate means. No confidential information should be included in any reports.

The above reporting mechanisms are intended to ensure appropriate levels of transparency and oversight and further uphold the integrity of direct compensation programs. Lessons learned from operational direct compensation programs could also be reviewed to inform future programs.

Resiliency Funds

PURPOSE OF RESILIENCY FUNDS

Fishing community resiliency funds are financial compensation provided to assist potentially impacted fishing communities in responding and adapting to offshore wind projects in a manner that supports the continued economic viability of fishing and the sustainability of fishing communities. Resiliency funds are separate from direct compensation funds and are the preferred way to address unavoidable, community-level impacts, from offshore wind development.

The Statewide Strategy envisions the creation of a resiliency fund program to administer the resiliency portion of the compensatory mitigation funds identified during an offshore wind project's permitting and regulatory review processes. As further described in the sections that follow, the resiliency fund program will be implemented by a Resiliency Administrative Entity (RAE) that the Commission selects with input from fishermen and developers. The Statewide Strategy, and agreements with the RAE, will outline the rules governing the program's function. The RAE will be responsible for ensuring that resiliency funds are used and dispersed in alignment with the Statewide Strategy and program specifications, which will include facilitating the formation of a decision-making body: the Regional Resiliency Committee (RRC). Together, the RAE and RRC provide the means to utilize resiliency funds to support programs, projects, and initiatives that build resilience of fisheries communities affected by offshore wind development.

RESILIENCY FUND USES

Activities, projects, and programs that support the purpose of the resiliency fund would be eligible to receive resiliency funds. As funding will be finite, activities identified by the fishing community that provide long-lasting and durable benefits should be prioritized. For example, funds may broadly be spent on (see Potential Resiliency Program Uses listed at the end of this chapter:

- Port infrastructure improvements
- Safety and navigation equipment for fishing vessels
- Goods and services that help fishing businesses adapt to emerging challenges
- Community organization and operations support

Resiliency funds would be restricted from being used in ways that do not directly support the resiliency fund's purpose. For example, funding cannot be used for:

- Litigation, except to defend the resiliency fund program
- Political campaigns, campaign donations, or registered lobbyists

- Purchasing assets or reimbursing expenses that are not incurred in the direct furtherance of creating resilient fishing communities
- Expenditures contrary to public policy, such as penalties, fines, gifts, bribes, or illegal kickbacks, etc.

Funding for resiliency projects, activities, and programs will be subject to funding availability and approval by the RRC, as described below. There are no restrictions on who can receive resiliency funds provided the funds are used to benefit fishermen and fishing community members who are potentially affected by an offshore wind project. Fishermen who receive direct compensation for lost fishing income will not be precluded from receiving resiliency funds; however, resiliency funding should not be used to cover losses or costs already compensated for by a direct compensation program.

RESILIENCY FUND PROGRAM PRINCIPLES

Resiliency fund programs for California fishermen should be designed with the following principles in mind:

- A resiliency fund program must be designed to support the overall objective of keeping fishermen fishing and supporting active fishing communities.
- A consistent framework for a resiliency funds program should be applied across offshore wind projects, avoiding the creation of multiple, different project-specific programs.
- Decision-making on funding priorities must be led by fishermen and reflect the priorities of the fishing communities impacted by offshore wind development.
- Administrative and overhead costs must be minimized to ensure funds are dedicated to, and available for, resiliency programs, projects, and initiatives.
- Fund management must be transparent, with clear reporting and oversight mechanisms in place.

RESILIENCY FUND PROGRAM STRUCTURE

The Statewide Strategy envisions the establishment of a single resiliency fund program for California. Funds for this program will be identified for each offshore wind project during the project's permitting and regulatory review processes.

The operation of the resiliency fund program will require key functions, including determining how funds will be used and overseeing fund management and administration. To carry out these essential functions, the resiliency fund program will be implemented by at least one RAE and at least one RRC (see Figure 6.1). The RAE(s) will be responsible for managing the resiliency fund program, serving as its fiduciary and performing administrative duties. The RRC(s) will determine how resiliency funds will be used at the regional level with input from local fishing communities.

The number of RAEs and RRCs required to implement the resiliency fund program is flexible, as shown in Figure 6.1. Depending on program needs and fishing community preferences, the resiliency fund program could, for example, include separate RAEs and RRCs based on the geographic location of offshore wind project lease areas (e.g., one RAE and RRC for the Central Coast and one RAE and RRC for the North Coast). Regardless of the configuration, it will be important to ensure that affected fishermen and communities are adequately represented. Adequate representation would require consideration for the location and number of offshore wind projects in conjunction with the scale and distribution of affected fishing operations and communities. However, the resiliency fund program will need to strike a balance between adequately representing and serving local fishing communities and maintaining the efficiency of fewer operating bodies.

The Statewide Strategy anticipates that a single RAE and RRC will be selected to implement the resiliency fund for the first offshore wind project that completes the permitting and regulatory process in California. The selection process is likely to take place after the BOEM issues a Record of Decision for the project's Construction and Operations Plan (COP) but before the start of in-water construction activities.

Additional RAEs and RRCs may be added to the resiliency fund program as needed for subsequent offshore wind projects (see Figure 6.1); however, it may not be necessary to convene a new RRC for each offshore wind project. For instance, offshore wind projects in the same region may be able to use the same RRC if the committee includes adequate representation of potentially affected fishing communities. If an existing RRC does not provide adequate representation for fishing communities potentially affected by a new offshore wind project, the committee may be expanded or an additional RRC may be formed.

Resiliency Administrative Entity

The RAE will serve six primary functions:

1. Day-to-day management of funds, including reporting and oversight.
    - Administrative support and coordination for RRCs.
    - Creation of the RRC Charter.
    - Solicitation of nominations for RRC membership.
2. Review of RRC actions to ensure alignment with program requirements.
3. Provide coordination and a line of communication among RRCs regarding common themes and priorities.

The RAE will receive resiliency funds, establish accounts, and disburse funds as stipulated in its agreement with the Commission and as directed by the RRC. The RAE will also be responsible for fulfilling any reporting requirements associated with the

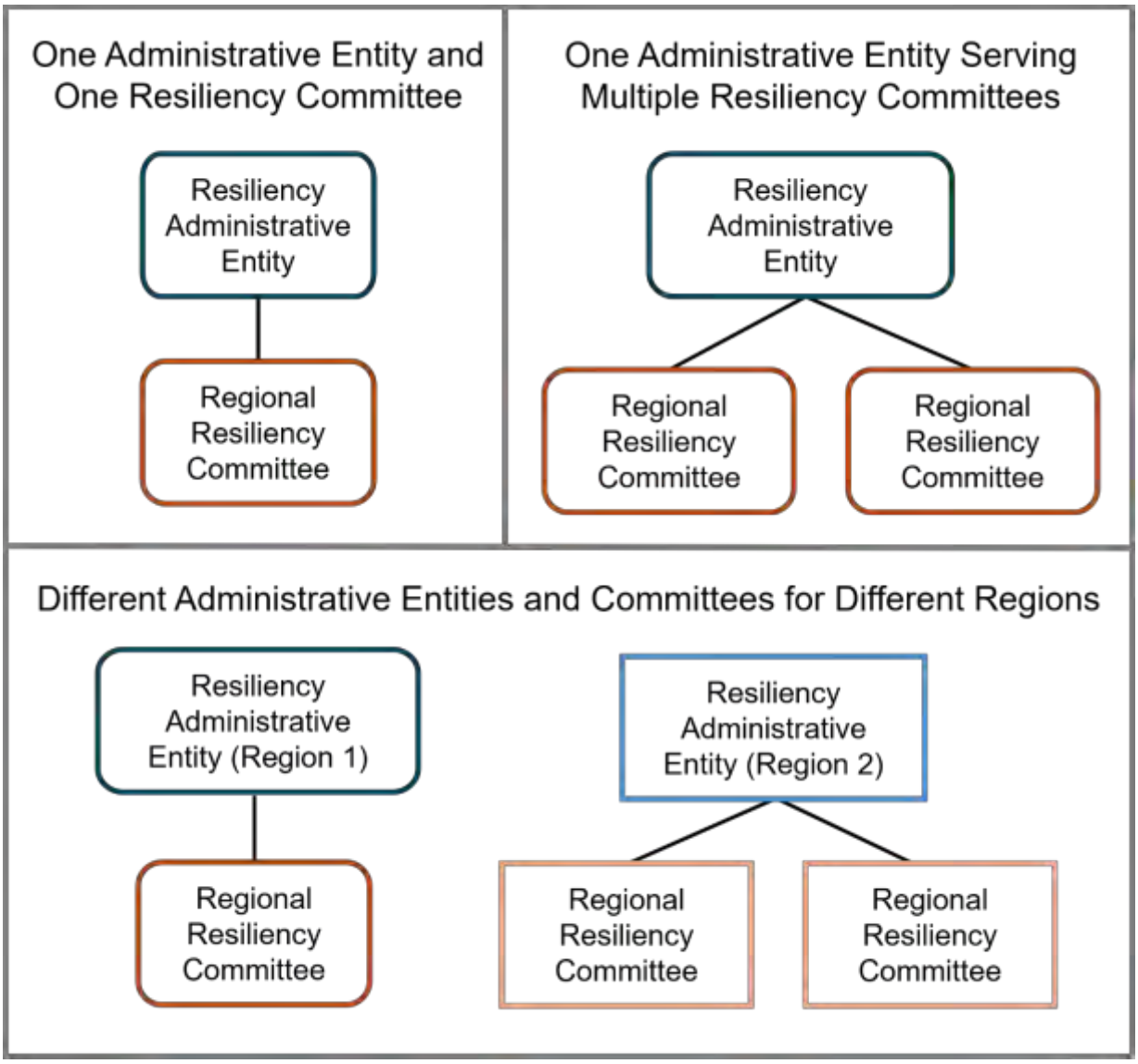


Figure 6.1 Example Resiliency Fund Program Structures. The flexible design enables the program to adapt to the location and number of offshore wind projects. The number and configuration of Resiliency Administrative Entities (RAEs) and Regional Resiliency Committees (RRCs) will be based on need with an eye to balancing the efficiency of fewer entities with the ability to serve local communities.

resiliency fund program (i.e., proposals funded, administrative costs, accounting of the funds, etc.). The RAE will provide administrative support to the RRC (e.g., scheduling meetings, taking meeting minutes, drafting documents, etc.) and coordinate activities between RRCs. For example, the RAE may facilitate coordination between RRCs to identify common themes that the RRCs are hearing as priorities from the fishing community, coordinate spending priorities between RRCs, or find coordinated ways to address challenges that arise during fund implementation. To facilitate this coordination role, the RAE will serve as an ex officio member of each RRC. The RAE will also develop an RRC Charter, as described below. Lastly, the RAE will adhere to the program rules established in the agreement with the Commission that clearly and

transparently define its roles and responsibilities. Resiliency fund program expenditures and funding awards will be required to comply with these rules.

The RAE is expected to have most or all the following characteristics and capacities necessary to execute the required tasks:

- Established appropriate fiscal controls, legal status, and governance structure (Manager(s), Board of Directors, etc.)
- Expertise in, or access to, accounting, legal, reporting, and record-keeping services
- Strong fiduciary responsibility, with the ability to adhere to rigorous policies on reporting, transparency, and oversight
- Experience in the management of resiliency funds, grant-based funds, or similar programs
- Established, or the ability to readily establish, credibility amongst the regional fishing community it will serve
- Knowledge of and connection to the diverse California fisheries, fishing communities, and associations/organizations in the area affected by offshore wind development

Regional Resiliency Committee

The RRC is intended to serve as the decision-making body of the resiliency fund program. An RRC Charter, as described below, will dictate the fund's governance structure, auditing and public reporting procedures, and internal controls.

The RRC will:

- Identify funding priorities and solicit proposals aligned with the needs of the regional fishing community.
- Review proposals and select projects for resiliency fund grants and awards.
- Provide opportunities for input from the regional fishing community on funding priorities.
- Conduct solicitation and fund award processes in accordance with the RRC Charter. If the RRC cannot identify project proposals to fund, the RAE will assume the decision-making role under the same criteria outlined for the RRC.

As part of identifying funding priorities, the RRC will develop an annual spending plan informed by input from the local fishing community. This plan will outline funding caps, categories, and other parameters for the coming year in line with program rules and the regional fishing community's priorities. Whenever possible, no more than 10% of the

annual budget should be allocated to administrative costs. This includes expenses related to both the RAE and RRC. Similarly, the RRC should limit overhead costs on funded grants and projects to 10% or less whenever possible. The RAE will be responsible for confirming that sufficient funds are available to support the annual spending plans. Commission staff will have the opportunity to review and approve these plans before they are implemented.

The RRC will be based in California and carry out operations within the state. Each RRC established will be composed of fishing community representatives that reflect the major and diverse fisheries active in and around an offshore wind project area. Fishing community representation will be generally proportional to the anticipated fisheries impacts of an offshore wind project development. Fishing community representatives may include individuals from affected fisheries (including single- and multiple-gear types), local ports or harbor districts, the recreational for-hire sector, and the seafood processing sector. The RRC should also provide state agencies, offshore wind developer(s), and the RAE with the option to serve as representatives. Such representatives would have a non-voting seat on the RRC and serve in an advisory capacity to the committee.

CONVENING PROCESS

The following provides guidance on the selection of an RAE and the establishment of an RRC.

RESILIENCY ADMINISTRATIVE ENTITY SELECTION

The RAE will be selected by the Executive Director of the Commission following solicitation of interest from organizations that meet the criteria outlined in this chapter. The solicitation is likely to occur after BOEM issues the first Record of Decision on a COP for an offshore wind project in California. The Commission will provide fishermen and developers the opportunity to give input on the RAE selection criteria and to review nominations. Fishing entities within the affected communities who meet the criteria described further above should be given strong consideration by the Commission for fulfilling the RAE role. If the solicitation does not identify a suitable organization, the Executive Director will appoint the RAE while adhering to the guidance in the Statewide Strategy as much as possible.

Once identified, the RAE would enter into a Resiliency Fund Administrator Agreement (see Appendix A) with the Commission. The agreement will outline the rules of the resiliency fund program, including the roles and responsibilities of the RAE and RRC, and reporting requirements. The agreement will also specify the total number of representatives and the fishing sectors that must be represented on the committee to reflect the fisheries and communities identified as potentially affected during the federal consistency review process. Developers contributing funds to the resiliency fund program may also enter into an agreement with the RAE specific to the management of the resiliency funds for a particular offshore wind project. Coordination among the

Commission, developer, and RAE will ensure that agreement terms do not conflict. Such agreements would be informed by the resiliency fund program rules and the project's permitting requirements.

Regional Resiliency Committee Establishment

RRC members will be selected through a process where fishing sectors provide nominations for consideration to the Executive Director of the Commission. The Executive Director will select the RRC members from the nominations. The nomination process will be facilitated by the RAE and based on the agreement with the Commission. The agreement will detail the seats to be filled based on the impact analysis on fishery communities from the consistency review process. The RAE, developer, and government agencies such as CDFW and NMFS will have the opportunity to review the nominations and provide feedback or make recommendations to the Executive Director on the composition of the RRC. In selecting the RRC members, the Executive Director will give great weight to nominations made by members of the potentially affected fishing community.

Any issues identified during the review process should be discussed with the RAE to identify a solution. A similar process will be used to fill future vacant seats. Roles, responsibilities, and the procedures and protocols for operation of the RRC will be outlined in the RRC Charter.

Regional Resiliency Committee Charter

The RRC's operation procedures will be outlined in an RRC Charter (see Appendix C). The RAE will be responsible for drafting the Charter and informed by the agreements between the RAE, the Commission, and the developer.

The Charter will define processes and procedures for the RRC, including:

- Meeting protocols
- Decision-making processes
- Public participation guidelines
- Conflict of interest policies
- Conflict resolution procedures
- Procedures for solicitation of proposals for resiliency funds

The Charter will be reviewed by Commission staff and approved by the Commission's Executive Director to ensure alignment with the principles of the resiliency fund program identified in the Statewide Strategy. Following Commission staff review, the Charter will be considered for adoption at the first meeting of the RRC. Any future updates to the Charter must be approved by the Executive Director of the Commission prior to taking effect.

POTENTIAL RESILIENCY PROGRAM USES

The following provides a non-exhaustive list of examples of potential uses of resiliency program funds:

I. Port Infrastructure Investments and Improvements
   a. Ice Machines, Cold Storage and Freezing Capacity
   b. Marketing or Processing Facilities
   c. Fuel Facilities
   d. Hoists, Dock Repair and Piling Replacement
   e. Investments in slips and docks
   f. Truck Loading Facilities and Equipment
   g. Haul out and vessel repair facilities
   h. Gear Storage Facilities

II. Safety and Navigation
   a. Safety and Navigation Equipment Grants
   b. Training programs

III. Adaptation Services for Fishermen
   a. Gear and vessel innovation

IV. Certification and vessel upgrade programs to allow fishermen to work for offshore wind
   a. Training Programs
   b. New gear types
   c. Coast Guard Licensing for New Entrants
   d. Programs to decrease overhead costs- e.g. Fuel, Moorage, and Ice Subsidies
   e. Community Quota Fund Programs
   f. Funding Experimental Fisheries Projects, Gears, and Plan
   g. Promotion of Local Seafood
   h. “Cost of Fishing” Grants
   i. Crew insurance
   j. Communication tools and equipment

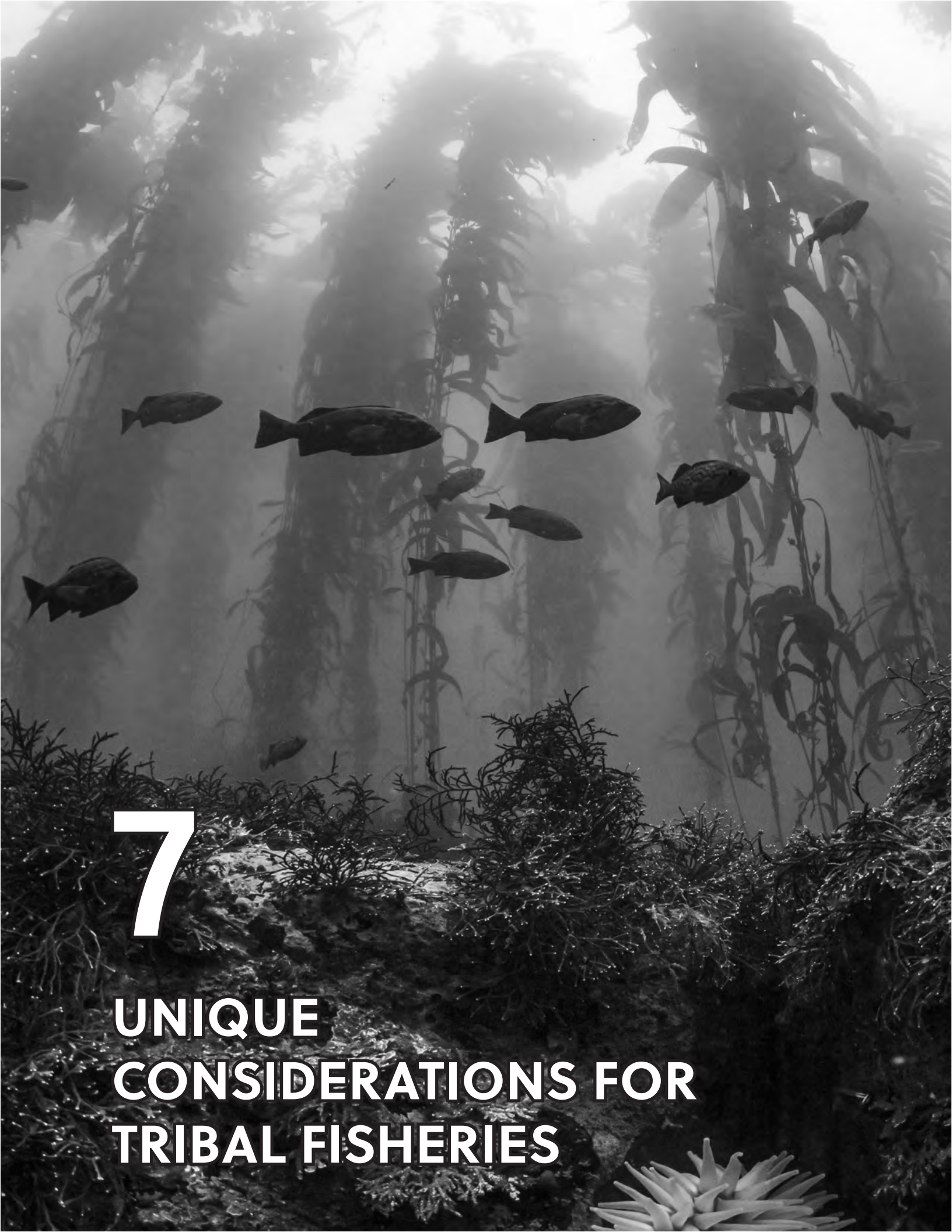
V. Support for Community Organization and Operations
   a. Funding for Participation in Fisheries Management

b. Funding Costs of Consultants for both fishing Communities and Commercial Fishermen's Association
c. Grants for Commercial Fishermen's Associations Operating Costs
d. Socioeconomic Impact Reports, Analysis, and Studies that have a clear intent and purpose to directly benefit fishermen and fishing communities
e. Community outreach activities, including education and scholarships
f. Surveying and polling

VI. Permit banks

VII. Resource enhancement

VIII. Cooperative research



7

UNIQUE CONSIDERATIONS FOR TRIBAL FISHERIES

7. Unique Considerations for Tribal Fisheries

INTRODUCTION

Tribal fisheries include commercial, recreational, and subsistence fishing activities conducted by Tribes and tribal members. Tribal subsistence fishing is defined as the non-commercial catching or gathering of natural aquatic resources, including fish and shellfish, for consumption by individuals, households, or communities of California Native American Tribes (Tribes) to meet needs for sustenance (Figure 7.1).[82,83]

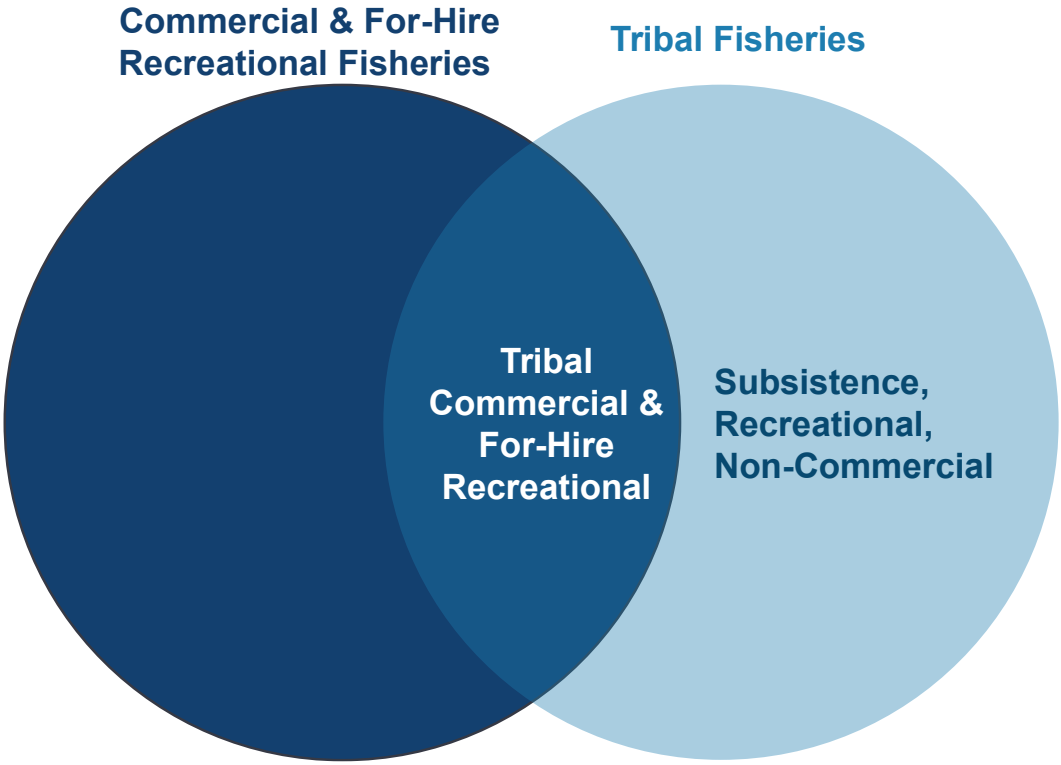


Figure 7.1 Tribal Fisheries in the Statewide Strategy. This Venn diagram shows how tribal fisheries are represented with the Statewide Strategy. The left circle represents commercial and for-hire fisheries; the right circle represents tribal fisheries. The overlap indicates tribal participation in commercial and for-hire recreational fishing. The light blue circle highlights subsistence, recreational, and non-commercial tribal fisheries—the focus of the tribal chapter.

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[82] The tribal fisheries definition used here is used to provide clarity on what is meant by 'tribal fisheries' in the context of the Statewide Strategy. Discussions on tribal fisheries should encompass tribal-defined fisheries. The definition comes from the California Water Boards Tribal Beneficial Uses and was codeveloped with California Native American Tribes. https://www.waterboards.ca.gov/tribal_affairs/docs/tbu_fact_sheet_v04.pdf.

[83] In this context, the definition is not regulatory, nor should it be considered limiting.

Chapters 1-6 of the Statewide Strategy outline strategies for addressing potential impacts from offshore wind development to commercial and for-hire recreational fishing sectors, which include tribal members who participate in these fisheries. This chapter outlines additional considerations for identifying, understanding, and addressing potential impacts to tribal fisheries that are not associated with the commercial and for-hire recreational fishing sectors discussed in Chapters 1-6. If a Tribe engages in commercial fishing, other chapters of the Statewide Strategy may be relevant to addressing impacts to their fisheries.

When seeking to understand potential impacts to tribal fisheries and identifying solutions to avoid, minimize, and mitigate those impacts, the California Coastal Commission (Commission) and developers should recognize the sovereignty of Tribes. A Tribe's rights, interests, and cultural priorities are a unique aspect of finding strategies for coexistence between offshore wind development and tribal fisheries. Nothing in the Statewide Strategy foregoes or minimizes the obligation for meaningful government-to-government consultation between the Commission and Tribes. For more information about consultation, engagement, and public comment opportunities during the planning and permitting stage of offshore wind energy projects, please refer to Figure 7.2.

This chapter is intended to facilitate engagement between Tribes, the Commission, and developers on the topic of tribal fisheries during the planning and permitting of proposed offshore wind projects and offers guidance for how projects may be developed to minimize potential effects on tribal fisheries.

BACKGROUND

California's coastal zone holds deep cultural significance for Tribes. Long before colonization by European settlers, each coastal area was meaningful to the local Indigenous communities. This significance is a vital part of California's history—a history marked by centuries of land theft, oppression, and violence that displaced Indigenous peoples from coastal and other regions early in the colonization process. Even after Indigenous communities were forcibly removed from these lands by settlers and government authorities, expressions of Indigenous culture, religion, and values were often met with hostility, persecution, and even genocide. As a result, many Tribes were driven away from their ancestral coastal territories.

Today, California is home to the largest number of Tribes in the contiguous United States. The federal government, through the Department of the Interior's Bureau of Indian Affairs (BIA), currently recognizes 109 California Tribes, and the State of California (through the Native American Heritage Commission, NAHC) currently acknowledges 55 additional California Tribes and Tribal communities.[84]

Contemporary tribal fisheries are rooted in historic and traditional practices that have been forced to adapt to shifting marine and coastal environments as well as evolving

[84] California Coastal Commission Tribal Consultation Policy: https://documents.coastal.ca.gov/assets/env-justice/tribal-consultation/CCC%20Tribal%20Consultation%20Policy%20Adopted%208.8.2018.pdf.

regulatory and management frameworks. Traditional tribal fishing and subsistence gathering in California have included species such as finfish, seaweeds, kelp, sea palm, abalone, oysters, and other shellfish. While tribal fisheries encompass commercial, recreational, and subsistence practices, they represent far more than economic activity. For many Tribes along the coast, harvesting aquatic resources is deeply rooted in cultural identity, spiritual tradition, health, and intergenerational knowledge transfer with historic and current lifeways connected to these resources. For many, fishing is what your family taught you. Additionally, many Tribes have spiritual and cultural connections to salmon and other anadromous and aquatic species based on thousands of years of use for tribal religious and cultural ceremonies, as well as subsistence and commerce.[85,86]

Expected Use of the Statewide Strategy for Tribal Fisheries

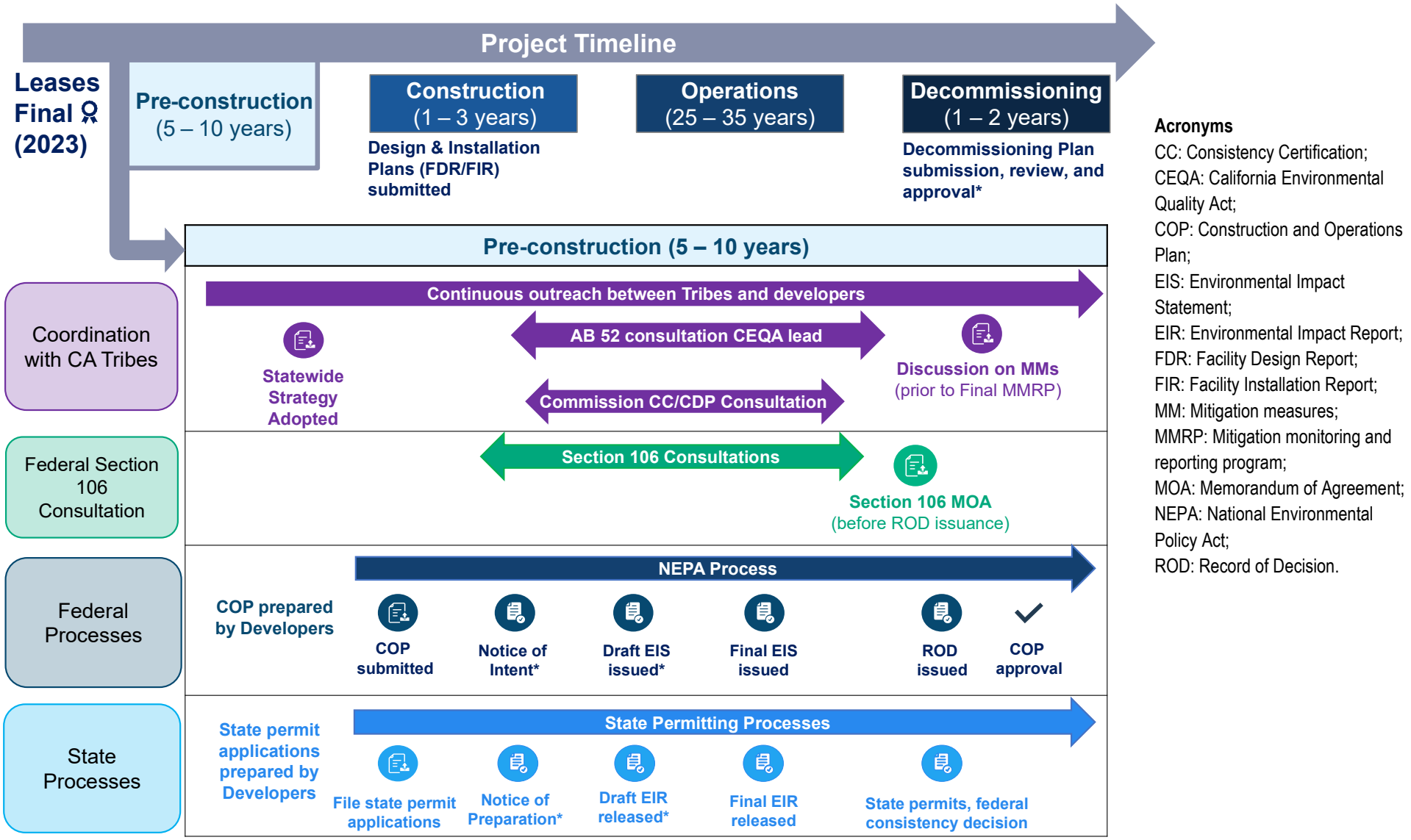
The tools in the Statewide Strategy are meant to increase understanding of potential impacts to tribal fisheries such that offshore wind projects can be designed to avoid impacts to the greatest extent practicable and identify appropriate measures that could be used to minimize and mitigate impacts. The novelty of floating offshore wind in federal lease areas on the West Coast creates uncertainties; however, its potential effects will be better understood as specific projects are planned. At the same time, potential impacts to tribal fisheries may be challenging to identify due to a lack of publicly available tribal fisheries data. Timely and open dialogue between Tribes and developers can foster the exchange of knowledge, including knowns and unknowns, and help identify pathways for the coexistence of offshore wind projects and tribal fisheries.

Developers should refer to this chapter while engaging with Tribes; designing their projects; and drafting their Construction and Operations Plans (COPs), federal consistency certifications, and state permit applications. Developers should use this chapter to assess impacts to tribal fisheries and to avoid, minimize, and mitigate impacts. The Commission expects that, where appropriate, impacts to tribal fisheries would be addressed in alignment with the Statewide Strategy.

Tribes may choose to use this chapter as a guiding framework for discussions with developers and federal and state agencies.

[85] Castillo, Edward D., Short Overview of California Indian History, 2018, California Native American Heritage Commission.

[86] Pacific Fishery Management Council – Tribes. https://www.pcouncil.org/fishing-communities/tribes/.



Acronyms
CC: Consistency Certification;
CEQA: California Environmental Quality Act;
COP: Construction and Operations Plan;
EIS: Environmental Impact Statement;
EIR: Environmental Impact Report;
FDR: Facility Design Report;
FIR: Facility Installation Report;
MM: Mitigation measures;
MMRP: Mitigation monitoring and reporting program;
MOA: Memorandum of Agreement;
NEPA: National Environmental Policy Act;
ROD: Record of Decision.

Figure 7.2 Federal and State Consultation Opportunities During Offshore Wind Development. This figure shows a timeline of engagement and consultation with California Native American Tribes during the pre-construction phase. The pre-construction phase is expanded from the timeline at top to show the parallel consultation and engagement processes with Tribes by State and Federal agencies. The asterisks (*) indicate opportunities for public comment. State engagement lines include all California recognized Tribes (i.e., federally and non-federally recognized). Federal engagement is often limited to federally recognized tribes.

COMMUNICATION PROTOCOLS

COMMUNICATION PROTOCOLS BETWEEN DEVELOPERS AND TRIBES

Effective communication between Tribes and developers is essential for the responsible development and operation of offshore wind projects.

Developers should engage with Tribes about tribal fishing to build long-term partnerships. This may include participating in community events and outreach activities related to the project to build and enhance a working relationship if the Tribe wishes to do so. tribal members have expressed that communications should primarily be placed in the context of a long-term “neighbor-to-neighbor” relationship and not as a single, one-time, stand-alone, or “check-box” activity. Understanding that it takes time to form relationships is extremely important.

The guidance in this chapter builds upon the Native American Tribes Communication Plans (NATCPs), which are required of each developer by BOEM. The NATCP describes how a developer (or group of developers) intends to communicate with Tribes that have cultural and/or historic ties to their lease area. Examples of NATCPs that contain contact information for tribal liaisons for each of the developers are provided below.

- Central Coast
    - Joint-NATCP for Atlas Wind (Equinor), Golden State Wind (Ocean Winds), and Even Keel Wind (Invenergy).
- North Coast
    - NATCP for California North Floating (Vineyard Offshore).
    - NATCP for Canopy Offshore Wind (RWE).

Each NATCP acts as a living document and emphasizes the importance of maintaining transparent, consistent, and adaptive communication channels to share information, discuss potential issues, and collaboratively identify solutions. Every developer commits to meeting regularly with Tribes on specific project issues. Meetings may focus exclusively on tribal fisheries-related topics or combine various subjects. Examples of agenda items could include cultural heritage, training opportunities, surveys, and construction activities. Figure 7.3 provides an overview of specific points of engagement between Tribes and developers over the life of an offshore wind project.

BEST PRACTICES AND GUIDELINES FOR TRIBAL COMMUNICATION AND ENGAGEMENT

The following best practices should be used by developers when engaging with Tribes about tribal fishing. The following recommendations have been adapted from BOEM guidance that synthesized existing federal agency consultation

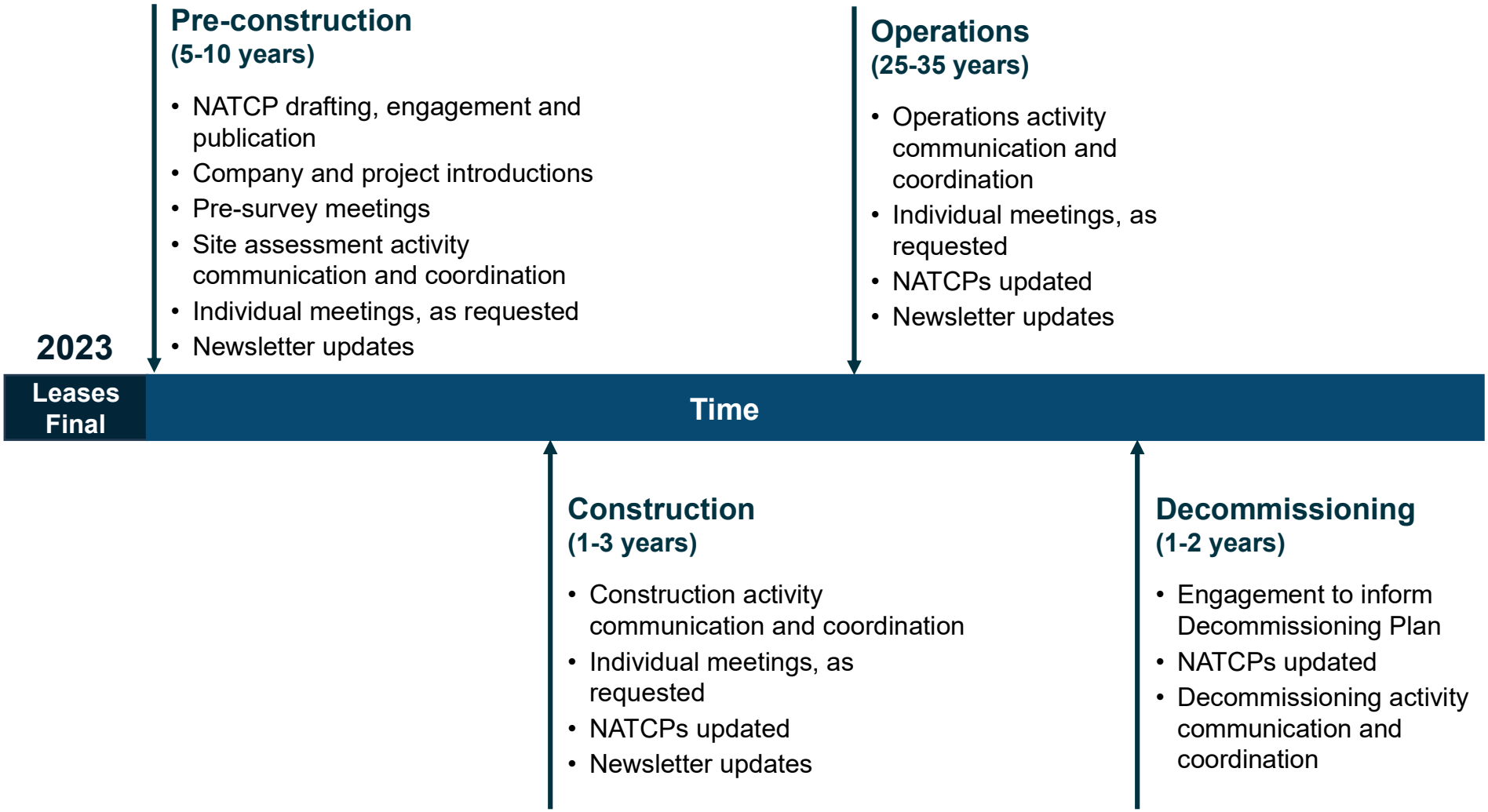


Figure 7.3 Offshore Wind Developer's Tribal Engagement. This figure illustrates the full lifecycle of an offshore wind farm, from pre-construction through construction, operations, and decommissioning. Each phase is expanded to show how offshore wind developers will communicate and engage with Tribes during that stage.

Acronyms NATCP: Native American Tribal Communication Plan

guidelines and have been further developed through feedback received from the Working Group and Tribes during Commission staff's outreach.[87,88,89]

General Best Practices

- Research the Tribe's culture. Understand what is and is not appropriate within tribal culture.
- Research the history of the Tribe and its current and historical relationship with Federal and State Government.
- As much as possible, information about a Tribe should come from that Tribe.
- Understand the Tribal perceptions of time and allow time to form relationships.
- Budget resources and time for building relationships before decisions are made.
- Construct flexible protocols.
- Understand Tribal authority and representation. Communicate with each Tribe to understand their unique government and decision-making structure.
- Respect Tribal sovereignty, self-determination, and protocols.
- Respect Tribal representation of Tribal interests and practices.
- Adapt communication plans if given new information from Tribes.
- Research/identify any intertribal issues, jurisdictions, disagreements, etc.
- Assess the Tribe's capacity to be involved in the project (research, monitoring, implementation).
- Work toward building Tribal capacity, if desired by the Tribe.
- All communications with Tribes should happen early, often, and should meaningfully recognize the sovereignty of the Tribe(s).
- All communications should work to address issues that come up through appropriate communication, coordination, and collaboration efforts.
- Communication methods should be tailored to each Tribe to ensure access to relevant project information.

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[87] Natural Resources Conservation Service (NRCS). 2009. Tribal Consultation: A Guide for Natural Resources Conservation Service (NRCS) Employees. http://nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_021895.pdf

[88] U.S. Fish & Wildlife Service (USFWS). 2011. Tribal Consultation Handbook. https://www.fws.gov/mountain-prairie/tribal/documents/Tribal_Consultation_Guide_Apr_2013.pdf

[89] NOAA. 2023b. NOAA Procedures for Goverment-to-Government Consultation with Federally Recognized Indian Tribal Governments. https://www.noaa.gov/sites/default/files/2023- 07/NOAA_Tribal_Consultation_Handbook_2023_FINAL.pdf

Best Practices for Offshore Wind Project Planning

- Many Tribes have limited capacity. If developers have contacted a Tribe and have not received a response, they should continue to reach out and provide information until a Tribe requests no further communications.
- If a Tribe outside a project's geographical area contacts the developer, the developer should work with them to answer questions and include them in communications.
- Within each developer's company, tribal and fisheries liaisons should reach out to one another to understand needs and communication preferences to relay information. Each developer has both of these liaisons; developers should leverage these two positions to work with Tribes to better understand tribal fisheries.
- Communications between Tribes and developers should happen at every stage of the project. Tribes listed in the NATCPs, which include federal and state-recognized Tribes, should be included in all communications unless a Tribe indicates otherwise. If a Tribe is not listed in the NATCP and would like to be communicated with by the developer, contact information can be found in the NATCP for each developer (see NATCP list earlier in this chapter).
- Review a Tribe's consultation policy to learn about potential communication approaches, preferences, and expectations.
- Ensure that all relevant information about project activities, schedules, and opportunities to engage or provide input in the process are shared with Tribes and that adequate time is given for review, particularly if feedback is requested. The California Natural Resources Agency recommends a 90-day review period for substantive documents; however, each Tribe may have their own preference.
- Significant changes (e.g., major schedule changes) should be communicated to Tribes within appropriate timeframes, so they are aware of and understand such changes.
- Work with Tribes to understand their preferred methods of communication. These could include physical mail, electronic mail, phone calls, and other methods.
- Work with Tribes to understand what information and data shared by Tribes and by developers may be confidential. If appropriate, develop data sharing agreements or execute non-disclosure agreements to protect confidential information shared by Tribes and/or developers.
- Understand that Tribes have the right to rescind permission to share information.
- For information about procedural considerations, Tribes and developers should refer to the BOEM's *A Guidance Document for Characterizing Tribal Cultural*

Landscapes.[90] This is guidance that can be modified to best suit the meetings conducted between Tribes and developers.

For tribal fisheries:

- It should be understood in characterizing tribal fisheries that the Tribe or individual tribal fisherman may have sensitive or confidential information. The process of informing the developer or receiving fisheries data will not look the same as it does for commercial and recreational fishing.
- Specific best practices for characterizing tribal fisheries should be discussed and agreed upon whenever possible between the Tribe and the developer in accordance with this guidance.
- Additional best practices can be raised through the fisheries characterization process and at time throughout the phases of an offshore wind energy project.
- Keep tribal communications separate. Avoid carrying conversations from one Tribe into another, as each Tribe is unique and may have its own preferences, context, and communication style.

POTENTIAL IMPACTS AND AVOIDANCE AND MINIMIZATION MEASURES

This section provides a list of actions that could be appropriate to implement to avoid and minimize potential impacts that are unique to tribal fisheries from offshore wind development. These measures are based on knowledge of West Coast tribal fisheries and activities associated with offshore wind projects.

Measures to avoid and minimize impacts to tribal fisheries will be considered as part of an offshore wind project's state and federal permitting processes, including the Commission's evaluation of the coastal effects of any project and its consistency with the California Coastal Management Program's enforceable policies.[91] Necessary, appropriate, and workable measures may be included as developer-proposed measures or conditions to agency authorizations. Commission staff will collaborate with Tribes and developers to ensure that any measures pursued through consistency review do not conflict with federal or state permitting or regulatory requirements. More information can be found in the Introduction (Chapter 1) on regulatory authorities.

Potential impacts that could generally occur from the development of an offshore wind energy project are listed below with avoidance and minimization measures, which are

[90] Ball, D., R. Clayburn, R., Cordero, B. Edwards, V. Grussing, J. Ledford, R. McConnell, R. Monette, R. Steelquist, E. Thorsgard, and J. Townsend. 2015. A Guidance Document for Characterizing Tribal Cultural Landscapes. US Department of the Interior, Bureau of Ocean Energy Management, Pacific OCS Region, Camarillo, CA. OCS Study BOEM 2015-047. 32 p.

[91] California's Coastal Management Program consists of the enforceable policies of Chapter 3 of the Coast Act (Cal. Pub. Res. Code §§ 30200-30265.5).

the principal focus to prioritize reducing any conflicts or impacts. These potential impacts and avoidance and minimization measures are meant to be a starting place for discussions between a Tribe and a developer.

Although the potential impacts and avoidance, minimization, and mitigation measures (AMMMs) below are organized by project phase, some impacts are challenging to differentiate by project phase, such as cumulative impacts. Some Tribes may prefer to discuss impacts and AMMMs for the whole project, rather than in a phased structure. Developers should accommodate how Tribes wish to structure any impacts discussion and bring those discussions into their project planning.

Tables 7.1 through 7.4 below should not be considered a comprehensive list of all potential impacts to tribal fisheries. Additional potential impacts outside of the scope of this Statewide Strategy heard through consultation and Roundtables are listed at the end of this chapter.

Table 7.1 Site Assessment and Design Phase Potential Impacts to Tribal Fisheries and Avoidance and Minimization Measures

Potential Impact		Avoidance and Minimization Measures
1.1	Short-term displacement from fishing, gathering, and ceremonial areas due to site assessment activities.	Communicate with Tribes to understand fishing and gathering seasons, as well as sacred practices and sensitive species reproduction timing, to avoid displacement or population impact to fishing grounds and ceremonial activities. Communicate with Tribes well in advance of anticipated site assessment activities and collaborate with affected Tribes to minimize potential short-term displacement impacts and ensure effective information sharing. If site assessment activities are likely to impact tribal fisheries, developers should engage with Tribes and seek to schedule these activities to avoid days and times important to tribal fishing, including fishing seasons and cultural and ceremonial lifeways of Tribes.
1.2	Short-term displacement from fishing areas due to site assessment activities.	In dialogue with Tribes, seek to design offshore wind (OSW) infrastructure and project footprints to avoid and/or minimize impacts to tribal fishing activities, in the context of many design considerations and constraints, and to the extent technically and commercially feasible.
1.3	Damage to cultural artifacts related to historic tribal fishing activities from geotechnical sampling activities.	In collaboration with Tribes, ensure the Unanticipated Discovery Plan within the Native American Tribal Communication Plan is the preferred protocol to follow to notify Tribes. In collaboration with Tribes and relevant state and federal agencies, establish appropriate buffers to protect archaeological resources.
1.4	Increased Tribal engagement burdens due to time engaging with OSW Developers, State Agencies, and Federal Agencies.	Ensure offshore wind meetings are planned and conducted efficiently to minimize the burden of participation by tribal members, consistent with the communication protocols in this chapter and the Native American Tribal Communication Plan. Offshore wind developers should collaborate, as appropriate, when hosting tribal fisheries outreach meetings and consider reimbursing expenses incurred for participation.[92]

[92] If a meeting includes confidential business information, multiple offshore wind developers may not be able to co-host or jointly participate in a meeting with Tribes.

Table 7.2 Construction Phase Potential Impacts to Tribal Fisheries and Avoidance and Minimization Measures

Potential Impact		Avoidance and Minimization Measures
2.1	Short- and long-term displacement from fishing areas due to construction activities.	Communicate with Tribes well in advance of anticipated construction activities and collaborate with affected Tribes to minimize potential short- and long-term displacement impacts and ensure effective information sharing. Communicate with Tribes to seek to schedule construction activities to avoid days and times that are important for tribal fishing activities including fishing seasons and cultural and ceremonial lifeways of Tribes.
2.2	Increased Tribal engagement burdens due to time engaging with OSW Developers, State Agencies, and Federal Agencies.	See Table 7.1 Item 1.4

Table 7.3 Operations Phase Potential Impacts to Tribal Fisheries and Avoidance and Minimization Measures

	Potential Impact	Avoidance and Minimization Measures
3.1	Gear entanglement/gear loss from interactions with offshore export cables/cable protection.	See Table 4.3 Item 3.7. In addition to the avoidance and minimization measures listed in 3.7: Chart all cables, facilities, and obstructions, providing data to Tribes. Communicate with Tribes to notify if cables become unburied or otherwise become hazards to fishing operations. Establish protocols for gear entanglement with OSW infrastructure and include protocols in emergency response plans and tribal communication plans as appropriate.
3.2	Short-term displacement from sections of the export cable area due to inspection, maintenance, or repair.	See Table 4.3 Item 3.8. In addition to the avoidance and minimization measures listed in 3.8: In collaboration with Tribes, use relevant communication protocols well in advance of construction activities. If area is within tribal fishing grounds, communicate with Tribes and include tribal monitoring if maintenance includes ground disturbance or if export cables become unburied. Prioritize maintenance techniques that avoid and minimize disruption to tribal fishing activities (e.g. simultaneous cable lay and burial).

Table 7.4 Decommissioning Phase Potential Impacts to Tribal Fisheries and Avoidance and Minimization Measures

Potential Impact		Avoidance and Minimization Measures
4.1	Short-term displacement due to vessel activities from important fishing areas.	In collaboration with Tribes, use relevant communication protocols well in advance of decommissioning activities and collaborate with affected Tribes to minimize potential short-term displacement impacts and ensure effective information sharing. Communicate with Tribes to seek to schedule decommissioning activities to avoid days and times that are important for tribal fishing activities including fishing seasons and cultural and ceremonial lifeways of Tribes.

SOCIOECONOMIC IMPACT METHODOLOGY

SB 286 requires a methodology to inform project-level socioeconomic analyses of direct and indirect impacts to commercial, recreational, and tribal fisheries and fishing industries. The methodology proposed in Appendix B serves as guidance for conducting thorough and objective evaluations of potential impacts from offshore wind developments to tribal fisheries (See Appendix A for the methodology for commercial and recreational fisheries). Developers and Tribes will determine the best way to use the methodology to assess potential impacts on tribal fisheries from offshore wind developments.

The methodology envisions an analysis that targets an evaluation of the socioeconomic effects from potential impacts to tribal fisheries that may remain after all other AMMMs are considered. Specifically, the methodology suggests approaches to assess the socioeconomic effects, considering possible data and information sources and limitations, project-specific considerations, and other circumstances, as necessary.

The amount of data available for tribal fisheries varies widely. This methodology is designed to work with varying levels of data and focuses on the assessment of tribal fisheries impacts. This methodology is intended to be generalizable and flexible—with the ability to incorporate the best available data and science—but detailed enough to allow for ease of use and provide a consistent reference.

The socioeconomic impact methodology for tribal fisheries was developed by Northern Economics, Inc. with input from the Working Group. Northern Economics' team members have technical expertise in socioeconomic analysis and were requested by the Working Group to develop the methodology. The work was funded by a grant from the California Ocean Protection Council.

Please see Appendix B for the Tribal Fisheries Socioeconomic Methodology.

Template for an Agreement Addressing Tribal Fishing Interests

INTRODUCTION

This section provides guidance for Tribal Nations and developers on the potential process and substance of creating a tribal fisheries agreement. SB 286 requires the Statewide Strategy to include a template for any such agreement to address potential impacts to tribal fisheries from offshore wind development. This guidance is intended to serve as a flexible roadmap. It is not a one-size-fits-all model. If pursued, agreements are likely to differ between Tribes, developers, and offshore wind projects. Ultimately, any agreement and the process through which it is developed should be shaped through mutual understanding and conversations between Tribes and developers.

This guidance is grounded in the recognition of Tribal sovereignty and legal protections. Information shared in the process of developing such an agreement must be governed by Tribal-defined protocols, including, but not limited to data ownership, confidentiality, and appropriate sharing mechanisms.

Where multiple Tribes have cultural, historic, and/or present affiliations with a location, each must have the opportunity to define their engagement capacity, want, and need. If data is being shared or used to create an agreement, data sovereignty and confidentiality must be discussed and agreed upon before a tribal fisheries agreement can be developed.

GUIDANCE ON AGREEMENT FORMATION

The type of tribal fisheries agreement will vary depending on the goals and preferences of each Tribe and developer. Formal agreements may take the form of a Letter of Intent, Memorandum of Understanding, a financial agreement, a teaming agreement, or another format. It is up to the parties entering into the agreement to determine what structure best meets their needs and capacity.

Not all tribal fisheries-related topics need to be addressed in a single agreement. Multiple agreements or even regional agreements between multiple developers and Tribes may be more appropriate depending on the parties' objectives and the topics covered. Developers and Tribes may also choose to enter into a single agreement that covers tribal fisheries as well as other topics. The process and approach should reflect each Tribe's capacity, resources, and priorities, as well as the uniqueness of each developer and their respective projects.

Importantly, Tribes should not be expected or required to support an offshore wind project, nor should they be asked to forgo participating in any aspect of an offshore wind project's permitting process, as part of entering into a tribal fisheries agreement.

If a Tribe and a developer decide to pursue an agreement, the following guidance can serve as a starting point for those discussions. Tribes and developers are encouraged to adapt and revise the proposed approach to suit their unique context and needs.

PROCESS GUIDANCE, BEST PRACTICES, AND RECOMMENDATIONS FOR CREATING AN AGREEMENT

Specific Communication Protocols for Agreement Development

In addition to the communication protocols outlined in this chapter, and consistent with protocols in the developers' Native American Tribal Communication Plans, these specific additional protocols should be considered for agreement development. To support respectful and effective engagement, Tribes and developers should:

- Follow Tribal Protocols: Each Tribe's preferred modes of communication, timelines, and decision-making structures should be respected.
- Designate Points of Contact: Both parties should identify consistent liaisons to manage communications.
- Maintain Documentation: Both parties should keep accurate, confidential records of meetings, decisions, and agreements-in-principle.
- Respect Confidentiality: Ensure confidentiality clauses are included and honored for sensitive tribal fisheries and offshore wind project-related information.
- Avoid Assumptions: Each Tribe is unique; do not generalize based on previous agreements or engagements.
- Allow Time for Relationship and Trust Building: Recognize that building meaningful relationships and trust requires time, consistency, and patience.
- Avoid Rushing Processes; prioritize respectful engagement over expedited timelines.

Best Practices for Agreement Development

- Respect for Sovereignty: Developers must recognize each Tribe's autonomy, governance structure, and processes.
- Transparency and Mutual Accountability: Establish clear, agreed-upon procedures for communication, data sharing, implementation, and dispute resolution.

- Capacity Support: Developers should consider providing reasonably necessary resources to support Tribal participation in the negotiation process if needed, including technical assistance and legal review.
- Cultural and Subsistence Fishing Recognition: Agreements should acknowledge tribal fishing practices, particularly those with cultural or ceremonial significance.
- Monitoring and Adaptive Management: Depending on the nature of the agreement mechanisms, ongoing evaluation could be included to facilitate adaptation as project impacts, conditions, and scientific understanding evolve.

Recommendations

If a Tribe and developer decide to create an agreement:

- Joint Identification of Goals and Concerns: Collaboratively identify the Tribe's communication preferences and priorities related to tribal fisheries. Understand the importance of sacred marine sites, traditional fishing grounds, and seasonal access patterns.
- Develop an Agreed-Upon Approach: Identify whether and how the Tribe wants to be involved. Develop a shared understanding of activities that are preferred for tribal participation. Specifically, understanding capacity and desire to actively participate in offshore wind projects. Outline the timeline, roles, resources, and deliverables related to the agreement process. Co-design the structure and focus areas of the agreement. Create a plan (if needed) for managing tribal fisheries impacts (how can Tribe be involved on the ground).
- Define Data Governance Early: Clarify how fisheries or cultural data will be collected, used, stored, and shared. Include Tribal review and approval if data is being used.
- Agreement Negotiation and Drafting: Use plain language and avoid legal jargon where possible. Ensure drafts are reviewed through Tribal legal and governance processes. Allow adequate time for internal coordination and in some cases community input.
- Finalization and Implementation: Include procedures for amending the agreement, resolving disputes, and monitoring commitments. As appropriate, ensure any financial or in-kind commitments are clearly defined and enforceable.
- Post-Agreement Collaboration: Establish ongoing communication mechanisms (e.g., annual meetings, joint steering committees). Support capacity building and knowledge sharing that benefits both parties. If necessary, make plans to review the agreement and adjust as needed post-execution.

HOW TO FORMALIZE AND CREATE AN AGREEMENT

The language below is for Tribes and developers to use if they want a starting point for formalizing and creating an agreement. If chosen for use, the language should be changed to best fit the needs of the Tribe.

I. Identify and Describe All Parties

Start by naming all parties involved in the agreement. This might include Tribal governments and developers.

Ex. “This is an agreement between the [Tribe Name], with fishing rights in [region], and [Developer Name], an organization involved in the planning and development of [project name] offshore wind energy project.”

Include a brief description of each party, laying out their roles and interests relevant to the agreement.

II. Define the Purpose and Scope

Clearly articulate the purpose of the agreement. What is it trying to accomplish? Why are the parties coming together to form this agreement?

Define the scope. What issues or activities does the agreement cover (e.g. communication protocols, data sharing, information about fisheries impacts, etc.)?

Include definitions for necessary terms (e.g., tribal fisheries).

III. Providing Background and Context

Include relevant background information about the relationship between the parties, the history of engagement, and the broader context (e.g. tribal fisheries concerns, offshore wind siting, etc.).

This section helps situate the agreement in real-world events or concerns and builds shared understanding.

IV. Include Mutual Understandings or Shared Principles

State any shared values or principles that guide the partnership. These could include, but are not limited to, respect for Tribal sovereignty and knowledge, commitment to good-faith dialogue, and data confidentiality.

This section is useful for grounding the relationship and setting expectations beyond technical tasks.

V. Outline Each Party's Responsibilities

Clearly list what each party has agreed to do under the agreement. Responsibilities could include but are not limited to holding regular meetings, providing timely updates or data, and collaborating on studies or monitoring.

VI. Address Funding or Resource Sharing (If Applicable)

If the agreement includes any financial commitments or resource sharing (e.g. covering travel costs, funding studies, or supporting staff), include those terms here.

VII. Add Any Additional Sections Needed

Include other elements relevant to your situation such as dispute resolution processes, confidentiality clauses, reporting mechanisms, etc.

VIII. Establish the Effective Date and Include Signature Lines

Specify when the agreement goes into effect and for how long. Agreements often include a timeframe with options for renewal, amendment, or termination.

Example: "This Agreement shall be effective upon the signature of authorized representatives from both parties and will remain in effect from [Start Date] to [End Date], unless amended or terminated in writing by mutual consent."

Include signature lines for each party's authorized representative(s), along with the date, if needed.

Annex I: Broader Tribal Concerns About Offshore Wind Energy Development

During the Commission's 2025 consultation and roundtable outreach conducted as part of drafting the Statewide Strategies' tribal fisheries chapter, Tribes raised a range of concerns regarding offshore wind development. While some concerns may not be directly related to tribal fisheries in a narrow sense, they are closely connected to the broader ecological, cultural, and resource systems that support tribal fisheries. Commission staff recognizes that many Tribes see tribal fisheries and the underlying biology as inherently interconnected and cannot truly be separated. We also acknowledge that the concerns described here may be viewed by Tribes as tribal fisheries concerns, even where they extend beyond what may traditionally be categorized as fisheries issues, and that these distinctions are not easily separated.

The development of offshore wind energy projects raises complex and interrelated issues with the potential to affect Tribes. The purpose of documenting these concerns is to support more informed project planning and regulatory review. Developers and the Commission may use this annex to better understand tribal perspectives and to meaningfully consider these concerns in project design, scope, and communications with Tribes.

Impacts to Marine Ecosystems and Species:

- Tribes expressed concern about the reduction of upwelling, which could have repercussions across the marine ecosystem.
- Tribes expressed concerns about impacts from nearshore construction and operations activities to short-lived forage fish, such as surf smelt, which are key species for some Tribes.
- Tribes expressed concern about electromagnetic fields impacting marine organisms. Species like salmon, sturgeon, and eels were of particular concern because they are already vulnerable due to pollution and damming of the rivers.
- Tribes expressed concern about potential disruptions to food security due to ecosystems changes that could affect species such as Albacore and Dungeness crab. Tribes note that disruption of fisheries does not just affect food supply, it also impacts human development, cultural transmission, and intergenerational learning.

Impact of Cables and Infrastructure:

- Tribes expressed concerns about cables emitting heat and electric current even when well-insulated and how this may biologically affect marine species, migration patterns, and species' communication.

- Tribes expressed concerns about how infrastructure will be maintained and replaced. New marine life may colonize, and habitats may form in response to the presence of infrastructure; this will raise the question of whether to disturb or protect the new ecosystem.
- Tribes expressed concerns that the onshore landings of cables and project staging near river mouths and deltas could cause ecological impacts upstream and impact inland Tribes. Tribes stressed the importance of rivers to tribal culture. “The river is a school”—it’s a place where families learn to work together and form identity.
- Tribes expressed concerns that offshore structures may interfere with the natural movement and energy of water. Water is considered alive. Offshore wind development risks disrupting the cultural relationship with water and land.
- Tribes expressed concerns about the ability to monitor impacts and attribute impacts if multiple projects are proceeding simultaneously.

Early and Meaningful Tribal Involvement and Communication:

- Tribes stressed that their involvement must happen early in the planning process, not after projects are underway.
- Tribes expressed that late-stage engagement results in mitigation, rather than prevention or avoidance.
- Tribes expressed interest in learning about alternatives to offshore wind in California.
- Tribes expressed an interest in funding being allocated to support Tribal communication and resource protection. Additionally, Tribes expressed that not supporting a project should not disqualify Tribes from receiving funding or participating in dialogue.
- Tribes explained that the Morro Bay harbor patrol could improve communication surrounding closures to boat launches and the bay bar crossings. It was suggested that more communication and more platforms of communication would be useful.
- Tribes expressed concerns about communications out at sea. Tribal fishermen have limited internet access out at sea and boundaries (e.g., Marine Protected Areas) are hard to access and unclear. There was a question about how limits would be defined and communicated in the offshore environment.
- Tribes expressed concern about the distribution of benefits and community wellbeing. Concern about the creation of “man camps” during offshore wind construction, which could increase sex trafficking and reduce safety in surrounding areas.
- Tribes expressed that their communities want to understand what they receive in return throughout the entire lifecycle of a project, not just during development.

- Tribes expressed concerns about exclusion zones expanding and further reducing Tribal access to coastal and marine areas.
- Tribes expressed the need for transparency regarding the distribution of money, electricity, and benefits from offshore wind development—the process should be public and inclusive.

Glossary

Commercial Fisherman	An individual engaged in the harvest of fish from a commercial fishery.
Commercial Fishery	A group of individuals and businesses that catch, process, and sell fish and yield seafood from a fishery.
Compensatory Mitigation	Financial compensation provided by offshore wind leaseholders to fishermen and fishing communities to compensate for and/or offset the socioeconomic impacts attributable to the construction, operation, and decommissioning of offshore wind projects. Compensatory mitigation may include gear loss/damage compensation, direct compensation to affected fishermen and processors, and fishing community resiliency funding components, and could also include other programs or activities not detailed in this document (e.g., stock enhancement programs).
Compensatory Mitigation Fund	Compensatory mitigation for direct compensation and fishing community resiliency funding.
Cumulative Effect	The incremental effects of an action when added to other past, present, and reasonably foreseeable future impacts.
Data-Limited Fisheries	A fishery for which spatial fishing information is not reported or available to apportion fishery landings and revenue to areas of the ocean with a high degree of confidence. Fisheries with only a fish ticket reported Fishing Block Identifier and no logbook locations of hauls or effort are considered data limited.
Developer	Offshore wind developer / leaseholder
Direct Compensation	Financial compensation provided to an affected fisherman or processor for unavoidable, unrecovered fishery income and losses attributable to an offshore wind project.

Direct Compensation Fund Administrator	An individual or entity contracted to administer direct compensation payments to fishermen and/or processors.
Export Cable	Cable connecting an offshore wind facility to the onshore electrical grid power.
Export Cable Corridor	Area identified for routing the entire length of the onshore and offshore export cables.
Fairway	A lane or corridor in which no artificial island or fixed structure, whether temporary or permanent, will be permitted. Temporary underwater obstacles may be permitted under certain conditions. Aids to navigation approved by USCG may be established in a fairway.
Feasible	Capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors.
Federal Aids to Navigation	Visual references operated and maintained by USCG, including radar transponders, lights, sound signals, buoys, and lighthouses, that support safe maritime navigation.
Fishermen	Commercial and for-hire recreational fishermen licensed to fish in marine waters off California (including State Waters and the EEZ).
Fishery	Both of the following: (a) One or more populations of marine fish or marine plants that may be treated as a unit for purposes of conservation and management and that are identified on the basis of geographical, scientific, technical, recreational, and economic characteristics. (b) Fishing for, harvesting, or catching the populations described in (a).
Fishing Community	A community that is substantially dependent on, or substantially engaged, in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew,

	and United States fish processors that are based in such community (16 USC §1802(17)).
Fishing Community Resiliency Funding	Fishing community resiliency funding is financial compensation provided by an offshore wind leaseholder to assist potentially affected fishing communities in responding and adapting to offshore wind projects to support continued fishing and the vitality and sustainability of fishing communities.
Fixed-Bottom Offshore Wind	A bottom-founded offshore facility permanently attached to the seabed of coastal waters.
Floating Offshore Wind	A buoyant offshore facility, securely and substantially moored or otherwise connected to the seabed of coastal waters, that cannot be moved without substantial effort.
For-Hire Recreational Fishing	Fishing from a vessel carrying a passenger for hire who is engaged in recreational fishing.
Gear Loss / Damage Compensation	Gear loss/damage compensation is financial compensation to reimburse fishermen for gear loss and/or damage resulting from interactions with project vessels/equipment or offshore wind project infrastructure.
Interarray Cable	Cables connecting the wind turbine generators to the electrical service platforms.
Landfall Site	The shoreline landing site at which the offshore cable transitions to onshore.
Offshore Wind Project Area	The offshore wind project area is defined as the wind turbine array within a federally designated lease area and includes any inter-array cabling, offshore wind substations or converter stations, and export cables from the wind turbine array to the landfall site in federal or state waters.
Onshore infrastructure	Cable landing locations, onshore substations, converter stations, onshore interconnection cables, points of interconnection, and operations and management facilities.

Onshore Project Area	The area covered by all inshore project components including landfall sites, the sea-to-shore transition that connects the offshore export cables to the onshore export cables, onshore export cable routes to onshore substations or converter stations, and the connection from the onshore substations or converter stations to the existing grid.
Offshore Wind Leaseholder or **Offshore Wind Developer**	Refers to an individual, corporation, or consortium, holding a lease in a federally designated wind energy lease area off California for the purpose of wind energy extraction and electricity production and export.
Offshore Wind Project Impact Area	The area where fishing effort is likely to be precluded during any stage of offshore wind development. This may be the offshore wind project area plus any additional buffers or areas where it may be reasonably assumed that fishing activities may be precluded. As a result, the offshore wind project impact area may vary by sector (commercial or for-hire recreational), fishery, or gear type.
Private Aids to Navigation	Visual references on structures positioned in or near navigable waters of the United States, including radar transponders, lights, sound signals, buoys, and lighthouses, that support safe maritime navigation; permits for the aids are administered by USCG.
Regional Resiliency Committee (RRC)	A committee to identify funding priorities, solicit proposals, select projects to be funded using fishing community resiliency funds.
Resiliency Administrative Entity (RAE)	An entity for the purpose of managing finances and performing administrative duties associated with fishing community resiliency funding provided by one or more offshore wind leaseholders.
Traditional Knowledge	The non-native definition of TK is “a cumulative body of knowledge, practice and belief evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment” (USFS 2011:1).

Transit Corridors	Lanes or corridors that are not enshrined in law under USCG but are created through "no build" zones between or within wind lease areas described in designation of final lease areas.
Tribal fisheries	Tribal fisheries include commercial, recreational, and subsistence fishing activities conducted by tribes and tribal members. Tribal subsistence fishing is defined as the non-commercial catching or gathering of natural aquatic resources, including fish and shellfish, for consumption by individuals, households, or communities of California Native American Tribes to meet needs for sustenance.
Tribes	All California Native America Tribes, including federally recognized and non-federally recognized tribes.
Wind Energy	Electricity from naturally occurring wind.
Wind Energy Area (WEA)	Areas with significant wind energy potential and defined by the Bureau of Ocean Energy Management (BOEM).

Appendices

Appendix A: Socioeconomic Methodology for Commercial and Recreational Fisheries

Socioeconomic Impact Methodology for Commercial and Recreational Fisheries and Offshore Wind Projects in California

Prepared for

California Coastal Commission

April 2026

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Final

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Abbreviations

CCIEA	California Current Integrated Ecosystem Assessment
CDFW	California Department of Fish and Wildlife
CDP	Census Designated Place
COP	Construction and Operations Plan
CPFV	Commercial Passenger Fishing Vessel
CSVI	Community Social Vulnerability Index
EIS	Environmental Impact Statement
IOPAC	Input Output Model for Pacific Coast Fisheries
MPA	marine protected area
NMFS	National Marine Fisheries Service
OMB	Office of Management and Budget
OSW	offshore wind
PacFEM	Pacific Fishing Effort Mapping Project
PSMFC	Pacific States Marine Fisheries Commission
PV	present value
SB	Senate Bill
SEER	U.S. Offshore Wind Synthesis of Environmental Effects Research
SIA	social impact assessment
VMS	Vessel Monitoring System

Background

This document is a methodology for a comprehensive project-level socioeconomic analysis of direct and indirect impacts to commercial and recreational fishing industries and tribal fisheries. The methodology was developed to support the California Offshore Wind Energy Fisheries Working Group, which has been tasked with developing a Statewide Strategy to address fisheries impacts from offshore wind development. For more information on how this methodology fits within the larger Statewide Strategy, as well is how it relates to the development of compensatory mitigation agreements, please refer to the Statewide Strategy that can be found in Chapter 6. This document only lays out a methodology for commercial and recreational fishing industries; tribal fisheries are addressed in Chapter 7. Please refer to the scope section of the tribal fisheries methodology for more information about this distinction.

Key Terms and Definitions

Offshore wind (OSW) project area: The offshore wind project area is defined as the wind turbine array within a federally designated lease area and any inter-array cabling, offshore wind substations or converter stations, and export cables from the wind turbine array to the landfall site in federal or state waters.

OSW project impact area: Specifically with respect to this methodology, the OSW project impact area is the area where fishery harvesting or transiting activities are likely to be excluded or otherwise impacted during any stage of OSW development. This may be the project area plus any additional buffers or areas where it may be reasonably assumed that fishing activities may be excluded or otherwise impacted. As a result, the OSW project impact area may vary by sector (commercial or for-hire recreational), fishery, or gear type.

Fishermen: Fishermen refers to commercial and for-hire recreational fishermen licensed to fish in state or federal waters off the state of California.

Fishing community: Fishing community refers to a community that is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew, and United States fish processors that are based in such community (16 USC §1802(17)).

Data limited fisheries: Specifically with respect to this methodology, a fishery for which spatial fishing information is not reported or available to apportion fishery landings and revenue to areas of the ocean with a high degree of confidence. A fishery with only a fish ticket reported Fishing Block Identifier and no logbook locations of hauls or effort is considered data limited as are fisheries where data is not available or constrained due to confidentiality restrictions.

Fixed-bottom offshore wind (OSW): A bottom-founded offshore facility permanently attached to the seabed of coastal waters. This term includes platforms, guyed towers, articulated gravity platforms, single- and multi-well caissons, gravel and ice islands, caisson retained islands, sub-sea wells and manifolds, and similar facilities designed for drilling, production, storage, or transportation of oil. (Adapted from Regulation Terminology (30 CFR 553.3) | Bureau of Ocean Energy Management).

Floating offshore wind (OSW): A buoyant offshore facility—securely and substantially moored or otherwise connected to the seabed of coastal waters—that cannot be moved without substantial effort. This term includes tension leg platforms, spars, and similar facilities designed or modified for drilling, production, separation, or storage of oil. These facilities may have semisubmersible or ship-shape hulls. (Adapted from Regulation Terminology (30 CFR 553.3) | Bureau of Ocean Energy Management).

Onshore Project area: Onshore Project components including cable landing locations, onshore export cable corridors, onshore substations and/or converter stations, and O&M facility (Adapted from Atlantic South Shores Appendix K).

Socioeconomic Impact Methodology Overview and Outline

Overview

The methodology supports the comprehensive evaluation of socioeconomic impacts of a proposed OSW project, including economic, social, and community impacts, including any potential non-additive cumulative impacts relative to status quo fishery conditions (i.e., without the proposed OSW project). It is expected that impacts evaluated here constitute unavoidable impacts, or impacts remaining after all avoidance, minimization, and mitigation measures for the project are implemented. Impacts considered in the socioeconomic analysis should be considered reasonably foreseeable, including those that are described within a project's COP and EIS.

The methodology consists of three primary components, which are laid out as steps. The goal of Step 1 is to provide a big picture estimate of the unavoidable impacts of the project to commercial, for-hire, and shoreside fishing businesses over the lifetime of the project. Depending on the method used, the results of this step may provide an indicator of the level of fishing income impacts related to the project but may overestimate those impacts, depending on its ability to directly incorporate assumptions about changes in fishing behavior. Subsequent analyses may support the evaluation of the assumptions of that analysis and support understanding of where and by whom impacts may be experienced. Specifically, Step 2 recommends available indicators of dependence and vulnerability of fishing fleets and fishing communities to help contextualize these impacts and better understand the likelihood and magnitude of impacts. In Step 3, other gaps or sources of uncertainty may be further explored, as appropriate, including vessel traffic impacts, non-additive cumulative impacts, other social or economic impacts, or limitations of the analyses to predict impacts due to management, stock, or climate effects. Step 3 analyses can be used to qualitatively refine the estimates from Step 1 and understand the distribution of those impacts across and within fishing fleets and shoreside interests. As with the previous steps, the focus of Step 3 analyses should be limited to reasonably foreseeable impacts determined through analysis of best available information. While these steps are laid out sequentially based on their ability to build on one another, the goal is for all steps to cumulatively provide a comprehensive evaluation of impacts. It is expected that existing information and analysis will be utilized whenever appropriate, including but not limited to relevant analyses in the EIS.

Applying this methodology, *Step 1 Income Impacts* will yield quantitative end estimates or indicators of the dollar value of impacts (Table 1), while *Step 2 Dependence and Vulnerability,* will utilize quantitative analyses but will not generate dollar value estimates of impacts. Most analyses in *Step 3 Other Socioeconomic Impacts* have been grouped together because the evaluations of other impacts not covered by the prior two steps will likely entail a qualitative discussion of the likely magnitude and direction of such impacts (see Table 2 below) where appropriate and available. As in Step 2, Step 3 is unlikely to result in dollar value estimates of impacts. As a result, steps are generally ordered by their expected ability to produce quantitative outputs—in particular, dollar value outputs. It is

expected that any dollar value output generated in Step 1 would be considered in light of its assumptions and sources of uncertainty and the results of the analyses in Steps 2 and 3 may be used to help support evaluation of if and how Step 1 estimates may overestimate or underestimate impacts. Together, all steps should provide a comprehensive picture of the OSW project's socioeconomic impacts on fisheries.

Table 1. Major Methodological Steps, Analysis and Impact Type, and Ability to Produce Dollar Impact Values.

Step	Analysis Type	Impact Type	Able to generate impacts in terms of dollars?
Step 1: Income Impacts	Quantitative	Quantitative (dollars of income impacted or revenue exposed)	Yes
Step 2: Dependence and Vulnerability	Quantitative	Quantitative (proportion of total revenue coming from OSW area; measures of vulnerability)	No
Step 3: Other Socioeconomic Impact Considerations	Quantitative or Qualitative	Qualitative Impact Factor Descriptions	No*

*Notes: *an exception is in Step 3b where a quantitative measure of the dollar value fuel impacts to vessels transiting through (but not fishing in) the OSW project area may be created.*

Qualitative impact factor descriptions provide information about the type, magnitude, and direction of impacts, as opposed to the quantity or numerical measurements of impacts. Qualitative impact descriptions evaluate reasonably foreseeable impacts of the proposed project, including the likelihood of impact, and provide an indication of the impact type (direct or indirect[1]), and the magnitude, scale, and direction of impacts (examples provided in Table 2) as well as whether the impacts will be short term (e.g., immediate but temporary) or long term (either occur later in time or will occur over an extended period of time including after the project's completion). In addition, any uncertainty about the impact should be described as applicable using a range (e.g., in magnitude, scale, direction, or duration) and may be provided under best case or worse case scenarios (e.g., neutral to low positive impacts).

Table 2. Example Qualitative Impact Factor Descriptions and Examples

Impact Type	Magnitude	Direction	Duration	Scale (size of geographic area affected)	Likelihood
Direct	Negligible	Positive	Short Term	Localized	Very Unlikely
Indirect	Slight	Neutral	Medium Term	Broad	Unlikely
-	Low	Negative	Long Term	-	Likely
-	Moderate	-	Irreversible	-	Very Likely
-	High	-	-	-	-

[1] This methodology adopts the same definition of direct and indirect effects as used by the National Environmental Policy Act (NEPA) where direct effects are immediate effects in place and time and indirect effects occur later in time or farther away but are reasonably foreseeable (40 CFR § 1508.1(i))

Outline

1. **Step 1: Income Impacts Analysis**
    a. Determine Approach
    b. If Using a Revenue Exposure Approach:
        i. Develop Annualized Baseline Estimate
        ii. Make Adjustments for Data Limited Fisheries
        iii. Apply Shoreside Multipliers
        iv. Estimate Total Over Lifetime of Project
2. **Step 2: Assess Dependence and Vulnerability**
    a. Assess Dependence of Fishing Fleets
    b. Assess Fishing Community Dependence and Vulnerability
    c. Summarize Results
3. **Step 3: Other Socioeconomic Impact Considerations**
    a. Vessel Traffic and Rerouting Analysis
    b. Other Economic Impact Considerations
    c. Other Social and Community Impact Considerations
    d. Cumulative Impacts
    e. Future Stock, Management, and Climate Considerations
4. **Appendices:**
    a. Impact Studies, Tools, and Data for Consideration
    b. Information and Data for Evaluation of Fisheries Impacts
    c. Guidance For Step 1: Income Impacts Analysis
    d. Guidance For Step 2: Dependence and Vulnerability
    e. Guidance For Step 3: Other Socioeconomic Impact Considerations

Step 1: Income Impacts Analysis

Overview

The goal of Step 1 is to evaluate the effects of the proposed project on the income of commercial and for-hire fishing businesses and downstream and upstream shoreside businesses that may also be affected by disruptions to fisheries operations. The end of this step should yield a quantitative estimate of the fishing income likely to be lost due to the OSW project (Table 1). If methods are not available to estimate or predict such impacts[2], a revenue exposure method may be utilized as an indicator of potential fishing income impacts. This methodology provides guidance specific to using a revenue exposure approach because it is both the most widely used in similar applications and the most feasible analysis to conduct with available fishery data, however, it may overestimate fishing income impacts. As noted previously, revenue exposure assumes complete cessation of fishing trips that coincide with the OSW project impact area and fishing income impacts will be less than revenue exposure to the extent that operators will instead shift their effort into other areas or into other fisheries (King 2019) or continue to fish in the project impact area. *Appendix A3. Guidance for Step 1: Income Impacts Analysis* provides more information about this method and its limitations. Depending on the method used, additional detail or analysis may be warranted to explore assumptions (including any assumed exclusion and ability to recoup lost revenue), limitations (including the ability to forecast impacts under future conditions), and sources of uncertainty and describe the likelihood or magnitude of other economic impacts of interest (such as fishing congestion outside the project area or fuel costs to vessels transiting through the area) or impacts to fisheries within ports and harbors. These considerations may be described in Steps 2 and 3 (see *Appendix A4. Guidance for Step 2: Dependence and Vulnerability* and *Appendix A5. Guidance for Step 3: Other Socioeconomic* for more information).

1a. Determine Approach

Select an approach to evaluate direct fishing income impacts for commercial and for-hire fisheries and associated shoreside businesses based on available data and tools (see *Appendix A1. Impact Studies, Tools, and Data for Consideration* and *Appendix A3. Guidance for Step 1: Income Impacts Analysis)*. The approach used should ideally be able to forecast direct income impacts resulting from the OSW project.[3] The most substantial effect of OSW development on fishing will likely arise from the displacement of effort from the OSW development area and the success of fishermen in recouping

[2] Such as a fishery location choice model that can evaluate where fishing effort would occur to the extent it is displaced from the OSW project areas.

[3]Here, income is fisheries income for those who own or are employed by commercial or for-hire fisheries or associated industries. Typically, income is represented by wages and salaries; however, particularly in a commercial fisheries context, income from fishing for owners or crew may be a share of revenue less expenses.

lost catches from alternate fishing locations. The best estimates of direct income impacts will evaluate fishermen's likely responses to the OSW development under future conditions. Specifically, such a method would evaluate the probability that fishermen can shift their effort into alternate fishing areas and evaluate the likely consequences to fishing income as a result.[4] Given such approaches may not be readily available, a revenue exposure method may be used as an indicator of potential income impacts (See *Appendix A3. Guidance for Step 1: Income Impacts Analysis* for more information). However, because revenue exposure assumes complete cessation of fishing trips that coincide with the OSW project impact area (as defined in *A2. Information and Data for Evaluation of Fisheries Impacts*), fishing income impacts will be less than revenue exposure to the extent that operators will instead shift their effort into other areas or into other fisheries (King 2019) or otherwise continue to operate within the area. Evaluation of the likelihood and consequences for ultimate income impacts resulting from these assumptions may be further explored in Step 2 and Step 3.

1b. Develop Annualized Baseline Estimate

Steps 1b–1e all assume a revenue exposure approach. Use available data and tools (see *Appendix A1. Impact Studies, Tools, and Data for Consideration)* to develop a baseline exposure estimate for the **OSW project impact area**[5] using the most recent available fishery data (ideally the last 5-10 years,[6] see *Appendix A2. Information and Data for Evaluation of Fisheries*). This estimate can be adjusted in later steps to account for any gaps in available fishery data for any given fishery (i.e., data limited fisheries).

1c. Make Adjustments for Data Limited Fisheries

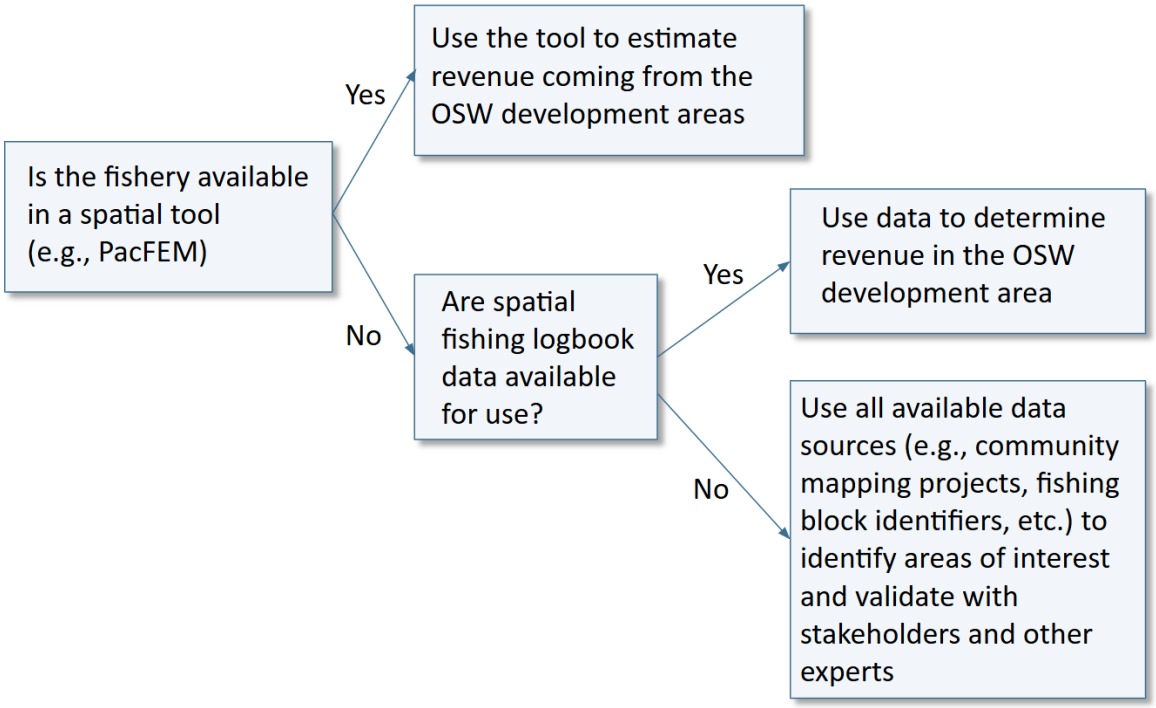
Identify the extent to which any fishery is underrepresented or not represented in the baseline estimate. Use any available studies and other sources of information to best fill gaps to provide estimates of revenue exposed in the OSW project impact area for such data limited fisheries (see Figure 1).

[4] e.g., fishery participation and location choice models, like Kirkpatrick et al. 2017

[5] The offshore wind project impact area is the area where fishing effort is likely to be excluded during any stage of OSW development. This may be the project area plus any additional buffers or areas where it may be reasonably assumed that fishing activities may be excluded. As a result, the OSW project impact area may vary by sector (commercial or for-hire recreational), fishery, or gear type.

[6] Or another baseline period if advised by CDFW or NMFS. It may be important to consider alternate baseline periods if the most recent data are likely to not be representative of future fishing effort and revenue exposed in the OSW project impact area. For example, if there have been fishery closures or anomalous market conditions (e.g., as occurred during the COVID-19 pandemic).

Figure 1. Revenue Exposure Method Decision Tree



1d. Apply Shoreside Multipliers

Once an adjusted baseline estimate of revenue exposure has been generated, apply best available multipliers to account for upstream and downstream economic impacts to shoreside businesses that may lose business sales due to lost or displaced fishing effort. As is recommended by BOEM (2025), this methodology recommends using Type I economic output (business sales) multipliers[7] (which include direct and indirect effects[8]).

1e. Estimate Total Over Lifetime of Project

Using information on the expected duration of impacts including any adjustment over time (see *Appendix A2. Information and Data for Evaluation of Fisheries Impacts*), use the adjusted annual estimate to at-sea and shoreside businesses to generate a total lifetime revenue exposure estimate

[7] As defined by IMPLAN: https://blog.implan.com/understanding-implan-multipliers

[8] As defined in Leonard and Watson (2011) direct, indirect, and induced effects are the following:

1. Direct effect refers to the production change associated with a variation in final demand for the good itself. It is the initial activity that occurs in the economy.
2. Indirect effect refers to secondary activity caused by changing input needs of directly affected industries (e.g., additional input purchases to produce additional output).
3. Induced effect is caused by changes in household spending due to additional employment generated by direct and indirect effects.

over the course of the project. This is the sum of estimated revenue exposure during construction, operations, and decommissioning.

In this step, describe major assumptions and sources of uncertainty underlying the estimate, including, but not limited to, the ability of the analysis to evaluate and account for likely shifts in fishing effort and exposure under future management or stock conditions. Any major assumptions or sources of uncertainty may be further explored in subsequent steps.

Step 2: Assess Dependence and Vulnerability

Overview

The goal of Step 2 is to provide additional analysis that can further describe the impacts of the proposed project on various fishing fleets and broader fishing communities by assessing the dependence of various fishing fleets on the OSW project impact areas and, in the case of fishing communities, the fishery dependence and vulnerability of those communities. These assessments can be used to qualify the findings from Step 1. For example, fishing fleets and communities that are more dependent on the OSW project impact area may be more likely to experience negative impacts than those that are not, as they may be less able to shift into alternate fishing areas or into other fisheries (Warlick et al. 2025). Conversely, fishing fleets that are less dependent may also be more likely to recoup lost fishing income from other areas. These considerations may lead the analyst to suggest the degree to which Step 1 estimates might overestimate or underestimate the revenue impacts of displacement. In addition, fishing communities that are considered vulnerable prior to the OSW development may also have a harder time recovering from any OSW project impacts. In this framework, fishing communities that are more dependent and more vulnerable are considered to have a higher risk of experiencing negative impacts and potentially may be less able to absorb and recover from (i.e., be resilient to) impacts than others. While this step will produce quantitative results and indicators of dependence and vulnerability, this step is intended to inform the results of Step 1 qualitatively (see Table 1), to better contextualize where and by whom impacts may be felt.

2a. Assess Dependence of Fishing Fleets

Calculations of the dependence of individual fishing fleets examine the proportion of effort, landings, and revenue for a given fishery management or gear group that may be affected by the OSW project (see *Appendix A4. Guidance for Step 2: Dependence and Vulnerability*). Fishing fleets that are more dependent on the OSW project impact area may be more likely to experience negative impacts than those that are not, as a higher proportion of their operations fall in the development areas, as a result they may be less able to shift into alternate fishing areas or into other fisheries to compensate for lost income.

Calculating the dependence of a given fleet requires the same data needed to evaluate revenue exposure (e.g., revenue by fishery falling within the OSW project impact area) for the fishing fleet as a whole—including recent revenue, landings, and effort associated with the OSW project impact areas and across all areas. The OSW project impact areas are defined in *Appendix A2. Information and Data for Evaluation of Fisheries Impacts*.

2b. Assess Fishing Community Dependence and Vulnerability

Assessing the dependence of individual fishing communities requires examining the proportion of individual fishing ports' landings and revenue that may be affected by OSW projects. Fishing communities that are more dependent on the OSW area may be more likely to experience negative impacts than ones that are not. Community dependence on OSW project impact areas is the proportion of total effort, landings, and revenue in that community that are exposed (in the OSW project impact areas as defined in *Appendix A2. Information and Data for Evaluation of Fisheries Impacts*).

A potential tool for supporting the community vulnerability assessment uses observable characteristics of communities to produce a quantitative indicator of the likelihood of a community will experience negative impacts and its capability of withstanding and recovering from those impacts (i.e., how resilient that community is). NMFS' Community Social Vulnerability Index (CSVI) is a set of indicators that are annually produced at the Census Designated Place (CDP) level and may be helpful for describing fishing community vulnerability.

2c. Summarize Results

Summarize results of the above analyses in a tabular format (see example below in Table 3). Create rows for each of the affected fishing fleets and communities. Note that the CSVI only currently exists for communities. For communities, negative impacts may be more likely to occur if the community is more dependent on the affected fisheries and is socially vulnerable to changes. Low dependence but high vulnerability may also be noteworthy for evaluating potential impacts. Here, any limitations of the analysis, including data that may be underrepresented or unable to be shown due to confidentiality constraints, should be noted. It should be noted that these indicators, while useful, may not fully capture the vulnerability of a given fishing community/ fleet or impacts associated with the proposed project. In particular, the CSVI relies on Census Bureau data at the CDP level, which includes all residents regardless of their involvement in commercial or recreational fishing industries. Assumptions and limitations of this or any other approaches used should be described and may be further explored in Step 3.

Table 3. Example Step 2 Results Table

Unit	Results by Analysis or Index: OSW Area Dependence	Results by Analysis or Index: Social Vulnerability
Fishing Fleets	%	NA
Communities	%	Low to High

Step 3: Other Socioeconomic Impact Considerations

Overview

The first two steps of the methodology focus on generally replicable, accessible, and quantitative analyses that are recommended for the evaluation of important socioeconomic fishery impacts. However, these analyses may not be comprehensive of all economic, social, and community impacts and furthermore, depending on the methods used, there may be other impacts or important sources of uncertainty for which additional analyses may be helpful to contextualize their likelihood and magnitude. The goal of Step 3 is to build off the prior steps and fill any gaps and explore any major sources of uncertainty. If the analysis in Steps 1 or 2 cover the issues described below, additional analyses in Step 3 may not be necessary. This step summarizes five categories where additional impact considerations may be described quantitatively or qualitatively to support comprehensive evaluation of the likelihood and magnitude of direct and indirect impacts to fisheries (see *Appendix A5. Guidance for Step 3: Other Socioeconomic Impact Considerations)*. The focus of these analyses should be reasonably foreseeable impacts determined through analysis of best available information (See *Appendix A1. Impact Studies, Tools, and Data for Consideration)*.

3a. Vessel Traffic and Rerouting Analysis

A supplementary evaluation of any fishing vessel traffic (congestion or compaction) or rerouting issues due to the OSW project may be informative if an assessment of revenue exposure is used in Step 1 and such impacts are not directly incorporated into the analysis. New structures and lines in the water may result in less navigable space and harvest grounds for fishing vessels and other vessel types, which may require rerouting for vessels that transit through the area to reach fishing grounds if there is any exclusion from the OSW project impact area for any length of time.

3b. Other Economic Impact Considerations

This section supports a qualitative description of any other reasonably foreseeable economic impacts resulting from the OSW project not addressed or fully explored by prior analyses, so as to produce a complete and thorough evaluation of all relevant economic impacts on fisheries. Other areas of economic impacts may include impacts to fuel or operating expenditures for vessels that fish or transit through the OSW project impact area,[9] cost of insurance related to increased safety and navigation risks, and business support related to supply chains and markets (including impacts on seafood dealers, processors and other fishery support businesses not captured by prior analyses).

[9] Note that if revenue exposure is used in Step 1, it would not be appropriate to add quantitative dollar estimates of fuel costs to vessels fishing in the OSW project impact area to revenue exposure estimates, since revenue exposure assumes a complete cessation of affected fishing trips. However, impacts to vessels transiting, but not fishing, through the OSW project impact area may be considered and it may be appropriate to estimate fuel costs impacts to the extent these impacts are not estimated under Step 1.

Other impacts that could be described, if determined to be reasonably foreseeable and attributable to the project and not covered by prior analysis, may include but are not limited to, impacts to asset value and capital stranding risks [10]; impacts to employment; or impacts to product quality.

Assessment of impacts in this step should build off the prior analyses in Step 1 and Step 2 and focus on any uncertainties or limitations of these analyses and avoid double-counting of impacts.

3c. Other Social and Community Impact Considerations

There may be social and community impacts resulting from the proposed project not covered by prior steps. The purpose of this section is to evaluate other fishery social and community impacts resulting from the project not otherwise discussed or captured through prior analyses. It is recommended that such impacts be explored using NMFS' social impact factors see *Appendix A2. Information and Data for Evaluation of Fisheries* for more information). Where practicable, present a qualitative evaluation of the likelihood and magnitude of OSW project impacts on each social impact factor (Table 2).

3d. Cumulative Impacts

In addition to impacts stemming from the proposed project, it may be important to identify any important cumulative impacts of the project considering other planned or in-progress offshore development activities in California or neighboring states (e.g., other OSW projects or other energy projects). The purpose of this analysis is to identify any non-additive effects of the project when considering other reasonably foreseeable changes, specifically with respect to OSW projects. This is because the analysis will use baseline information and consider impacts of the proposed project, but the baseline data will not include effects or changes due to other planned, but not completed, OSW projects.[11] The goal is not to double-count any impacts that have been previously considered or will be considered under future projects, but to identify if any impacts identified in prior steps of the analysis would be greater in light of other proposed projects that will not be considered through the evaluation of impacts by those projects. Similar to previous steps, this should evaluate qualitative impacts across fisheries (by management group, target species, and gear type, see Table 2 for a description of qualitative impact factors).

3e. Future Stock, Management, and Climate Considerations

Reasonably foreseeable fisheries management actions, market conditions, stock assessments, or other ocean management actions may all be analyzed here if not incorporated in other steps (per BOEM 2025). This information may be helpful for at a minimum qualitatively evaluating factors that may exacerbate or alleviate impacts on fisheries in the future.

[10] For example, fishing capital vulnerability indicators and analysis of capital stranding risk in Calhoun and Scheld (2024)
[11] Here, it is recommended that all projects with a COP are considered as planned projects.

Wrapping Up the Analysis

Applications of this methodology should consist of a comprehensive assessment of the unavoidable socioeconomic impacts of the proposed OSW project. At the completion of all analyses, major findings should be summarized. The summary should focus on final income impact analysis numbers and a summary of major assumptions or limitations from Step 1; results of the Dependence and Vulnerability analyses in Step 2; and major findings of Step 3, with a conclusion about the overall likelihood and magnitude of various economic, social, and community impacts.

Appendices

A1. Impact Studies, Tools, and Data for Consideration

For all subsequent steps of the methodology, it is important to have compiled the most relevant and up-to-date information available for informing analysis. It is not expected that new data collection will be conducted to support any step. Primary sources of information used throughout the methodology should be project specific, if practicable (such as information contained in the Construction and Operations Plan [COP] or Environmental Impact Statement [EIS]). Additional information and data to support evaluations can be sourced from a wide variety of sources including white and grey literature (including state and federal government reports), stakeholder letters, federal or state databases, and the academic literature. This ensures that the best available and most up to date information is used for analysis. It is not expected that primary data collection efforts will be undertaken to support the evaluation of impacts. Here, we briefly summarize the major categories of information or resources that may be compiled: 1) impact studies and information and 2) tools and data. Other more specific resources or tools are described in the steps where they will be used. It should be noted that this list of resources is not exhaustive and other information sources may be used as appropriate.

a1.1 Impact Studies and Information

It is important to survey the literature and available reports on the impacts of the project or similar projects in and outside of California as well as any studies or reports gathering information on fishery stakeholder perceptions of impacts, particularly any literature and available reports on the area and fishing fleets. Such evaluations may be important to developing analyses. Information and analyses contained in the COP or EIS for the project may be incorporated directly or referenced throughout all steps of the methodology, as relevant. It also will be important to identify if any specific studies have been conducted that would have bearing on the project. Such studies could include surveys of spatial locations of for-hire fishing effort in proposed wind energy lease areas (e.g., WHOI 2023), or studies examining specific impacts on fisheries resulting from similar technologies in California or elsewhere (e.g., DePiper et al. 2025; Kirkpatrick et al. 2017; Scheld et al. 2022; Szostek et al. 2025; Shimada et al. 2022), such as exclusion from project areas (e.g. marine protected area [MPA] or other fish grounds closure studies, e.g., Püts et al. 2023) or insurance impacts. Other studies could be considered that have examined socioeconomic impacts on fisheries from OSW projects generally (e.g., Chaji and Werner 2023; Willis-Norton et al. 2024) or specific examination of those impacts on the West Coast (e.g., Feist et al. 2025) or California (e.g., BOEM 2024). The U.S. Offshore Wind Synthesis of Environmental Effects Research (SEER)[12] effort provides an overview of environmental effects, key issues, and future research needs. Such studies may be used to identify other data

[12] https://tethys.pnnl.gov/us-offshore-wind-synthesis-environmental-effects-research-seer

resources that may be directly used to develop economic exposure estimates or may be used to justify methodological considerations, such as the area or duration of impacts during different OSW phases.

Qualitative studies including those that look at fishery stakeholder concerns (e.g., Emery 2020; ten Brink and Dalton 2018; Hooper, Ashley, and Austen 2015; Mackinson et al. 2006), or realized impacts (e.g., Gray, Stromberg, and Rodmell 2016) should also be considered as sources of information about impacts or potential impacts of the proposed project.

a1.2 Tools and Data

While it is important to understand broadly what information and studies have been conducted to better understand impacts relevant to the project, it may also be important to compile data and potential tools that may assist with the impact analyses.

At the time that this methodology was prepared in 2025, state and federal agencies were in the process of developing tools and data products to be used to evaluate impacts of floating OSW projects on the West Coast. This methodology uses information about these in-progress tools and data products as a starting point, but recommends users coordinate and communicate early on in the process with relevant agencies, primarily the National Marine Fisheries Service (NMFS) and California Department of Fish and Wildlife (CDFW) on the status of publicly available tools and data summaries and the coverage across relevant fisheries.

If multiple data sources and tools are available, users should prioritize tools that are up to date and/or comprehensive of all impacted fisheries and areas as well as tools that have been peer-reviewed or are actively used to support fisheries management decisions. It may be important to coordinate with NMFS and CDFW to identify the best tools, research, and data for various fisheries.

Table 4 provides a non-exhaustive summary of some data and information resources available for use at the time this methodology was prepared. In addition, it is worth noting that there are resources that are being developed concurrently with this methodology as part of the statewide strategy that may provide additional guidance or information, specifically in the other chapters.

Table 4. Potential Information, Databases, and Tools

Data Product, Tool, or Resource	Agency or Organization	Status/details	Description of data/information
California Fishing Communities Website	Various	Fishingcommunities.net	California port profiles that include summary of history, port governance and infrastructure, commercial and recreational fisheries profiles, current issues affecting fisheries, and social and environmental vulnerability
PacFEM	NMFS	In progress. Some details available here: *https://geo.psmfc.org/portal/apps/storymaps/stories/7bc1a025e2fd43e49efb011cd15e1d4e*	An integrated spatial fisheries data tool to support analyses of various ocean activities.

Data Product, Tool, or Resource	Agency or Organization	Status/details	Description of data/information
California Marine Fisheries Data Explorer	California Department of Fish and Wildlife	*https://wildlife.ca.gov/Conservation/Marine/Data-Management-Research/MFDE*	Explore reviewed and summarized California commercial landings data
RecFIN	Pacific States Marine Fisheries Commission (PSMFC)	*https://www.recfin.org/*	Centralized database to support federal and state management of recreational fisheries. Contains data on effort, landings, and trips for private and for-hire recreational fisheries by port and region.
IOPAC	NMFS	*https://repository.library.noaa.gov/view/noaa/8718/noaa_8718_DS1.pdf*	Input-Output economic model of west coast fisheries to estimate gross changes in contributions and impacts from policy changes.
Community Social Vulnerability Indicators (CSVI)	NMFS	https://www.integratedecosystemassessment.noaa.gov/regions/california-current	Indicators of engagement and vulnerability for west coast fishing communities updated annually for the California Current Integrated Ecosystem assessment (CCIEA) Source information: Jepson and Colburn 2013
Fishing Community Resilience and Social Cohesion	Institute of Marine Sciences	Pomeroy and McCaw (2025)	Outline of key concepts and considerations related to interactions and impacts of OSW on California fishing community resilience including examples of community-led and co-led efforts working towards social cohesion, adaptive capacity, and resilience.
Northern CA Commercial Fishermen's Associations Community-Mapped Fishing Grounds	Humboldt Fishermen's Marketing Association	*https://caoffshorewind.databasin.org/datasets/11d66ff9ae524ef49313759ddc525964/*	Community-based map of species, gear type, and fishing grounds on the Northern California Coast. Data are the result of a collaborative effort by three Northern California Commercial Fishermen's Associations to map community fishing grounds by species/species complex, gear type, depth, seafloor substrate, and season.
Central Coast Fisheries Heritage Mapping Project	Morro Bay Commercial Fishermen's Association	*https://caoffshorewind.databasin.org/datasets/7ea9f5e0e5c149ef9c5286b39c4753d2/*	Community-based map of commercial fishing grounds in central California (Point Sur to Point Conception). Data are the result of a collaborative effort led by the Morro Bay Commercial Fishermen's Organization, involving fishermen from San Diego to Santa Cruz, to map commercial fishing grounds.
California Offshore Wind Energy Gateway	Conservation Biology Institute	*https://caoffshorewind.databasin.org/about/*	Open access Database of thousands of biological, physical, and socio-economic datasets.
California North Coast Offshore Wind Studies: Stakeholder Benefits and Concerns	Humboldt State University	*https://schatzcenter.org/pubs/2020-OSW-R21.pdf*	Study on stakeholder benefits and concerns focused on Humboldt County, CA
Marine Region GIS	CDFW	*https://wildlife.ca.gov/Conservation/Marine/GIS*	A catalogue of spatial data and interactive map within CDFW's Biogeographic Information and Observation System (BIOS)
Letter of impacts from commercial fishing organizations	Various	Sent to California Coastal Commission, State lands Commission, and California Energy Commission in February 2022	Letter describing a fishing community benefit agreement template supported by various commercial fishing organizations. As an attachment to this template, a list of impacts identified by fishermen is also provided. The list of impacts can be found here: *https://documents.coastal.ca.gov/assets/upcoming-projects/offshore-wind/Th4/Th4-Scheiblauer.pdf*

Data Product, Tool, or Resource	Agency or Organization	Status/details	Description of data/information
Programmatic Environmental Impact Statement (PEIS)	BOEM	In progress. More details available here: *California Offshore Wind Programmatic Environmental Impact Statement | Bureau of Ocean Energy Management*	The PEIS assesses the potential biological, socioeconomic, physical, and cultural impacts that could result from floating offshore wind energy development. The purpose is to identify and analyze potential mitigation measures that BOEM can, but may not necessarily, require as conditions of approval for future COPs or that lessees can incorporate directly into their COPs. BOEM will conduct subsequent site-specific National Environmental Policy Act (NEPA) analyses and consultations for individual proposed wind energy projects that focus on the impacts of approving a particular COP, including identification of mitigation measures that are best suited for that project.

A2. Information and Data for Evaluation of Fisheries Impacts

To determine which fisheries and fishing communities may be affected by the OSW project, it is important to use the data and information identified with information specific to the project to characterize potentially impacted fisheries and fishing communities. Information provided in the COP, EIS, or Preliminary EIS (PEIS) may be used as the foundation of the analysis. The goal is to characterize trends and historical information about potentially affected fisheries (commercial and for-hire) and fishing communities to aid in the identification of impacts.

a2.1 Describe project, determine impact areas and duration of impacts by fishery or gear type

Describe the project including OSW project areas and duration of project phases and any avoidance, minimization, and mitigation measures related to fisheries impacts. This should include information from the COP that describes the expected duration of different project phases (construction, operations, and decommissioning), as well as maps of project areas, and landfall locations. Maps should detail the full spatial footprint of the proposed project in the lease area, cable corridors, and onshore project areas. Details about the technology used, configuration of cables, and depth of floating and buried components should also be identified. Given construction may have an indeterminate timeline due to supply chain constraints, permitting, deployment, weather, and other factors, describe a conservatively long construction timeline (i.e., account for possible delays) and explicitly explain this period.

This step should also characterize the project across the lease area, export cable corridor, and onshore project area locations.

To set up analyses, make a determination about the OSW project **impact area**, by fishery or gear type, if warranted, which should include any additional areas beyond the project's footprint (such as 'buffers' around turbines, the lease area, or the export cable corridor). Buffers may be used to fully account for the likely area of displacement during any project phase (construction, operations, and decommissioning), which may practically extend beyond the footprint of the project. A determination about buffers should be made based on the area that can be reasonably assumed to be unavailable to

fishing by fishery and gear type. At the time this methodology was drafted, floating offshore wind technology was relatively new and understanding about if and how fishery operations may fish within or around turbines was limited. Because of this, it is recommended that any analysis should clearly document supporting evidence about the ability for harvesters to operate within the OSW project sea during any project phase, by fishery and gear type, to justify any assumptions made about the extent that fishing operations will be excluded from the project area during construction, operations, or decommissioning. Should studies about the specific impacts of floating OSW operations to fishery operations be conducted, those studies should be considered when describing the OSW project area and duration of impacts. If the EIS is available, these documents may also provide information on the expected impacts during operations on individual fisheries. If considerable uncertainty exists about the potential extent of exclusion, the analysis should make conservative assumptions. The methodology recommends that estimates regarding anticipated exclusion of fisheries or gear types from portions or phases of the project should include a clear presentation of assumptions and associated uncertainties. The analysis should also consider adding buffers around both the export cable corridor and lease area to capture the likely area of displacement from fishing operations during specific project phases. The analysis may specify different buffers for different structures (i.e., turbines, anchorings, interarray cables, transmission cables).

It may be justifiable to assume that fishing businesses and operators will adjust to the loss of fishing ground over time by shifting effort into other areas and/or into other fisheries (as is advised in BOEM 2025), which should be considered in determining the duration of impacts, especially during operations.

Table 5. Example Impact Area and Duration Table by Fishery

Impact Area	Project Phase	Sector	Fishery/Gear Type	Impact Area (if different from project area)	Duration of Impacts (if different from COP)
Lease Area	Construction	Commercial	Trawl		
Export Cable Corridor	Construction				
Lease Area	Operations				
Export Cable Corridor	Operations				
Lease Area	Decommissioning				
Export Cable Corridor	Decommissioning				

a2.2 Baseline conditions of potentially affected fisheries and fishing communities

Baseline evaluation of affected fisheries and fishing communities is helpful for understanding what conditions may be like without the proposed project (i.e., status quo) and are useful to support both quantitative (numerical) and qualitative (descriptive) evaluations of project impacts. Using tools and data identified in *Appendix A1. Impact Studies, Tools, and Data for Consideration*, characterize the fisheries and sectors potentially affected by the OSW project by describing recent historical trends in

participation, landings, revenue, and fishing communities. Ideally, this will focus on fisheries and communities affected by the project and not the larger Wind Energy Area (WEA) or larger fishery management areas that overlap with the project, though if information specific to the project is not available, studies or information from broader areas may prove the best source for assessing impacts.

California's master plan for fisheries under the Marine Life Management Act (CDFW 2018) specifies nine basic types of socioeconomic information to support the evaluation and understanding of direct and indirect impacts of fishery management measures which may be considered here. These information types are:

- **Demographics:** Data relating to a population and groups that comprise it.
- **Practices:** Where, when, and how fishermen participate in fisheries and fishery-related activities.
- **Motivations:** Why people do the things they do.
- **Institutions:** The norms, rules, and strategies that govern peoples' behavior.
- **Relationships:** The social and economic connections among people.
- **Capital:** The natural, human, physical, and financial resources needed and used by participants.
- **Employment:** Jobs in fishing, seafood production, and supporting infrastructure.
- **Expenditures:** Amounts paid by participants for goods and services to participate in the fishery.
- **Revenue:** Payments received for fish landed, handled, processed, and sold.

This is not an evaluation of impacts of the proposed project but rather provides recent historical contextual information about the fisheries and fishing communities that are expected to be affected and provides a description of baseline conditions. This should utilize the most recent data available, the most recent 5 to 15 years of data may be ideal, but in some cases it may be desirable to characterize a longer time series to capture trends.

A summary of relevant economic and social information to consider is provided below (Table 6). Social and community information recommended to be considered includes relevant information per the California master plan for fisheries (above), as well as the five social impact factors described in NMFS' Policy Directive for conducting social impact assessments (SIA) (NMFS 2007) and summarized below:

1. Size and Demographic Characteristics of the fishery-related workforce residing in the area; these determine demographic, income, and employment effects in relation to the workforce as a whole, by community and region.

2. The Attitudes, Beliefs, and Values of fishermen, fishery-related workers, other stakeholders, and their communities; these are central to understanding the behavior of fishermen on the fishing grounds and in their communities.

3. The Social Structure and Organization; changes in the fishery's ability to provide necessary social support and services to families and communities, as well as effects on the community's social structure, politics, etc.

4. The Non-Economic Social Aspects of the fishery; these include lifestyle, health, and safety issues, and the non-consumptive and recreational uses of living marine resources and their habitats.

5. The Historical Dependence on and Participation in the fishery by fishermen and communities, reflected in the structure of fishing practices, income distribution, and rights.

Note that primary data on several social impact factors are not regularly collected or available (particularly 2, 3, and 4), and thus, this methodology recommends that these factors be evaluated as best as practicable using any available sources of information, including the EIS.

Table 6. Step 2 Potential Metrics and Public Sources

Metric or Information Type	Possible public source
Landings Trends (by species, fishery management, and gear group)	California Marine Fisheries Data Explorer; California Fishing Communities Website
Revenue Trends by species, fishery management, and gear group)	California Marine Fisheries Data Explorer; California Fishing Communities Website: fishingcommunities.net
Number of Vessels (homeported and landing)	California Marine Fisheries Data Explorer; California Fishing Communities Website:
Days at sea (by species, fishery management, and gear group)	None identified
Value of fishing permits (by management group)	None identified
Employment (by vessel size, fishery management group, and/or community)	None identified
For-Hire Fishing Trips (by target species)	RecFIN, California Fishing Communities Website
For-Hire Landings (by species)	RecFIN, California Fishing Communities Website
Number of For-Hire Vessels (CPFVs) by Homeport	California Fishing Communities Website
Port Infrastructure	California Fishing Communities Website
Port Population and Demographic data	US Census Bureau: https://data.census.gov/
Attitudes, Beliefs, Values	California Fishing Communities Website
Social Structure and Organization	California Fishing Communities Website

Note: for generalizability with the literature, the term 'for-hire' is used, but in California these are managed and permitted as Commercial Passenger Fishing Vessels (CPFVs) and associated datasets will use that term.

A3. Guidance for Step 1: Income Impacts Analysis

The goal of Step 1 is to evaluate the effects of the proposed project on the fishing income of commercial and for-hire fishing businesses as well as downstream and upstream shoreside businesses that may also be affected by disruptions to fisheries operations. The end of this step should yield a quantitative estimate of the amount of income likely to be lost due to the OSW project area activities (Table 1). If methods are not available to predict such impacts, a revenue exposure method may be utilized as an indicator of the amount of income affected by the OSW project activities. Ideally, this analysis will consider all relevant information necessary to forecast impacts in the future given the OSW project, including but not limited to, displacement of fishing effort to other areas or fisheries given reasonably foreseeable impacts to access to fishing grounds and stock availability as well as reasonably foreseeable stock and management conditions. If such factors cannot be incorporated directly and evaluated quantitatively, they may be qualitatively evaluated in Step 3 (see *Appendix A5. Guidance for Step 3: Other Socioeconomic Impact Considerations*).

a3.1 Evaluate Direct Income Impacts (Commercial and For-Hire)

a3.1.1. Determine Approach

Based on data and tools available for use, select an approach to evaluate direct fishing income impacts. The approach used should ideally be able to assess direct income impacts resulting from OSW projects. Methods that can directly incorporate assumptions about how target species and fishermen's responses to OSW project areas and evaluate likely effects on alternative fishing locations will be best able to assess impacts resulting from project area activities (i.e., fishery participation and location choice models). However, the complexity of such approaches and the specificity needed for the particular OSW project area being investigated have largely precluded their use for their use in past OSW impact analyses. The most commonly used approach for fixed-bottom offshore wind projects and used in fisheries management regulatory impact analyses has been based on determining revenue exposure. At the time that this methodology was developed, no guidance specific to floating OSW was available. BOEM 2025 defines revenue exposure as the amount of revenue generated from the OSW project impact area. For commercial fisheries, it may be represented by the total ex-vessel value of the fish landed, and for shoreside businesses it may be estimated using a shoreside support services multiplier. As King (2023) describes, revenue exposure is not a predictor of likely impacts, and is used as an indicator of potential income impacts:

> [E]xpected economic impacts will be less than economic exposure if fishing vessel operators can recoup at least some lost fishing revenues by shifting fishing effort from impacted areas to other nearby areas. (King 2023, New England Wind COP Appendix III-N)

This statement is true for the other affected sectors as well, including for-hire and shoreside businesses. However, it should be noted that any shifts in fishing effort may not be economically or socially neutral (i.e., without other adverse effects).[13]

If using revenue exposure, potential useful data sources and tools are as follows:

1. NMFS **PacFEM**[14] - available for most commercial fisheries
2. Logbook data- for fisheries that are not available on PacFEM and have logbook data
3. Fish Tickets- **fishing block location**[15]
4. **Community fishery mapping projects**[16]
5. Revenue estimates per trip for hire trips and **shoreside multipliers**[17] for for-hire fisheries: **Lovell et al. 2020**[18]
6. Commercial fishery shoreside multipliers for California: **NMFS FEUS**[19] **(Seafood Industry Impacts Tool)**[20]**, IOPAC**[21]**, or IMPLAN**[22]

To use a revenue exposure approach, there must be a way to apportion historical effort and associated revenue to the OSW project impact areas, including the lease area and export cable corridor. At this step, it may be appropriate to catalogue affected fisheries and determine if any alternate approaches are needed (see data-limited fisheries). Different approaches may be needed for some commercial or for-hire fisheries based on data availability or the coverage or relevance of available tools. For example, at the time of writing this methodology, the Pacific Fishing Effort Mapping Project (PacFEM) does not include for-hire fisheries or all California commercial fisheries.

[13] For example, fishing productivity may be lower though reduced catch per unit effort (CPUE), transit costs and other operating costs may increase, and shifts in fishing areas could increase conflict between or within fisheries.

[14] Pacific Fishing Mapping Project. A brief overview of the project can be found here: *https://geo.psmfc.org/portal/apps/storymaps/stories/7bc1a025e2fd43e49efb011cd15e1d4e*

[15] In California, a fishing block is a 100 square nautical mile (10nm by 10 nm) location that is reported as the fishing location on fish tickets for landings in commercial fisheries and in the monthly logbooks in for-hire fisheries.

[16] Two specific community mapping projects and their data products exits through the California Offshore Wind Energy Gateway (*linked here*), the Northern CA Commercial Fishermen's Associations Community-Mapped Fishing Grounds (*linked here*) and Central Coast Fisheries Heritage Mapping Project (*linked here*).

[17] Multipliers can be developed for shoreside impacts using NMFS' Fisheries Economics of the US report for commercial fisheries and Lovell et al. 2020 for for-hire fisheries.

[18] Lovell, S.J., Hilger, J., Rollins, E., Olsen, N.A. and Steinback, S., 2020. The Economic Contribution of Marine Angler Expenditures on Fishing Trips in the United States, 2017. National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Silver Spring, MD. https://spo.nmfs.noaa.gov/sites/default/files/TM201.pdf

[19] All of the past Fisheries Economics of the United State Reports can be found here: *https://www.fisheries.noaa.gov/national/sustainable-fisheries/fisheries-economics-united-states*

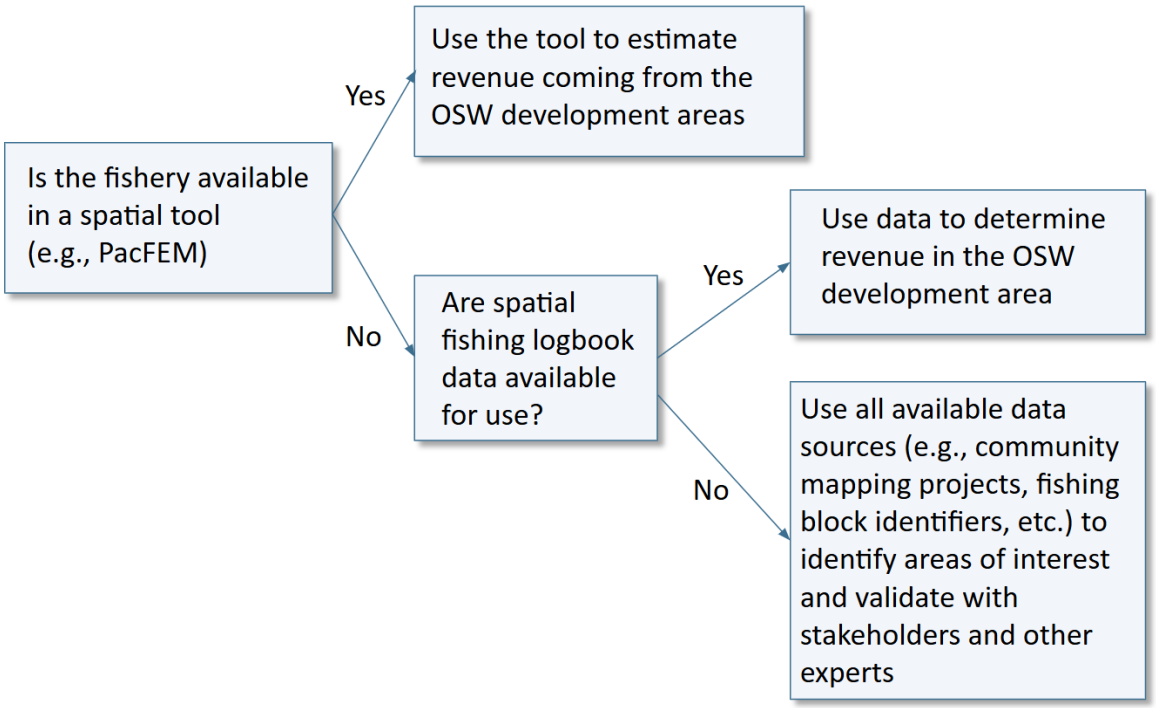
[20] Fisheries economics data and visualizations can be found here: *https://www.fisheries.noaa.gov/data-tools/fisheries-economics-united-states-data-and-visualizations*

[21] The Input-Output Model for Pacific Coast Fisheries (IOPAC) model was developed specifically for West Coast fisheries and a full description of the model can be found *here*.

[22] IMPLAN (IMpact analysis for PLANning) is an input-output model that is used by NMFS to better understand regional economic impacts of potential management decisions.

Figure 2 presents a decision tree for what data or tools may be used and prioritized for the analyses based on availability by fishery based on information available when this methodology was prepared in 2025. NMFS and CDFW may be best suited to support the identification of the most up to date and appropriate approach for use.

Figure 2. Revenue Exposure Method Decision Tree



a3.1.2. Develop annualized baseline estimate

Substeps a.2–5 all assume a revenue exposure approach. If using revenue exposure to determine potential impacts, use the following steps to characterize a baseline exposure estimate.[23]

Describe baseline landings and revenue from the OSW project impact area (including lease area and export cable corridor; see *Appendix A2. Information and Data for Evaluation of Fisheries* for definition*)*, including total landings and ex-vessel revenue across all anticipated affected species for the last 5–10 years (or other baseline period if deemed appropriate) to derive an average annual estimate (the analysis should take into account the cyclical nature of some fisheries and thus may need to account for years beyond the last five years). Choice of an appropriate baseline period may be informed by expert and stakeholder consultation. This requires spatially explicit fishery data that are capable of apportioning fishery effort, landings, and revenue to space in the ocean that overlaps with the OSW project areas. While Vessel Monitoring System (VMS) and fish ticket data provide the

[23] The following steps may also be relevant for other methods or approaches, but have not been specifically written with these alternate approaches in mind. Thus, reference or use of these substeps to other methods should be used with care.

bulk of the information required for such an assessment, generally modeling is needed to spatially apportion total reported revenue to the fishing track of a vessel. Such a method (PacFEM) is currently being developed by NMFS and other agencies that will be capable of providing this information. If data are not available to determine landings and revenue exposure coming from the area for a given fishery or are only available for a subset of the fishery, see *Section a.3. Make adjustments for data-limited fisheries* for more information. Standardize all values to the most recent year using the GDP implicit price deflator.

a3.1.3. Make adjustments for data-limited fisheries

Adjustments will be needed to estimate baseline revenue exposure for fisheries where the fishery data are not available in a publicly available tool such as PacFEM.

While all fisheries report their landings on fish tickets which contain a spatial identifier of where fishing took place by block, not all fisheries are required to submit logbooks or have VMS, which provides fine-scale information about where fishing effort has taken place. Here, such fisheries are considered data limited because fishing blocks are relatively coarse spatial units and such data are not validated on fish tickets (Wang et al. 2024). Because of this, fishing block identifier information may be used as a starting place for identifying the spatial distribution of fishing effort, but maps or analyses of the assumed areas of fishing effort should be validated against available sources, potentially including but not limited to, community fishery mapping projects and academic studies on the spatial dimensions of fishing effort. Expert and stakeholder consultation may also be able to verify maps of fishing effort.

a3.1.4. Apply multipliers to evaluate shoreside impacts

In addition to determining revenue exposure for commercial and for-hire fisheries, a shoreside business multiplier should be used to account for shoreside economic impacts to related fishery businesses (such as dealers, processors, and fishery supply businesses) due to lower fisheries landings or for-hire trips.[24] Commercial shoreside fishery businesses can be categorized as upstream (e.g., ice, bait, gear, and fuel suppliers) and downstream (e.g., processors and other seafood dealers). As is recommended by BOEM (BOEM 2025), this methodology recommends using Type I economic output (business sales) multipliers[25] (which include direct and indirect effects[26]). Such a multiplier

[24] It should be noted that the current BOEM fisheries mitigation guidance does not recommend a shoreside business multiplier for for-hire fishing businesses because of the nature of substitutes for other recreational activities (BOEM 2025). This methodology instead recommends including a for-hire shoreside multiplier unless evidence is available that suggests that shoreside impacts stemming from displaced for-hire fishing effort are unlikely.

[25] As defined by IMPLAN: https://blog.implan.com/understanding-implan-multipliers

[26] As defined in Leonard and Watson (2011) direct, indirect, and induced effects are the following:

1. Direct effect refers to the production change associated with a variation in final demand for the good itself. It is the initial activity that occurs in the economy.
2. Indirect effect refers to secondary activity caused by changing input needs of directly affected industries (e.g., additional input purchases to produce additional output).
3. Induced effect is caused by changes in household spending due to additional employment generated by direct and indirect effects.

accounts for impacts on sectors that supply goods and services to the fishing industry and the seafood processing sector. There are several publicly available resources for determining multipliers for commercial and for-hire recreational fisheries (Table 7). It may also be appropriate to derive new multipliers using IMPLAN or other input-output modelling software. It is recommended that NMFS be consulted to advise on the best choice of multiplier to be used for this work and multipliers derived from region-specific models (e.g., the Input Output Model for Pacific Coast Fisheries, IOPAC) may be better to use than from national models (e.g., the Seafood Industry Impacts Tool). NMFS' Seafood Industry Impacts Tool should only be used if other regionally specific Type I multipliers are not available.[27] Each method has potential constraints and biases which should be noted in a discussion of the analysis. For instance, IMPLAN models may overestimate downstream revenue effects due to the linear nature of the model, which assumes no substitution of inputs (i.e., similar to revenue exposure, assumes no substitution in purchasing behavior). If revenue exposure information is unavailable for some fisheries, additional multipliers should be considered to account for this missing information.

Table 7. Shoreside Multipliers and Possible Sources

Fishery Sector	Tool Name or Estimate	Source
Commercial	IOPAC	https://repository.library.noaa.gov/view/noaa/8718/noaa_8718_DS1.pdf?
Commercial	Seafood Industry Impacts Tool*	*https://www.fisheries.noaa.gov/data-tools/fisheries-economics-united-states-data-and-visualizations*
Commercial	California Shoreside Support Services Multiplier	Data tool: https://www.fisheries.noaa.gov/data-tools/fisheries-economics-united-states-data-and-visualizations *https://www.fisheries.noaa.gov/resource/document/fisheries-economics-united-states-report*
For-Hire	California Average For-hire Angler Expenditures Per Day, California Sales Impact Multiplier for For-hire angler expenditures	Lovell et al. 2020

*Note: *the Seafood Industry Impacts Tool, while publicly available, presents type II multipliers and thus is not recommended by this methodology*

a3.1.5. Estimate total impacts over lifetime of project

Using information about the duration of impacts (see *Appendix A2. Information and Data for Evaluation of Fisheries*), use the adjusted indicator of annual impacts to at-sea and shoreside fishery businesses to produce an indicator of total lifetime impacts over the course of the project. This is the sum of the estimates during construction, operations, and decommissioning. It should be noted that to accurately forecast revenue exposure and shoreside impacts, factors and trends affecting the baseline data as well as future conditions (such as stock or management changes, as described in BOEM 2025) should be directly incorporated into the analysis. If not possible to directly evaluate

[27] NMFS' seafood industry impacts tool produces Type II economic multipliers (i.e., includes direct, indirect, and induced impacts) and therefore should not be used unless other multipliers are not available.

these factors, they may be qualitatively evaluated in Step 3 (see *Appendix 3e. Future Stock, Management, or Climate Considerations).*

Discounting

Depending on the compensation framework, it may make sense to discount the total income effects estimate and present the total impacts in terms of the present value (PV). PV calculations convert future costs and benefits into common terms for the purposes of assisting with decision making. The discount rate represents the difference between present values and future values owing to several factors including expectations about future wealth, expected rate of returns on investments, and the effect of time on consumer preferences and value (social rate of time preference). Specifically with respect to the social rate of time preference, this represents how individuals tend to value benefits received immediately over delayed benefits and may be willing to accept lower immediate benefits than higher, but delayed benefits (Prest 2020; OMB 2023).

If this is appropriate, a discount rate should be selected based on best available guidance and practice. The US Office of Management and Budget (OMB) sets the discount rate for federal government regulatory decision-making in Circular A-4 and may be referenced if other more specific guidance is not available, but choice of discount rate should be discussed with appropriate economic experts and refer to any applicable guidance at the time that the methodology is applied. Note that if all values have been converted to real values (i.e., adjusted for inflation and in terms of a common base year), a *real* discount rate should be used (as opposed to a nominal discount rate). A sensitivity analysis may also be used to understand how the choice of discount rate affects ultimate results and a range of values.

The simple equation for calculating the present value (PV) is provided below, where present value is equal to the total real future value (FV) divided over 1 plus the real discount rate (r) raised to the power of the number of years (t).

$$PV = \frac{FV}{(1+r)^t}$$

It should be noted that determining an appropriate discount rate is a topic of much debate across economists, owing to the complexity of factors that determine the discount rate, as well as distinct prescriptive (what *should* the rate be based on current and future consumption and intergenerational equity) and descriptive (based on observed behavior, how *do* markets and individuals currently tradeoff current and future values) approaches (Prest 2020; Harrison 2010).

A4. Guidance for Step 2: Dependence and Vulnerability

The goal of Step 2 is to provide additional analysis that can assess the likelihood, magnitude, and distribution of impacts of the proposed project on various fishing fleets and fishing communities by

assessing how dependent various fishing fleets are on the OSW project areas and, in the case of fishing communities, how dependent and vulnerable such communities are. Fishing fleets and communities that are more dependent on the OSW project impact area may be more likely to experience negative impacts than those that are not (Warlick et al. 2025). Those that are less dependent may be more able to recoup any impacted revenue from other areas. In addition, fishing communities that are considered vulnerable may also have a harder time recovering from any OSW project impacts. In this framework, fishing communities that are more dependent and more vulnerable are considered to have a higher risk of experiencing negative impacts and may be potentially less able to absorb and recover from (i.e., be resilient to) impacts than communities who are not dependent and/or vulnerable. While this step will produce quantitative results and indicators of dependence and vulnerability, this step is intended to inform the results of Step 1 qualitatively.

a4.1 Select data, information, and tools for use

One tool that may be useful for assessing vulnerability of fishing communities is the Community Social Vulnerability Index (CSVI) which is a national-level set of indicators that can be applied to a Census Designated Place (CDP) to evaluate fishing community vulnerability. The CSVI indicators for commercial and recreational fisheries are updated annually in the California Current Integrated Ecosystem Assessment (CCIEA) report produced by NMFS (Leising et al. 2024). Where practicable, indicators for the most recent year should be used. More information about the indicators, their interpretation, and use can be found in Jepson and Colburn (2013) and Lewis-Smith and Norman (2024).

The California Fishing Communities website (*fishingcommunities.net*) is another potential resource to understand California's fishing communities. It was developed using information from port profile reports produced by California Sea Grant staff based on data and analysis provided by CDFW. This resource can increase understanding of California's fishing communities including history, economy, infrastructure, governance, fisheries, current challenges, and social and environmental vulnerability. Please note, an adaptation of the CSVI indictors for California fishing communities are also reported on the California Fishing Communities Website but may not be the most up to date. Where practicable, the most relevant and up to date information should be used. State and federal fishery management representatives, social scientists, and fishing industry stakeholders may be able to advise which indicators are most appropriate and relevant for use for evaluating fishing community vulnerability.

a4.2. Assess Dependence and Vulnerability

Dependence and vulnerability assessment allows for an evaluation of how vulnerable and resilient various fishing fleets and communities may be to impacts associated with the OSW project. This methodology recommends a possible approach for assessing dependence and vulnerability based on the current availability of fisheries data and tools to support such analyses. However, it is recommended that these analyses be supplemented or replaced if information, or indicators become

available that are more suitable for the evaluation. Research evaluating the responses of fishing communities and fisheries to OSW projects or other similar shocks should be prioritized, as well as any retrospective evaluation of how similar projects have affected the resilience of fisheries and fishing communities. Particular attention should be paid to not only aggregate outcomes (average or total) but distributional impacts as well (particularly if a small number of users may be more adversely affected than others).

Here, a possible approach includes calculating simple indicators based on exposure of various fisheries and communities to the project, but focuses on the proportion of fishery landings and revenue coming from the OSW project impact area, where fisheries and communities that are more dependent on the OSW project area may be more likely to experience negative impacts than those that are not, and/or may be less able to recover from impacts (Warlick et al. 2025). In addition, fishing communities that are considered vulnerable may also have a harder time recovering from OSW project impacts. In this framework, fishing communities that are more dependent and more vulnerable are considered to be potentially less resilient to negative OSW project impacts than those that are not. However, it should be noted that these indicators, while useful, may not fully capture the vulnerability of a given fishing community/ fleet or impacts associated with the proposed project. In particular, the CSVI relies on Census Bureau data at the CDP level, which includes all residents regardless of their involvement in commercial or recreational fishing industries. Assumptions and limitations of this approach should be described and may be further explored and described through additional assessment in Step 3.

Here, **fishing communities of place** (i.e., landing port communities) and **fishing fleets (**target fisheries, vessel sizes, gear groups, also called 'communities of interest) are separately evaluated and considered (the latter are also referred to as communities at sea, see (Selden et al. 2024; Martin and Olson 2017).

a4.2.1. Dependence of fishing communities of place on OSW impact area

Dependence of individual **fishing communities of place** examines the proportion of individual fishing ports landings and revenue that may be affected by OSW projects. Fishing communities that are more dependent on the OSW area may be more likely to experience negative impacts than those that are not. Community dependence on OSW project areas is the proportion of total effort, landings, or revenue in that community that are exposed in the OSW project impact areas (as defined in Step 1). To calculate the dependence of the community, similar data are needed as is required to evaluate revenue exposure, with the addition of data at the community/port level overall, including total revenue, landings, and effort.

The equation below summarizes the dependence calculation (*Dependence*) for a given community (i), metric (m, landings, revenue, or effort (e.g., number of trips or days at sea)), and year (t). Here, *exposure* is the amount of a given metric (m) coming from the OSW project area and the *total* is the total amount for that community, metric, and year. For example, dependence may be calculated as

the proportion of all ex-vessel revenue landed in that community coming from the OSW project impact area. Revenue is the suggested metric for use to evaluate dependence but other metrics may be explored and reported. Average dependence may be calculated as the mean dependence across years (using the same baseline period as in Step 1), though any increasing/decreasing trends or variability across years may be noted in the analysis.

$$Dependence_{imt} = \frac{exposure_{imt}}{total_{imt}}$$

This calculates the proportion of all ex-vessel revenue landed coming from the OSW project impact area. The proposed project may have limited impacts on a community if a small proportion of total effort and landings are affected, and larger impacts on another community if a high proportion of area of effort and landings are affected. Here, the duration of the impact also matters, and analysis should identify the duration of impacts by area (per Step 1). For a finer scale look at impacts, it may be worthwhile to examine the dependence of individual fisheries within a community on the OSW project impact areas.

All affected California fishing communities should be included, including communities where vessels are homeported and those where fishery landings occur from trips that occur in the OSW project impact area (defined in *Appendix A2. Information and Data for Evaluation of Fisheries Impacts*).

a4.2.2. Dependence of fishing fleets on OSW impact areas

The dependence of individual **fishing fleets** (also called communities of interest) on the OSW project impact areas in this context is a group of people united by shared interests related to fishing, which can include both commercial and recreational aspects. Here, fishing fleets may be described by various groupings of fishing vessels within a given sector such as gear groups, target fisheries, or vessel size groups. Other relevant groupings may be used if a rationale is available. The calculation of dependence of fishing fleets is the same as the analysis of fishing communities of place. While several metrics may be explored and reported, revenue is the suggested metric for use to evaluate dependence.

a4.2.3. Vulnerability of fishing communities of place

Community vulnerability measures suggest that based on observable characteristics (indicators) communities may be more or less vulnerable to a variety of shocks, including OSW projects, fishery management, or ecological changes. One tool that may be useful for assessing vulnerability of fishing communities is the Community Social Vulnerability Index (CSVI) which is a national-level set of indicators that can be applied to a Census Designated Place (CDP) to evaluate vulnerability. The CSVI as described in Jepson and Colburn (2013), is a composite indicator of 13 indices, four of which rely on information about the degree of general fisheries activity within a given place (engagement and reliance) and the others rely on data collected by the US Census Bureau about information from the

general population within the CDP such as poverty levels and housing characteristics (Table 8). Two categories of indices for this adaptation of CSVI include:

1. Social vulnerability indices. Includes individual and community demographics which, when high and taken alone, may not cause concern, but at the community level may indicate higher vulnerability;

2. Gentrification indices. Includes variables that can explain changes in social structures and networks and changes in cost of living;

The California Current Integrated Ecosystem Assessment (CCIEA) completes updated reports on West Coast communities including vulnerability analyses that are based on the CSVI following Jepson and Colburn (2013) and Norman et al. (2022) with adaptations to the recreational fisheries indices using Lewis-Smith and Norman (2024) (Leising et al. 2024). It is important to note that the two most relevant and publicly available sources of these indicators for West Coast fishing communities (Leising et al. 2024 and the Fishing Communities Project mentioned above) vary slightly from the description included in Jepson and Colburn (2013). Namely, the CCIEA does not include the natural amenities index within the gentrification index.

To the extent that the CSVI or the CCIEA continues to be updated regularly by NMFS, this may be used directly. If not, methods described by Norman et al. (2022), Jepson and Colburn (2013), and Lewis-Smith and Norman (2024) may be used to recreate the indices produced for the CCIEA reports, if access to requisite fishery data are available, if not, data or updated analyses may need to be provided by NMFS or PSMFC. Other methods may also be used, if deemed appropriate. A suggested list of groupings, indices, and variables to determine CSVI is included in Table 8.

Table 8. Community Social Vulnerability Index Base Indicators

Index	Variable	Source
Personal Disruption Index	Percent unemployed	U.S. Census Bureau ACS
Personal Disruption Index	Crime index	CL Research Website (http://www.clrsearch.com)
Personal Disruption Index	Percent with no diploma	U.S. Census Bureau ACS
Personal Disruption Index	Percent in poverty	U.S. Census Bureau ACS
Personal Disruption Index	Percent females separated	U.S. Census Bureau ACS
Population Composition Index	Percent white alone	U.S. Census Bureau ACS
Population Composition Index	Percent female single headed households	U.S. Census Bureau ACS
Population Composition Index	Percent population age 0-5	U.S. Census Bureau ACS
Population Composition Index	Percent that speak English less than well	U.S. Census Bureau ACS
Poverty Index	Percent receiving assistance	U.S. Census Bureau ACS
Poverty Index	Percent of families below poverty level	U.S. Census Bureau ACS
Poverty Index	Percent over 65 in poverty	U.S. Census Bureau ACS
Poverty Index	Percent under 18 in poverty	U.S. Census Bureau ACS
Labor Force Structure Index	Percent females employed	U.S. Census Bureau ACS
Labor Force Structure Index	Percent population in the labor force	U.S. Census Bureau ACS
Labor Force Structure Index	Percent of class of worker self employed	U.S. Census Bureau ACS
Labor Force Structure Index	Percent population receiving social security	U.S. Census Bureau ACS
Housing Characteristics Index	Median rent in dollars	U.S. Census Bureau ACS
Housing Characteristics Index	Median mortgage in dollars	U.S. Census Bureau ACS
Housing Characteristics Index	Median number of rooms	U.S. Census Bureau ACS
Housing Characteristics Index	Percent mobile homes	U.S. Census Bureau ACS
Housing Disruptions Index	Percent change in mortgage	U.S. Census Bureau ACS
Housing Disruptions Index	Percent change in home values	U.S. Census Bureau ACS
Housing Disruptions Index	Percent of owners monthly costs 35% of income	U.S. Census Bureau ACS
Retiree Migration Index	Households with one or more over 65	U.S. Census Bureau ACS
Retiree Migration Index	Percent population receiving social security	U.S. Census Bureau ACS
Retiree Migration Index	Percent receiving retirement income	U.S. Census Bureau ACS
Retiree Migration Index	Percent in labor force	U.S. Census Bureau ACS
Urban Sprawl Index	Population Density	U.S. Census Bureau ACS
Urban Sprawl Index	Nearest city w/50k population in miles	Neighborhood guides (www.moving.com)
Urban Sprawl Index	Cost of living index	CLResearch Website (http://www.clrsearch.com)
Urban Sprawl Index	Median home value	U.S. Census Bureau ACS

Note: ACS= "American Communities Survey"; Data Axel is the provider of business location data for Environmental Systems Research Institute's (ESRI) business analyst application.

Source: Adapted from Jepson and Colburn 2013 and Lewis-Smith and Norman (2024)

a4.2.4. Summarize Results

Based on the analyses above, summarize results of the analyses in a tabular format (see example below, Table 9). Create rows for each of the affected fishing fleets and communities. Note that social vulnerability indicators can only be created for fishing communities. For fishing communities,

impacts may be greater if the community is more dependent and vulnerable in the affected fisheries. Low dependence but high vulnerability may also be noteworthy for understanding the likelihood and magnitude of impacts on any given fishing community.

Table 9. Example Step 2 Results Table

Unit	Results by Analysis or Index: OSW Area Dependence	Results by Analysis or Index: Social Vulnerability
Fishing Fleets	%	NA
Communities	%	Low to High

A5. Guidance for Step 3: Other Socioeconomic Impact Considerations

To refine the information and analysis provided in Steps 1 and 2, Step 3 includes other analyses that may provide additional or supplementary information useful for describing potential socioeconomic impacts or exploring assumptions or sources of uncertainty in previous analyses. As part of this methodology, five additional supplemental analyses are outlined: a vessel traffic and re-routing analysis, other economic impact considerations, other social and community impact considerations, a cumulative impact analysis; and future stock, management, or climate considerations. All such analyses may not be able to provide numerical or dollar-value outputs, but resultant qualitative evaluations (see Table 10 for description of qualitative impact factors) may be helpful for understanding all direct and indirect impacts. Other supplemental analyses may be added to best evaluate or explore other reasonably foreseeable impacts. It is not expected that data will be collected (such as through surveys or interviews) to support these evaluations and that evaluations will be based on best available information, including from the EIS or broader academic literature or grey literature.

All impact evaluations should describe impacts in relation to what would exist without the project (i.e., status quo).

Qualitative impact descriptions of impacts should provide an indication of the impact type (direct or indirect[28]), including the likelihood of impact, and the magnitude, scale, and direction of impacts (examples provided in Table 10) as well as whether the impacts will be short term (e.g., immediate but temporary) or long term (either occur later in time or will occur over an extended period of time after the project's completion). In addition, any uncertainty about the impact on any impact factor should be described, if relevant a range of potential impacts in terms of magnitude, scale, direction,

[28] This methodology adopts the same definition of direct and indirect effects as used by the National Environmental Policy Act (NEPA) where direct effects are immediate effects in place and time and indirect effects occur later in time or farther away but are reasonably foreseeable (40 CFR § 1508.1(i))

or duration may be provided under best case or worse case scenarios (e.g., neutral to low positive impacts).

Table 10. Qualitative Impact Factor Descriptions and Examples

Impact Type	Magnitude	Direction	Duration	Scale (size of geographic area affected)	Likelihood
Direct	Negligible	Positive	Short Term	Localized	Very Unlikely
Indirect	Slight	Neutral	Medium Term	Broad	Unlikely
-	Low	Negative	Long Term	-	Likely
-	Moderate	-	Irreversible	-	Very Likely
-	High	-	-	-	-

a5.1 Vessel traffic and rerouting analysis

If an assessment of revenue exposure is used in Step 1, such a method cannot evaluate likely changes in fishing behavior, including shifts to other areas outside the OSW project area. As a result, in this case a supplementary evaluation of any vessel traffic (congestion or compaction) or re-routing issues as a result of the OSW project may be informative. With the addition of new structures and lines in the water, there may be less navigable space and harvest grounds for fishing vessels and other vessel types. The exclusion from the OSW development area for any length of time may require rerouting for vessels that transit through the area to reach fishing grounds.

Such issues outside of the OSW project areas may cause conflict for other fisheries or ocean users, restrict fishery access, and/or increase costs (Hogan et al. 2023). As described by Hogan et al. (2023), with the increase of automatic identification system (AIS) use, more traffic risk modelling and analysis methods have been developed, including vessel activity and route analysis (Christensen et al. 2001; Mazaheri and Ylitalo 2010; Wawruch and Stupak 2011).

An example of a possible analysis can be found in King (2023), which cites the navigation safety risk assessment analysis of the proposed project. This analysis used AIS data that evaluated seasonal vessel traffic patterns and estimated the number of vessels transiting through the project areas (Baird 2019). King (2023) specifically evaluates the number of vessels whose transit through the OSW project area could be affected on a daily and monthly basis to evaluate how much effort could be displaced to nearby areas as an indicator of potential congestion impacts. This can also be used to evaluate potential fuel cost impacts stemming from increased steam time around the lease area for vessels not included in a revenue exposure analysis (described in Step 3b below). Any limitations or gaps in the analysis should be documented, including the proportion of vessels that may be underrepresented (if they do not carry AIS), or the ability to differentiate fishing from transiting.

a5.2 Other Economic Impact Considerations

If revenue exposure analysis is used, this may be sufficient to provide an indicator of the magnitude of potential income impacts stemming from fishing displacement in the OSW project impact areas and both upstream and downstream impacts to shoreside businesses. However, such an analysis cannot predict how fishing behavior in and around OSW project impact areas may change (since it assumes complete displacement and cessation of fishing effort in the affected areas), so cannot capture any impacts associated with these changes and may overestimate impacts. The vessel traffic and re-routing analysis is suggested to be completed in part because it supports evaluation of the likelihood and magnitude of some of these impacts. The present section builds off this to further explore any additional sources of economic impacts, and allow for at a minimum, a qualitative description of any other factors that may also affect income, or any other economic impacts resulting from the OSW project impact area. Chaji and Werner (2023) identified four areas of economic impacts through workshops with the fishing industry and offshore wind experts: fuel expenditures, fishing industry revenues, income, and livelihoods, cost of insurance, and business support (some previous studies of these impacts can be found in Chaji and Werner (2023), Table 11). Revenue exposure assumes affected trips do not take place at all, so it is not appropriate to add cost impacts (e.g., insurance or fuel expenditure costs) to that estimate for vessels that fish in the OSW project impact area, but it may still be worthwhile to describe the likelihood and magnitude of such impacts, as they are different and distinct from other impacts, such as revenue that is simply foregone.

For vessels that only transit through the OSW project impact area to get to fishing grounds (and therefore may not be included in the revenue exposure analysis), supplemental quantification of economic impacts to these vessels may be warranted. Such an evaluation requires an evaluation of the number of vessels who transit through the lease area to reach fishing grounds outside the lease area and the change in trip distance and trip duration if such trips are rerouted. An example of this is provided in King 2023. This utilized the Safety and Navigation Analysis for the proposed project (Baird 2019) that evaluated typical transit patterns through the project area and the change in distance and time to transit around the project area to reach the same fishing location. Using estimates of the number of affected vessels, fuel consumption per hour, and average marine diesel prices, an estimate of total potential transit re-routing costs was calculated.

The safety and navigation analysis identifies potential vessel congestion or compaction issues (included in Step 3a), which may aid in the identification of concerns related to increased insurance premiums. However, it should be noted that at the time that this methodology was written, the available evidence and analytical approaches to evaluate these risks was limited (discussed more in Chaji and Werner 2023).

Impacts to upstream and downstream businesses, namely lost business sales, are included through the use of shoreside multipliers if using a revenue exposure approach. However, if additional information or data are available to evaluate how fishery supply chains and markets might be affected by the OSW project, such information may be provided here.

Table 11. Previous Studies of Economic Impacts of OSW by Impact Category

Impact	Resource/Previous analyses
Fuel expenses	Berkenhagen et al. 2010; Kirkpatrick et al. 2017; Samoteskul et al. 2014; Perry, Smith, and Carnevale 2012; Ecology and Environment, Inc. 2014; Baird 2019; King 2019a; 2019b
Industry revenue	Methratta et al. 2020; ten Brink and Dalton 2018; Hooper, Ashley, and Austen 2015; Mackinson et al. 2006; Ecology and Environment, Inc. 2014
Insurance costs	Hall and Lazarus 2015; Gusatu et al. 2020; Hooper, Ashley, and Austen 2015
Business income	Lovell et al. 2020; Scheld 2018; NMFS 2018

Source: adapted from Chaji and Wener (2023)

The California Coast Act § 30234 states "Facilities serving the commercial fishing and recreational boating industries shall be protected" and "Existing commercial fishing and recreational boating harbor space shall not be reduced unless the demand for those facilities no longer exists or adequate substitute space has been provided." This act supports the need for analyses of the harbor that is anticipated for use during the project, it's existing infrastructure, and capacity for increased use. Adverse impacts could include reduced dock space, reduced access to services, and increased costs of services due to increased demand, Other potential impacts may arise from additional infrastructure in the water (Emery 2020; Pomeroy et al. 2015) and crowding within the port or where cables land could also have impacts (Emery 2020). The construction phase may hinder normal operations of the fishing fleet due to various infrastructure challenges (Shields et al. 2023), including needed port upgrades (Rose et al. 2024; Shields et al. 2023).

One potential impact stems from the need for dredging in the harbor for most projects to build and maintain their infrastructure (Emery 2020; Rose et al. 2024; RODA (Responsible Offshore Development Alliance) 2023; Shields et al. 2023). Harbors closest to the OSW project impact area may also experience congestion and slower traffic during the tow-phase of the project and any delays to the projects due to weather may prolong those interruptions to normal fishing operations (Shields et al. 2023). The capacity of shoreside space, while different by project can range from 35 to 200 acres to accommodate the three main sites to support OSW (Shields et al. 2023), which could limit shoreside access for fishermen. To the extent that such impacts result in fishermen using other ports more or disrupts local markets, negative economic impacts may occur. These and any other impacts to ports that may have economic implications for fisheries may be considered.

Additionally, ecological changes may also affect fishing opportunities around the OSW project areas and result in indirect economic impacts that may not be captured in the Step 1 analysis. For example, on the East Coast, socioeconomic analyses have considered temporary impacts to fishing opportunities resulting from construction and pile driving activities (WHOI 2023). Any reasonably foreseeable economic impacts, including potential positive impacts, may be described qualitatively, if not considered directly in prior analyses.

Finally, if determined to be reasonably foreseeable and attributable to the project, other impacts may be evaluated as necessary, including but not limited to, impacts to asset value and capital stranding

risks[29]; impacts to employment; or impacts to product quality. Discussion of the likelihood and magnitude of impacts should be supported by the best available information, such as peer-reviewed research.

a5.3 Other Social and Community Impact Considerations

There may be social and community impacts resulting from the proposed project not covered by analyses in prior steps. As described in *Appendix A2. Information and Data for Evaluation of Fisheries Impacts*, NMFS' Social Impact Factors fit into five categories, which may be explored to the extent practicable and that they are not evaluated in prior steps:

1. Size and Demographic Characteristics of the fishery-related workforce residing in the area; these determine demographic, income, and employment effects in relation to the workforce as a whole, by community and region.

2. The Attitudes, Beliefs, and Values of fishermen, fishery-related workers, other stakeholders, and their communities; these are central to understanding the behavior of fishermen on the fishing grounds and in their communities.

3. The Social Structure and Organization; that is, changes in the fishery's ability to provide necessary social support and services to families and communities, as well as effects on the community's social structure, politics, etc.

4. The Non-Economic Social Aspects of the fishery; these include lifestyle, health, and safety issues, and the non-consumptive and recreational uses of living marine resources and their habitats.

5. The Historical Dependence on and Participation in the fishery by fishermen and communities, reflected in the structure of fishing practices, income distribution, and rights (NMFS 2007a).

It should be noted that baseline information about several impact factors was extremely limited at the time this methodology was prepared. To the extent practicable based on available information, a qualitative evaluation of the likelihood and magnitude of impacts on any social impact factors may be provided (see Table 10 for a description of qualitative impact factors, and an example of qualitative evaluation of social impact factors for a relevant action can be found in NMFS [2019]). Information from the EIS or academic or grey literature may be used to support these discussions in lack of project or site-specific information.

Community impacts not related to the revenue derived from fisheries relate to social factors 2, 3, and 4. Understanding the culture of fishing communities, including the attitudes, beliefs, and values of fishermen, may help illustrate how impacts to fisheries will impact their families and communities.

[29] For example, fishing capital vulnerability indicators and analysis of capital stranding risk in Calhoun and Scheld (2024)

Information on the social structure of the communities, including institutions such as fishing organizations or permit or quota banks that may be affected sheds light on their ability to be resilient in the face of impacts and if and how they may be able to adapt to changes in landings and revenue. Finally, information on any impacts to fishermen in terms of their lifestyle, health, safety, and overall wellbeing should be described to the extent practicable.

a5.4 Cumulative Impacts

In addition to impacts stemming from the proposed project, it may be important to identify any important cumulative impacts of the project considering other planned or in-progress offshore development activities in California or neighboring states (e.g., other OSW projects or other energy projects). The purpose of this analysis is to identify any non-additive effects of the project when considering other reasonably foreseeable projects. This is because the analysis will use baseline information and consider impacts of the proposed project, but the baseline data will not include effects or changes due to other planned, but not completed, OSW projects. The goal is not to double-count any impacts that have been previously considered or will be considered in the future, but to identify if any impacts identified in prior steps of the analysis would be greater in light of other planned or proposed projects not considered specifically in any prior analysis and that will not be considered in future analysis. Such an analysis should reexamine any assumptions in previous steps about the likelihood that fishermen may be able to shift their effort into other fisheries and/or adjust operations over time by evaluating the total proportion of fishing grounds affected by reasonably foreseeable OSW projects. Like previous steps, this should evaluate qualitative impacts across fisheries (by management group, target species, and gear type, see Table 10 for a description of qualitative impact factors). All OSW projects for which a COP has been developed may be considered, since projects in earlier stages of development may be too uncertain.

a5.5 Future Stock, Management, or Climate Considerations

Reasonably foreseeable fisheries management actions, or trends in market conditions or stock assessments may all be analyzed qualitatively if such information is not incorporated directly in other steps (per BOEM 2025). This information may be helpful for qualitatively evaluating factors that may exacerbate or alleviate impacts on fisheries considering future conditions.

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References

Baird. 2019. Vessel Navigation Through the Proposed Rhode Island/Massachusetts and Massachusetts Wind Energy Areas.

Berkenhagen, Jörg, Ralf Döring, Heino O. Fock, Matthias H.F. Kloppmann, Søren A. Pedersen, and Torsten Schulze. 2010. "Decision Bias in Marine Spatial Planning of Offshore Wind Farms: Problems of Singular versus Cumulative Assessments of Economic Impacts on Fisheries." Marine Policy 34 (3): 733–36. https://doi.org/10.1016/j.marpol.2009.12.004.

BOEM. 2024. California Offshore Wind Draft Programmatic Environmental Impact Statement. BOEM.

BOEM. 2025. Guidelines for Providing Information for Mitigating Impacts to Commercial and For-Hire Recreational Fisheries on the Outer Continental Shelf Pursuant to 30 CFR Part 585.

Brink, Talya S. ten, and Tracey Dalton. 2018. "Perceptions of Commercial and Recreational Fishers on the Potential Ecological Impacts of the Block Island Wind Farm (US)." Frontiers in Marine Science 5 (November): 439. https://doi.org/10.3389/fmars.2018.00439.

Calhoun, W. Reid, and Andrew M. Scheld. 2024. Vulnerability of Seafood Capital in the US Northeast and Mid-Atlantic. SCEMFIS Final Report. Virginia Institute of Marine Science, William & Mary.

CDFW. 2018. "2018 Master Plan for Fisheries A Guide for Implementation of the Marine Life Management Act." Department of Fish and Wildlife, June. https://opc.ca.gov/webmaster/_media_library/2018/07/2018-Master-Plan_FINAL.pdf.

Chaji, Marina, and Samantha Werner. 2023. "Economic Impacts of Offshore Wind Farms on Fishing Industries: Perspectives, Methods, and Knowledge Gaps." Marine and Coastal Fisheries 15 (3): e210237. https://doi.org/10.1002/mcf2.10237.

DePiper, Geret, Dennis Corvi, Scott Steinback, D Albrey Arrington, Rick Blalock, and Nate Roman. 2025. "Leveraging Data from a Private Recreational Fishing Application to Begin to Understand Potential Impacts from Offshore Wind Development." ICES Journal of Marine Science 82 (3): fsad154. https://doi.org/10.1093/icesjms/fsad154.

Ecology and Environment, Inc. 2014. Development of Mitigation Measures to Address Potential Use Conflicts between Commercial Wind Energy Lessees/Grantees and Commercial Fishermen on the Atlantic Outer Continental Shelf Report on Best Management Practices and Mitigation Measures. A Final Report for the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewal Energy Programs, Herndon, VA. BOEM.

Emery, Ciara R. 2020. Bringing Climate Change Home to Meet Your Community: Stakeholder Perceptions of Offshore Wind Energy in Humboldt County, California.

Feist, Blake E., Robert Griffin, Jameal F. Samhouri, et al. 2025. "Mapping the Value of Commercial Fishing and Potential Costs of Offshore Wind Energy on the U.S: West Coast: Towards an Assessment of Resource Use Tradeoffs." PLOS ONE 20 (3): e0315319. https://doi.org/10.1371/journal.pone.0315319.

Gray, M, PL Stromberg, and D Rodmell. 2016. "Changes to Fishing Practices around the UK as a Result of the Development of Offshore Windfarms–Phase 1 (Revised)." The Crown Estate.

Gusatu, Laura Florentina, Claudia Yamu, Christian Zuidema, and André Faaij. 2020. "A Spatial Analysis of the Potentials for Offshore Wind Farm Locations in the North Sea Region: Challenges and Opportunities." ISPRS International Journal of Geo-Information 9 (2): 96. https://doi.org/10.3390/ijgi9020096.

Hall, Damon M., and Eli D. Lazarus. 2015. "Deep Waters: Lessons from Community Meetings about Offshore Wind Resource Development in the U.S." Marine Policy 57 (July): 9–17. https://doi.org/10.1016/j.marpol.2015.03.004.

Harrison, Mark. 2010. "Valuing the Future: The Social Discount Rate in Cost-Benefit Analysis." Available at SSRN 1599963.

Hogan, Fiona, Brian Hooker, Brandon Jensen, et al. 2023. Fisheries and Offshore Wind Interactions: Synthesis of Science.

Hooper, Tara, Matthew Ashley, and Melanie Austen. 2015. "Perceptions of Fishers and Developers on the Co-Location of Offshore Wind Farms and Decapod Fisheries in the UK." Marine Policy 61 (November): 16–22. https://doi.org/10.1016/j.marpol.2015.06.031.

Jepson, Michael, and Lisa L Colburn. 2013. Development of Social Indicators of Fishing Community Vulnerability and Resilience in the U.S. Southeast and Northeast Regions.

King, Dennis. 2019a. "Economic Exposure of Massachusetts Commercial Fisheries to the Vineyard Wind Project." April.

King, Dennis. 2019b. "Economic Exposure of Rhode Island Commercial Fisheries to the Vineyard Wind Project." King and Associates, Inc., January.

King, Dennis. 2023. "Economic Exposure of Commercial Fisheries to the Vineyard Northeast Wind Energy Development in Lease Area OCS-A 0522." November.

Kirkpatrick, A Justin, Sharon Benjamin, Geret DePiper, Tammy Murphy, Scott Steinback, and Chad Demarest. 2017. Socio-Economic Impact of Outer Continental Shelf Wind Energy Development on Fisheries in the U.S. Atlantic, Volume I—Report Narrative.

Leising, Andrew, Mary Hunsicker, Nick Tolimieri, et al. 2024. 2024-2025 California Current Ecosystem Status Report. https://doi.org/10.25923/9t48-pb48.

Lewis-Smith, Connor, and Karma Norman. 2024. "Developing US West Coast Recreational Fishing Community Measures: Applying an Index Approach in the Context of COVID-19 and Social Vulnerability." Ocean & Coastal Management 255: 107236.

Lovell, Sabrina J, James Hilger, Emily Rollins, Noelle A Olsen, and Scott Steinback. 2020. The Economic Contribution of Marine Angler Expenditures on Fishing Trips in the United States, 2017.

Mackinson, Steven, Hazel Curtis, R Brown, et al. 2006. "A Report on the Perceptions of the Fishing Industry into the Potential Socio-Economic Impacts of Offshore Wind Energy Developments on Their Work Patterns and Income." Science Series Technical Report-Centre for Environment Fisheries and Aquaculture Science 133.

Martin, Kevin St, and Julia Olson. 2017. "Creating Space for Community in Marine Conservation and Management: Mapping 'Communities-at-Sea.'" In Conservation for the Anthropocene Ocean. Elsevier.

Methratta, Elizabeth T, Anne Hawkins, Brian R Hooker, Andrew Lipsky, and Jonathan A Hare. 2020. "Offshore Wind Development in the Northeast US Shelf Large Marine Ecosystem." Oceanography 33 (4): 16–27.

NMFS. 2007. "Guidelines for the Assessment of the Social Impact of Fishery Management Actions." December.

NMFS. 2018. "Fisheries Economics of the United States 2016." National Marine Fisheries Service, US Dept. of Commerce NOAA Tech. Memo. NMFS-F/SPO-187a: 243.

NMFS. 2019. Changes to Pacific Coast Groundfish Essential Fish Habitat Conservation Areas and Boundaries of the Trawl Gear Rockfish Conservation Area Final Environmental Impact Statement, Magnuson Stevens Act Analysis, Regulatory Impact Review, and Regulatory Flexibility Analysis. 422.

Norman, Karma, Daniel Holland, Joshua Abbott, and Amanda Phillips. 2022. "Community-Level Fishery Measures and Individual Fishers: Comparing Primary and Secondary Data for the U.S. West Coast." Ocean & Coastal Management 224 (June): 106191. https://doi.org/10.1016/j.ocecoaman.2022.106191.

OMB. 2023. "Circular No. A-4."

Perry, Katharine, Sarah Smith, and Michelle Carnevale. 2012. Rhode Island Ocean Special Area Management Plan: Fisheries Mitigation Options – A Review. URI Coastal Resources Center/Rhode Island Sea Grant, Ocean SAMP Implementation.

Pomeroy, Caroline, Madeleine Hall-Arber, and Flaxen Conway. 2015. "Power and Perspective: Fisheries and the Ocean Commons Beset by Demands of Development." Marine Policy 61 (November): 339–46. https://doi.org/10.1016/j.marpol.2014.11.016.

Pomeroy, Carrie, and Carly McCaw. 2025. "Fishing Community Resilience, Social Cohesion and Offshore Wind Energy Development in California." Institute of Marine Sciences, University of California, Santa Cruz, March.

Prest, Brian. 2020. "Discounting 101." Resources for the Future, January 16. https://www.rff.org/publications/explainers/discounting-101/.

Püts, Miriam, Alexander Kempf, Christian Möllmann, and Marc Taylor. 2023. "Trade-Offs between Fisheries, Offshore Wind Farms and Marine Protected Areas in the Southern North Sea – Winners, Losers and Effective Spatial Management." Marine Policy 152 (June): 105574. https://doi.org/10.1016/j.marpol.2023.105574.

RODA (Responsible Offshore Development Alliance). 2023. "Re: Port Access Route Study: The Areas Offshore of Massachusetts and Rhode Island [Docket No. USCG-2019-0131]." March. https://www.regulations.gov/comment/USCG-2019- 0131-0029.

Rose, Adam, Nathaniel Gundersen, Yamini Kumar, Joshua Jacobs, Isabel Reynoso, and Najmedin Meshkati. 2024. "Benefits and Challenges of California Offshore Wind Electricity: An Updated Assessment." Energies 18 (1): 118. https://doi.org/10.3390/en18010118.

Samoteskul, Kateryna, Jeremy Firestone, James Corbett, and John Callahan. 2014. "Changing Vessel Routes Could Significantly Reduce the Cost of Future Offshore Wind Projects." Journal of Environmental Management 141: 146–54.

Scheld, Andrew M. 2018. Economic Impacts Associated with the Commercial Fishery for Longfin Squid (Doryteuthis Pealeii) in the Northeast U.S.

Scheld, Andrew M, Jennifer Beckensteiner, Daphne M Munroe, et al. 2022. "The Atlantic Surfclam Fishery and Offshore Wind Energy Development: 2. Assessing Economic Impacts." ICES Journal of Marine Science 79 (6): 1801–14. https://doi.org/10.1093/icesjms/fsac109.

Selden, Rebecca L, Zoë Kitchel, Kaycee E Coleman, Leonardo Calzada, and Kevin St. Martin. 2024. "Using Historical Catch Flexibility and Fishing Ground Mobility as Measures of the Adaptive Capacity of Fishing Communities to Future Ocean Change." ICES Journal of Marine Science 81 (10): 1972–87. https://doi.org/10.1093/icesjms/fsae139.

Shields, Matt, Aubryn Cooperman, Matilda Kreider, et al. 2023. The Impacts of Developing a Port Network for Floating Offshore Wind Energy on the West Coast of the United States. NREL/TP--5000-86864, 2005543, MainId:87639. https://doi.org/10.2172/2005543.

Shimada, Hideki, Kenji Asano, Yu Nagai, and Akito Ozawa. 2022. "Assessing the Impact of Offshore Wind Power Deployment on Fishery: A Synthetic Control Approach." Environmental and Resource Economics 83 (3): 791–829.

Szostek, C.L., S.C.L. Watson, N. Trifonova, N.J. Beaumont, and B.E. Scott. 2025. "Spatial Conflict in Offshore Wind Farms: Challenges and Solutions for the Commercial Fishing Industry." Energy Policy 200 (May): 114555. https://doi.org/10.1016/j.enpol.2025.114555.

Wang, Yi-Hui, Benjamin I. Ruttenberg, Ryan K. Walter, et al. 2024. "High Resolution Assessment of Commercial Fisheries Activity along the US West Coast Using Vessel Monitoring System Data with a Case Study Using California Groundfish Fisheries." PLOS ONE 19 (6): e0298868. https://doi.org/10.1371/journal.pone.0298868.

WHOI. 2023. Fisheries Impacts in Massachusetts from the Revolution Wind Lease Area and the Federal Waters Section of the Revolution Export Cable Route. Woods Hole Oceanographic Institution.

Willis-Norton, Ellen, Tracey Mangin, Donna M. Schroeder, Reniel B. Cabral, and Steven D. Gaines. 2024. "A Synthesis of Socioeconomic and Sociocultural Indicators for Assessing the Impacts of Offshore Renewable Energy on Fishery Participants and Fishing Communities." Marine Policy 161 (March): 106013. https://doi.org/10.1016/j.marpol.2024.106013.

Supplemental Materials

For more information on the process used to develop the methodology as well as summaries of information and steps used to gather information and feedback for the methodology, several supplementary materials are included here. These include the scope of work funded by OPC, results of an initial literature review, a summary of interviews conducted to fill knowledge gaps, and a summary of an expert panel workshop that reviewed an initial draft of the methodology.

State of California Natural Resources Agency

Ocean Protection Council

Grantee Name:	Northern Economics, Inc.
Project Title:	Socioeconomic Impact Methodology for Fisheries and Offshore Wind Projects in California
Agreement Number:	C0223028
Term of Agreement:	Upon Approval through April 30, 2026

Project Summary:

Per the requirements of California Senate Bill 286 (McGuire, 2023), the California Coastal Commission's (Commission) Offshore Wind Energy Fisheries Working Group (hereafter referred to as the 'Working Group') must produce, among other items, a methodology to guide project level socioeconomic analysis of direct and indirect impacts to commercial, recreational, and tribal fisheries and fishing industries. This methodology will be used to inform guidance and determinations for compensatory mitigation resulting from unavoidable offshore wind (OSW) impacts in California. Specifically, the methodology will describe steps and approaches that can be used to inform the development of direct compensation and resiliency funds to mitigate unavoidable impacts as a result of OSW development, considering possible data and information limitations, project-specific considerations, and other circumstances, as necessary. The methodology is anticipated to be generalizable and flexible to apply to various OSW projects across the state but detailed enough to allow for ease of use and consistent application.

In conjunction with the Working Group, Northern Economics will produce the methodology in two parts: a commercial and recreational fisheries methodology using a combination of methods including a targeted review of relevant literature, expert and stakeholder interviews, and a one-day workshop; a tribal fisheries methodology using information derived from the literature review, interviews, and roundtables with California tribes in the summer and fall of 2025.

This project supports the Ocean Protection Council's (OPC) objective 4.4, Guide Sustainable Renewable Energy Projects, by working in a science-based and

collaborative way to minimize impacts on fishing and cultural resources. This project also helps support the 2024 target action to develop a statewide policy to establish criteria to ensure responsible evaluation and implementation of OSW projects.

Objective:

The objective for this project is to produce a socioeconomic impact methodology which will enable consistent, thorough, and objective evaluations of OSW impacts on fisheries to guide compensatory agreements in California. This directly supports OPC's Strategic Plan objective of guiding sustainable renewable energy projects.

Project Tasks and Deliverables:

Task 1: Ongoing Project Management and Ad-Hoc Meetings
Throughout the project, Northern Economics staff will work to manage the project, including monitoring project progress, meeting internally to set internal tasks and deliverables, creating and submitting invoices, and communicating with OPC points of contact, as necessary. Northern Economics includes time throughout the project to communicate and meet with other members of the project team for both Subgroup 4 and Subgroup 5, including Commission staff and members of the facilitation team for each subgroup and the full working group.

Task 2: Review of Current Practices and Guidance on Compensation and Economic Impacts
Deliverable: Review Summary Report
Information will be collected on how economic information and impact assessments have informed past compensation agreements, lessons learned from these agreements, available policy guidance, information on data availability and limitations, and available methodologies and resources available to inform impact analyses for compensatory mitigation in California, including those used by NMFS to inform economic impact analyses as a result of spatial management actions. It is acknowledged that recent and forthcoming work from NOAA and BOEM reviews west coast fisheries, data availability, and impact analysis approaches relevant for the development of OSW (Pfieffer et al. in prep)[1] and while the work will undoubtedly draw information from this report (especially on data sources and availability), the literature review will be more narrowly focused at

[1] Pfieffer, L., C. Alkire, and J.L. Ise. In prep. **Socioeconomic Characterization of West Coast Fisheries in Relation to Offshore Wind Energy Development.** Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management. xxx p. Report No.: OCS Study BOEM 2024-xxx. Interagency Agreement Number M22PG00032.

the nexus of socioeconomic impact analysis as used to inform the development of compensation agreements and draw from a distinct literature as a result. Where overlaps in content may exist, duplication with this report will be avoided and instead information will be incorporate by reference. The first deliverable will be a summary of the review, to be provided to the working group planning team and, if desirable, distributed to the sub-group and full working group for review. It is expected that this would be provided for informational purposes only, to increase awareness of the work and understanding of the issues, data sources, and background with respect to the methodology.

Task 3: Interviews
Deliverable: Interview Summary Report
This task will build on the literature review to collect information needed to understand lessons learned from past compensation agreements and data and determine information needs for the methodology to provide. This might be particularly important for understanding whether and how to provide guidance for groups where past compensation agreements have been more limited, such as for the private recreational industry or tribal fisheries. Others who will be important to interview include researchers in California and in other regions working on approaches to understand impacts that are difficult to quantify or sources of uncertainty, such as impacts resulting from environmental changes, or unique impacts resulting from floating wind turbines. This is particularly important given the amount of ongoing work and research in this area.

Interviews will be used to primarily to gather additional information on what methodologies are available and suitable for evaluating a range of socioeconomic impacts in California but also to gather information about other potential approaches, data availability and sources, and challenges. Interviews will assist with identifying who may be best to include in efforts to review and provide feedback on the draft methodology.

It should be noted that for impacts where limited pre-existing research exists (such as impacts on recreational and tribal fisheries or communities), there may be a need for considerable research about realized or expected impacts; however, given this project's timeline and goals, this is not included in this scope of work. Instead, the proposed project plans to identify and discuss where data or knowledge limitations exist as a consideration for the design of compensatory agreements.

To appropriately capture impacts and perspectives from a range of sources, 22 interviews are expected to be needed from several groups spanning federal fishery and OSW experts (i.e., NMFS and BOEM staff), researchers from public or private institutions working on OSW and compensatory mitigation or to understand socioeconomic impacts of OSW (including, but not limited to, social scientists,

economists, and biologists), state agencies or organizations engaged in past compensation agreements (including OSW developers), and various commercial, recreational, and tribal fishery representatives. The project budget includes funds for honoraria for participation of industry or tribal representatives. The estimated number of interviews needed by group is detailed in Table 1, noting that the exact number by group may depend on information needs as informed by the first tasks. Potentially more interviews may be needed with tribal or recreational fishery experts or representatives to fill key informational gaps for these groups.

Table 1. Estimated Number of Interviews by Group

Interview Group	Expected Number of Interviews
Federal Fishery and OSW Experts	3
Economists and other researchers working on OSW and Compensatory Mitigation	3
State Agencies and/or Organizations Engaged in East Coast Compensation Agreements	4
Commercial Fishing Industry Representatives	4
Recreational Fishery Representatives and Experts	4
Tribal Fishery Representatives and Experts	4
TOTAL	**22**

Note: this illustrates the approximate number of interviews required to get a variety of perspectives across groups and to gain needed information for this work; however, the number of interviews across groups is subject to change based on the results of the literature review and availability and willingness of potential interviewees.

As with the literature review, the interview process will be described in a supplementary report that includes who was interviewed and a summary of information gathered from these interviews. This will also be included as an appendix to the final methodology to record methods and processes used to inform the methodology, but also may be used to keep the workgroup planning team, sub-group, and full working group apprised of progress.

Additional interviews to gather further information and expert feedback may occur after the interview summary report has been produced to support the development of the methodology, particularly the tribal component.

Task 4: Skeleton Socioeconomic Impact Methodology

Based on the previous two tasks, Northern Economics will create a ‘skeleton’ version of the methodology that lists various impacts, how they connect to various compensation programs, and possible methodological approaches. As much as possible, this information will be presented in a flowchart that connects key informational or data needs to possible methodologies and compensation vehicles (e.g., direct impacts or

resiliency funds), in addition to a brief description of important information for each and key methodological questions or considerations for designing ultimate compensation programs. The skeleton methodology will be primarily used to inform key questions and discussion for the workshop in task 5 and will not be submitted to the working group or OPC and thus is not an official deliverable of the project.

Task 5: Workshop
Deliverable: Workshop Summary Report

In light of key sources of uncertainty and possible impacts that may be difficult to quantify, as well as ongoing processes to develop federal and regional guidance in this area (e.g., BOEM's Draft Fisheries Mitigation Guidance), there may be much to be gained if the methodology can be reviewed by experts who can weigh in on if and how to modify it to ensure it is as useful and comprehensive as possible and reflects best available knowledge and science. For example, NOAA's presentation to the working group on May 21 established that compensation agreements have heavily relied on revenue exposure for determining compensation amounts on the East Coast; however, this may fail to account for other impacts and is dependent on historical information which may not be a good predictor of future exposure and impacts. Northern Economics proposes to account for other impacts and uncertainty about future impacts in the methodology and suggests that the most feasible way to do so is based on the previous steps (literature review, interviews) combined with direct feedback from relevant experts. In addition, there may be different implications from how the impact analysis is designed and what data are used, such as the unit of analysis (e.g., permit or vessel owner), that may affect the design and use of compensation agreements. Such considerations may need to be preemptively addressed in the methodology. This review ensures that the design of this methodology benefits from broad expertise and lessons learned by past compensation agreements.

Northern Economics proposes to convene a one-day virtual workshop of 5-10 experts from around the country to discuss the skeleton methodology and provide feedback. This provides a novel venue for those who all have different experiences and expertise in compensation agreements to collaboratively provide insight and feedback, since while some regions are in the process of developing guidelines and best practices for compensation, no global consensus on these topics exists. This brief meeting will have substantial benefits for the methodology, including the ability to leverage the group's collective expertise to provide best practice recommendations for how to account for data or knowledge gaps, and notably, potentially suggestions for uncertainty buffers in compensation agreements based on certain conditions.

Northern Economics will work to ensure that this workshop and participants is not duplicative of the workgroup and sub-group roles to review the methodology, but to

provide for a diverse set of perspectives, especially those who have experience in these topics from the East Coast. Possible participants include researchers who have worked on past economic impact analyses for OSW; other researchers including social scientists and biologists; NOAA, BOEM, and other federal agency staff; state government representatives; Responsible Offshore Science Alliance and Responsible Offshore Development Alliance representatives; and if deemed appropriate, representatives from commercial, recreational, and tribal fisheries. If industry and tribal representatives are included, honoraria may be provided to support their participation. Northern Economics will work with the working group planning team and/or the sub-group to determine the appropriate size and composition of the workshop to maximize productivity and utility, while reducing redundancy with the sub-group and full working group.

Northern Economics will work to identify potential workshop participants, schedule the workshop and determine a workshop agenda, organize and send workshop invitations, prepare workshop materials including presentations, and facilitate the workshop discussions.

Northern Economics will summarize the workshop structure, participation, and summary of feedback received in anticipation of including it as an appendix to the final methodology and for having documentation to present to the sub-group and working group.

Task 6: Draft Commercial and Recreational Fisheries Methodology Preparation
Deliverable: Draft Methodology

Following the workshop, feedback and other adjustments will be incorporated into the skeleton methodology as necessary to prepare the draft methodology for working group consideration. Northern Economics will work to ensure all necessary background and information is contained within the appendices and focus on preparing a short, 10–20-page document that is an accessible guide for determining what approaches and methods are appropriate for determining various impacts, what compensation vehicles are most appropriate, and key factors, assumptions, or caveats that may be important for determining ultimate compensation amounts and eligibility. It will also include a flowchart or similar diagram showing which methodologies may be most appropriate based on certain conditions, and what additional research or guidance is needed to develop methodologies for determining certain impacts or impacts to certain groups, like tribal fisheries.

Task 7: Working Group and Subgroup Meetings
Northern Economics will solicit feedback throughout the process, as appropriate, from Subgroup 4, Subgroup 5 and the full working group on progress made, draft products, including the literature review and interview summaries, list of potential interviewees,

workshop feedback, and the draft and final methodologies. Northern Economics plans to attend up to five full working group meetings, seven Subgroup 5 meetings, six Subgroup 4 meetings, and additionally allocate time for coordination and communication time in between meetings, as needed throughout the project.

Task 8: Final Methodology Preparation
Deliverable: Final Methodology

Based on sub-group and working group review and feedback, the methodology will be revised accordingly, and a final methodology or preliminary final methodology will be submitted ahead of the seventh working group meeting in August or September. Submitting a preliminary final methodology would allow more time to incorporate feedback and prepare the final methodology ahead of the ~~8~~th **final** working group meeting.

Task 9: Tribal Fisheries Roundtable Meetings

Northern Economics will attend the tribal fisheries roundtables planned by OPC and the Commission for the summer and fall of 2025. Attendance at roundtables will assist in the collection and summarization of relevant information for the methodology and ensure that the methodology has benefitted from broader tribal engagement and feedback. This task includes travel and labor costs to travel to two in-person roundtable meetings and virtually attend a third. This task assumes that two staff will attend one in-person roundtable in Humboldt and the virtual roundtable, and one staff will travel to the final roundtable in Morro Bay. Each roundtable is expected to be 4 hours, but the Humboldt in-person roundtable will be spread across multiple days, so for that meeting 4 days of lodging and rental car use may be needed if flying in and out is not possible on the day of the meetings.

Task 10: Tribal Fisheries Methodology Preparation

Deliverable: Final Tribal Fisheries Methodology

Northern Economics will conduct additional research, as necessary, to follow-up on ideas or information sources gathered from the roundtables that will inform the development of the methodology and work to write up a separate methodology for tribal fisheries for the working group to consider. This methodology will include a description of data sources and information that can be used to support analyses of impacts to tribal fisheries or other background information on tribal fisheries in California.

Accessibility:

All public-facing products will be produced in accordance with California Department of Rehabilitation guidelines as per https://dor.ca.gov/Home/WebAccessibilityToolkit.

Project Timeline:

This proposal assumes work will begin by December 2024 and finish **March 30, 2026** with a contract end date of **April 30, 2026**. This assumes that work would begin before the fifth working group meeting, with a draft methodology presented by September 2025 and a final work product delivered by **March 2026**.

	Dec' 24	Jan '24	Feb '24	Mar '25	Apr '25	May'25	Jun '25	Jul '25	Aug '25	Sep '25	Oct '25	Nov'25	Dec '25	Jan '26	Feb '26	Mar '26
Task 1: Ongoing Project Management and Ad-Hoc Meetings																
Task 2: Literature Review																
Task 3: Interviews																
Task 4: Skeleton Socioeconomic Impact Methodology																
Task 5: Workshop to Solicit Expert Feedback																
Task 6: Draft Methodology Preparation																
Task 7: Working Group and Sub-Group Meetings*	SG	#5	SG	SG	#6	#6	SG	SG	#7	#7	SG	SG	SG	#8	#8	SG
Task 8: Final Methodology																
Task 9: Tribal Fisheries Roundtables																
Task 10: Tribal Fisheries Methodology																

** Note: 'SG' stands for 'Sub-Group Meeting" while numbers indicate the working group meeting number.*

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Socioeconomic Impacts of Offshore Wind on Fisheries and Compensation Agreements: A Review of the Literature

Prepared for

California Coastal Commission's Offshore Wind Energy Fisheries Working Group

February 2025

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Abbreviations

AIS	Automatic Identification System
BOEM	Bureau of Ocean Energy Management
CBA	Community Benefit Agreement
CCC	California Coastal Commission
CCMP	California Coastal Management Program
CDP	Coastal Development Permit
CEC	California Energy Commission
CFR	Code of Federal Regulations
CFRA	California Fishermen's Resiliency Association
COP	Construction and Operations Plan
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
ECC	Export Cable Corridor
ECRA	Export Cable Route Area
EFH	essential fish habitat
EIS	Environmental Impact Statement
FCP	Fisheries Communication Plan
FEIS	Final Environmental Impact Statement
GAP	General Activities Plan
HMS	Highly migratory species
I-O	Input-Output
MA DMF	Massachusetts Department of Marine Fisheries
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
OCS	US Outer Continental Shelf.
OCSLA	Outer Continental Shelf Lands Act
OECC	offshore export cable corridor

OSW	offshore wind
PEIS	Programmatic Environmental Impact Statement
PNNL	Pacific Northwest National Laboratory
RCA	Rockfish conservation area
ROD	Record of decision
SAP	Site Assessment Plan
SEER	Synthesis of Environmental Effects Research
SIA	Social impact analysis
VMS	Vessel monitoring system
VTR	Vessel Trip Report
WA	Working Area
WEA	Wind Energy Area
WHOI	Woods Hole Oceanographic Institution
WLA	Wind Lease Area
WTGA	Wind Turbine Generator Area

1 Introduction

1.1 Purpose

Under a grant from the California Ocean Protection Council, Northern Economics, Inc. is working to develop a socioeconomic impact methodology for fisheries and offshore wind (OSW) projects in California. This project is pursuant to the requirements of California Senate Bill (SB) 286, which directs the California Coastal Commission (CCC) and the Offshore Wind Energy Fisheries Working Group to develop such a methodology. This methodology will be used to inform guidance and determinations for compensatory mitigation resulting from unavoidable OSW impacts in California. This report reviews relevant literature to better understand similar methods used in other regions, available policy guidance, and potential impacts of concern and methods that can be used to describe impacts to West Coast and California fisheries. The goal of this report is to identify primary information and knowledge gaps that can be filled by conducting interviews with experts, stakeholders, and other relevant parties during the next stage of the project.

1.2 How This Report is Organized

This report is organized in five main sections:

1. **Introduction**
2. **Background:** Includes a brief description of SB 286 and the regulatory context for compensation agreements and the forthcoming methodology.
3. **Compensation Methodologies:** Focuses on compiling information on available Bureau of Ocean Energy Management (BOEM) guidance on compensation agreements (3.1) and examples of methodologies used for fisheries OSW compensation agreements on the East Coast (3.2.1) and similar fisheries agreements in California (3.2.2).
4. **Socioeconomic Impacts of OSW on Fisheries:** Compiles and summarizes information on socioeconomic impacts resulting from OSW on fisheries broadly (4.1), information available to inform socioeconomic impact analyses in California (4.2), and a high-level review of potential socioeconomic impacts in California (4.3).
5. **Conclusions:** Summarizes overall conclusions of the review and a preliminary set of knowledge gaps and questions to be informed by interviews in the next phase of work.

2 Background

2.1 California Senate Bill 286

SB 286, which Governor Newsom signed into law on October 7, 2023, is designed to ensure that OSW development in the state proceeds in a way that minimizes and compensates for economic disruptions to fisheries, thereby helping to protect the viability of these coastal communities while supporting renewable energy goals.

The legislation requires that the California Coastal Commission, in coordination with the California Department of Fish and Wildlife, convene a California Offshore Wind Energy Fisheries Working Group for the purpose of:

> …developing a statewide strategy for ensuring OSW projects avoid and minimize impacts to ocean fisheries to the maximum extent possible, avoid, minimize, and mitigate impacts to fishing and fisheries in a manner that prioritizes fishery productivity, viability, and long-term resilience, and fairly and reasonable compensate persons engaged in the commercial and recreational fishing industries and Tribal fisheries for economic impacts to ocean fisheries resulting from offshore wind energy projects.

Under SB 286, the statewide strategy must include best practices for addressing impacts to the commercial and recreational fishing industries, Tribal fisheries, and environmental resources associated with offshore wind energy projects, and specifically needed to include both a methodology for "comprehensive project-level socioeconomic analysis of direct and indirect impacts to commercial and recreational fishing industries and Tribal fisheries" as well as a "framework for reasonable compensatory mitigation for unavoidable impacts to the commercial and recreational fishing industries and Tribal fisheries." The legislation outlines that once adopted, applicants seeking approval or concurrence from a state agency for an offshore wind energy project shall comply with the terms, recommendations, and best practices established in the statewide strategy.

This project seeks to develop the requirement for a socioeconomic impact methodology under Sec 4(c)(2) of SB 286, specifically in a way that directly connects to the design and structure of compensation agreements for unavoidable impacts.

2.2 Regulatory Context for Compensation Agreements

BOEM oversees offshore wind leasing on the US Outer Continental Shelf. Under the Outer Continental Shelf Lands Act (OCSLA) and National Environmental Policy Act (NEPA), BOEM must ensure OCS leasing activities prevent interference with fisheries uses and evaluate social and economic impacts of potential OSW projects. As described in BOEM's Draft Fisheries Mitigation Guidance (BOEM 2022),

a lessee's Site Assessment Plan (SAP), General Activities Plan (GAP), or Construction and Operations Plan (COP) should contain the necessary information for these assessments. In addition, the lessee's plans should provide proposed measures for avoiding, minimizing, reducing, eliminating, and monitoring environmental impacts. Once the COP is submitted to BOEM, BOEM begins the preparation of the Environmental Impact Statement (EIS). Once the EIS is complete, a record of decision (ROD) is issued as well as the terms and conditions for the permit. However, the permit cannot be issued until affected states concur with the applicant's certification under the Coastal Zone Management Act (CZMA, Marine Affairs Institute 2024, UC Berkeley Center for Law, Energy & the Environment. 2024).

The CZMA at 16 U.S.C. §§ 1451 et seq., provides that a state with a federally approved coastal management (CZM) program may review any proposed activity requiring a federal license or permit if the activity would affect any land or water use or natural resources of the state's coastal zone. In the case of an OSW project developer seeking a federal license or permit from BOEM, a CZM program has federal consistency review authority for the project pursuant to the CZMA and its regulations at 15 C.F.R. part 930, subparts D and E.

A state CZM program cannot require monetary compensation as part of its federal consistency review and decision. Therefore, the program cannot object to an OSW project consistency certification solely for a failure to reach a compensatory mitigation agreement with the project developer. A state CZM program and a developer can, however, mutually agree that a compensation amount is sufficient in-part to meet enforceable policies to modify a project to mitigate potentially adverse impacts (Marine Affairs Institute 2024).

Once a compensatory mitigation agreement is in place, federal and state governments can enforce the developer's commitments to create compensation funds. For example, before an OSW project developer can begin activities on their leased area, BOEM must approve their Construction and Operations Plan (COP), which describes the developer's proposed activities and planned facilities. So far, BOEM has conditioned its approval of each of the COPs it has approved for New England OSW projects on the developers establishing the fisheries compensation funds they committed to create. Furthermore, the Bureau of Safety and Environmental Enforcement, which is the lead federal regulator for the safe and environmentally responsible production of offshore renewable energy, can require that developers comply with the terms and conditions BOEM includes in its approval of a COP. States may be able to use contract law and the CZMA to accomplish the same end. For example, a state may be able to use the process established in the CZMA's implementing regulations to have the federal government require a developer to either establish the fisheries compensation funds it has agreed to or submit a new consistency determination. However, if the developer chooses to submit a new consistency determination that does not call for creating fisheries compensation funds,

the state would not be able to object simply because the developer failed to provide monetary compensation (Marine Affairs Institute 2024).[1]

With respect to California, the CCC developed the California Coastal Management Program (CCMP) pursuant to the requirements of the CZMA. The key policy component of the CCMP is the California Coastal Act of 1976. The Federal Consistency Unit of the CCC implements the CZMA as it applies to federal activities, development projects, permits and licenses, and support to state and local governments. For projects in federal waters, the Commission has two opportunities to weigh in on offshore wind energy projects through its federal consistency and state regulatory process. The first occurs prior to a BOEM lease sale. At this stage, the Commission assesses whether the leasing process, including any reasonably foreseeable development within a proposed lease area, is consistent with Chapter 3 policies of the California Coastal Act. The second opportunity occurs after specific projects are proposed. Here, the Commission reviews the specific development proposed and must issue both a coastal development permit for project components in the Commission's direct jurisdiction (i.e., state waters and some onshore areas) and a consistency certification for project components in federal waters (California Coastal Commission undated; California Coastal Commission 2019).

BOEM has designated two Wind Energy Areas (WEAs) in California, one off the coast of Humboldt Bay and another off the coast of Morro Bay, comprising a total of 582 square miles of ocean. The CCC conducted a federal consistency review of both areas. In April 2022, Commissioners conditionally concurred on the consistency determination for the Humboldt Bay area. In June 2022, Commissioners conditionally concurred on the consistency determination for Morro Bay. BOEM agreed to several conditions, including to ensure coordination on survey and monitoring plans, minimize impacts to marine habitats, and engage with Tribal, fishing, and environmental justice communities, to ensure consistency with the Coastal Act.

After several years of planning and preparation, BOEM held an auction in December 2022 to auction off the five lease areas that comprise the Morro Bay WEA and Humboldt WEA. The five BOEM auction winners now have the opportunity to begin information gathering and other preliminary activities. Lessees must submit site survey plans describing data collection efforts the lessees will undertake to characterize their lease area. Developers then have up to 5 years to conduct these surveys. Information collected is then used by lessees to draft a COP. Once a project receives all the necessary local, state, and federal authorizations, including a consistency certification and Coastal Development Permit (CDP) from the Commission, the project can begin construction. The Commission will also have the opportunity to weigh in on decommissioning as well.

[1] States also have the option of implementing specific legislation requiring the development of fishery compensation funds. For example, lawmakers in Connecticut have introduced a bill in the Connecticut General Assembly that would require developers of offshore wind projects that will supply Connecticut customers with electricity to establish funds that would provide compensation if the project damages fisheries or the environment or if the project creates fewer jobs than the developer promised (Marine Affairs Institute 2024).

Specific Communications Plans are required in the leases, and developers must submit Agency, Fisheries, and Native American Tribes Communications Plans to BOEM within 120 days of the lease execution date (June 1, 2023). The Fisheries Communication Plan (FCP) must set out the approaches the lessee will use to communicate with fishermen. The FCP must also include a process to file a complaint with the offshore wind operator to seek the replacement of, or compensation for, lost gear.

On Dec. 20, 2023, BOEM published a Notice of Intent to prepare a Programmatic Environmental Impact Statement (PEIS) for potential development activities on the five offshore wind lease areas off California's central and north coasts. A draft PEIS was released in November 2024 (BOEM 2024a). Among the prospective mitigation measures for commercial fisheries and for-hire recreational fishing listed in the draft PEIS are the following (BOEM 2024a):

- Lessees should consider establishing a compensation process if a project is likely to result in lost income to commercial and recreational fisheries.
- The compensation process should be equitable and fair across fisheries and fishing communities and consider best practices and consistency across other offshore wind energy projects.
- Financial compensation can include compensation for gear loss and damage and lost fishing income.

3 Compensation Methodologies—Guidance and Examples

3.1 Current Guidance on Compensation Agreements

3.1.1 Compensation

BOEM's Draft Fisheries Mitigation Guidance (BOEM 2022) describes a suite of best management practices and mitigation measures to reduce potential impacts to commercial and recreational fisheries (based on workshops with East Coast fisheries stakeholders described in Ecology and Environment Inc 2014).[2]

With respect to compensation, the draft guidance states that compensation processes should be established if a project is likely to result in lost income to commercial and recreational fisheries. The guidance does not speak to Tribal fisheries. It says that the general approach for the compensation process should consist of the following:

1) Be fair and equitable across fisheries and fishing communities;
2) Consider best practices and consistency across other offshore wind energy projects;
3) Be based on the impacts identified in the various environmental documents including the lessee's COP and BOEM's assessments.

At present, the BOEM draft guidance is the only available resource of best practices, though examples of compensation schemes are available in the US (reviewed in the next section).

BOEM specifically recommends minimum standards for damaged and loss gear as well as lost fishing income. It does not produce standards for determining resiliency funds or resiliency fund amounts, or promulgate specific standards for floating offshore wind projects. These standards are as follows:

Damaged or Lost Gear:

- Follow minimum standards for gear loss that exist for the Fisheries Contingency Fund (FCF) claims process.[3]
- Consider reimbursements for lost or damaged gear as a result of the lessee's actions, including survey work, and interactions with non-marked/non-charter obstructions.

[2] Between the time this review was drafted in December 2024 and finalized in February 2025, final mitigation guidance was released, which made several changes which are not fully captured in this document; more information here: https://www.boem.gov/newsroom/notes-stakeholders/boem-finalizes-fisheries-mitigation-guidance

[3] More information available here: https://www.fisheries.noaa.gov/national/funding-and-financial-services/fishermens-contingency-fund-program

- Consider compensating for the repair or replacement of damaged gear and 50% of gross income loss during the period from the discovery of the lost or damaged gear to when the gear is repaired or replaced.
- Consider compensating reasonable fees paid to an attorney, public accountant or other consultant for preparation of the claim.

Lost Fishing Income:

- Establish adequate reserve funds to compensate for lost income as a direct result of the lessee's actions

3.1.2 Guidance for determining an adequate reserve fund for compensation

3.1.2.1 Revenue exposure

BOEM recommends that lessees consider using fishing revenue exposure, or the amount of ex-vessel revenue generated from the project area of potential displacement, for the purposes of determining the value of reserve funds to set aside for compensation (BOEM 2022). BOEM expects that because gross revenue does not account for expenses this is an overestimation of income loss to participants and should as a result sufficiently cover shoreside income loss and potentially underreported landings, but in some places it may be sufficient to add a multiplier to cover shoreside losses. BOEM suggests that if revenue exposure data are not available, lessees should consider an additional multiplier. Finally, the guidance suggests that all revenues should be standardized to a common year using the GDP Implicit Price Deflator.

Additional factors that may be considered in developing revenue exposure estimates, as described in Appendix A to the guidance, "Developing a Methodology for Developing Revenue Exposure Estimates in the Northeast Atlantic" (summarized in the following subsection), include the following:

- Stock assessments
- Fisheries management actions
- Market conditions
- Other relevant factors including: trends in landings/revenue, and/or management actions that drive spatial effort

3.1.2.2 Duration of Compensatory Mitigation

BOEM recommends that different project stages should consider differential estimates of exposure, as summarized below.

Construction & Decommissioning:

Consider compensation for lost income for the duration of foundation and submarine cable installation/decommissioning. This area might be where vessels cannot safely operate or transit or where operations may disrupt target populations (e.g., elevated acoustic exposure).

Operations:

At a minimum, it should be assumed that there is an adjustment period for fisheries post-construction. The minimum recommended payment structure is 100% of revenue exposure for the first year, declining 10% per year for the first 5 years (to 50% in year 5). Compensatory mitigation 5 years post construction may be necessary and should be evaluated based on activities proposed in the COP.

3.1.2.3 Eligible Entities

BOEM recommends that lessees should consider permitting claims from entities other than vessel owners, operators, and crew including shoreside businesses that can demonstrate that their business experienced a loss of income due to unrecovered economic activity.

3.1.2.4 Basic Reserve Fund Formula Calculation:

The basic formula used by BOEM to determine the total reserve fund requirements is shown below using the minimum reserve fund guidelines (as reviewed above). This includes the annual revenue exposure estimate for commercial (*CFR*) and recreational fisheries (*RFR*) in the years of construction, the first 5 years of operation, and years of decommissioning. The assumed amounts required are at a minimum 100% of the inflation-adjusted revenue exposure and in each of the years of construction (k) and decommissioning (j) and a declining proportion of the revenue exposure in the first 5 years of operation, decreasing from 100% in year 1 to 50% in year 5 (a total of 3.6[4]). The Lessee should use the GDP Implicit Price Deflator to adjust the annual average revenue exposure estimates to the most recent complete year of the deflator[5] (n_i, while the GDP deflator for the year of the annual commercial fisheries revenue exposure estimate is given by n_{bf}, where the deflator for for-hire recreational fisheries is given by n_{br}). The purpose of these adjustments is to account for inflation between years. For example, if revenue exposure estimates used fishery data from 2022 and the current year is 2025, the 2022 revenue exposure estimates would be converted to 2024 (the most recent complete year of the deflator). To make this adjustment, the deflator for 2024 (n_i) is divided by the deflator for 2022 (n_{bf} or n_{br}), and then multiplied by the revenue exposure estimate (*CFR* or *RFR*). Impacts to shoreside businesses may be accounted for in the multiplier term, M (more information on sources of information for the multiplier provided in in the next section, 3.1.3.4).

[4] 3.6 is the sum of the proportion of revenue exposed in each year—i.e., 1+ 0.8+ 0.7 + 0.6 + 0.5= 3.6

[5] The most recent complete year of the deflator means the year for which a full year of information is available. For the GDP Implicit Price Deflator, deflator data are released quarterly (see https://fred.stlouisfed.org/series/GDPDEF); thus the most recent complete year is the most recent year for which all four quarters of data have been released.

$$k\left(CFR * \frac{n_i}{n_{bf}} + RFR * \frac{n_i}{n_{br}}\right)(1+M) + j\left(CFR * \frac{n_i}{n_{bf}} + RFR * \frac{n_i}{n_{br}}\right)(1+M) + \left((3.6 * CFR) * \frac{n_i}{n_{bf}} + (3.6 * RFR) * \frac{n_i}{n_{br}}\right)(1+M)$$

Source: Adapted from BOEM (2024b)

3.1.3 Guidance for Revenue Exposure Estimation in the Northeast Atlantic

As an appendix to the main document, BOEM created a guidance document for developing revenue exposure estimates in the Northeast Atlantic (BOEM 2022). The guidance document was specifically generated to support compensatory mitigation of lost income to fishermen and was developed from consultation with the National Marine Fisheries Service (NMFS). It describes methods for commercial fisheries, including data-limited stocks, recreational fisheries, and shoreside businesses. In addition, it also describes factors that may be taken into account when forecasting exposure in the future.

3.1.3.1 Commercial fisheries

In the guidance appendix for Greater Atlantic regional fisheries, BOEM explicitly identified fisheries for which it believes there is a high degree of confidence in the data and data tools for estimating revenue exposure in the Northeast Atlantic (Specifically, the fishery footprints data tool, based on DePiper 2014 and Benjamin et al. 2018, and the socioeconomic impacts of Atlantic Offshore Wind development reports[6]), though it notes that the lessee should work to ensure that the data tool accurately reflects the proposed action in the lessee's COP and to request an analysis specific to the proposed action. Specific components of the revenue exposure analysis include the following:

- Data from 2008 to the most recent year available
- VMS data to evaluate finer-scale vessel activity, interannual variation, and transit routes

The appendix notes that several limitations to using vessel monitoring system (VMS) data exist, including fisheries that do not require VMS, fisheries that cannot be assigned a specific target species without additional information, issues with linking VMS to other trip or landings datasets, and issues with distinguishing fishing from transiting behavior.

3.1.3.2 Data-limited commercial fisheries

The appendix identifies a set of species considered to be data-limited commercial fisheries. These fisheries are generally non-federally managed species, such as lobster, Jonah crab, and Atlantic menhaden, where spatial fishing and landing data reporting requirements may be determined

[6]https://www.fisheries.noaa.gov/resource/data/socioeconomic-impacts-atlantic-offshore-wind-development?utm_medium=email&utm_source=govdelivery

differently across states or may not be required at all. For each data-limited fishery, a snapshot of the data available (including estimated coverage) and major characteristics of the fishery are described.

3.1.3.3 Recreational fisheries

For recreational fisheries, the appendix describes the current recreational fishing industries in the Northeast Atlantic, including federally permitted party and charter fishing vessels, highly migratory species charter vessels, and private recreational angling. However, only the party and charter fisheries are included in NMFS' socioeconomic assessments. Economic exposure estimates are based on industry surveys and estimates of for-hire passenger fees per reported trip.

3.1.3.4 Shoreside seafood businesses

In the appendix, economic exposure estimates of upstream (e.g., bait, ice, and gear suppliers) and downstream (e.g., seafood processors, wholesalers, and markets) fishing industries are recommended to be analyzed using state-specific economic impact tables from the Seafood Industry Impacts Tool, a product of NMFS' Fisheries Economics of the U.S. report, and the IMPLAN regional economic impact modelling software. However, the guidance acknowledges that other sources and methods may be appropriate, depending on the affected fisheries, such as if fishery-specific models have been developed. It acknowledges the potential biases of using IMPLAN or other input-output (I-O) regional economic modeling software to estimate impacts since they do not account for substitution, which can lead to overestimation. The guidance notes how prior economic impact analyses used for compensation agreements have used I-O models to identify a multiplier to be used against the revenue exposure calculation for determining sufficient funds for claims of revenue loss for the shoreside sectors.

3.1.3.5 Forecasting Revenue Exposure

The guidance discusses that in order to use the past economic exposure to forecast losses in the future, it is necessary to consider how to adjust these estimates for future changes. The guidance notes that adjustments may be warranted, including if landings are on an increasing or declining trend, or if there are other management trends that may affect the distribution of fishing effort that could affect the exposure estimates.

3.1.4 Summary of Direct Compensation Methodological Approach

In summary, the BOEM guidance presents three primary steps for calculating direct compensation fund amounts for compensating for lost income in fisheries industries. These steps are as follows:

Step 1. Estimate baseline exposure

Estimate baseline revenue exposure in relevant fisheries, based on affected fisheries, industries, and data available for each. Different approaches may be suitable and/or necessary depending on the affected fisheries and/or industries and the information currently available for each.

Step 2. Forecast revenue exposure

Baseline revenue exposure estimates may be adjusted to account for various factors which may affect the likely exposure in the future, including landings or management trends.

Step 3. Calculate minimum reserve amount

The adequate funds to be held in reserve must be calculated consistent with BOEM's guidance and must meet several minimum standards including:

- Standardizing all values to the most recent year available using the GDP Implicit Price Deflator
- Calculating the minimum reserve fund amounts as follows:
    - 100% of revenue exposure during construction and during decommissioning years and first year of operations
    - At least 80% of revenue exposure during the second year of operations, 70% in year 3, 60% in year 4, and 50% in year 5.

However, it should be noted that BOEM's guidance for minimum reserve amounts has not applied to states where final mitigation agreements have been approved (see BOEM 2024b for example).

3.2 Examples of Existing Fisheries Compensation Agreements

This section draws from the history of compensation agreements in the US resulting from current OSW development activities as well as other offshore activities (e.g., offshore telecommunications cable construction). We summarize the approaches used for these agreements to understand their composition and the socioeconomic impact approaches used to inform negotiations between OSW developers and the fishing industry.

3.2.1 East Coast OSW Project Fisheries Compensation Agreements

3.2.1.1 Summary of Fisheries Compensation Funds

Drawing largely on information in CZMA federal consistency concurrence documents for specific East Coast OSW projects, Table 1 summarizes the fisheries compensation programs or funds that project developers have established or agreed to establish. A fisheries mitigation measure not shown in the table, but which BOEM has required of all OSW projects, is a separate claim procedure used to compensate fishing operations for gear loss and damage that may occur during project construction, operations, and decommissioning. It should be noted that the final compensation amounts are not equal to the output of the impact methodologies described in the following sections, since those figures are used as the starting point for negotiations between states and developers to determine final compensation amounts.

Table 1 Summary of East Coast OSW Fisheries Compensation Programs and Funds by Project

State	Compensation Program/Fund	Compensation Amount
Vineyard Wind		
MA	Direct Compensation	$19,185,016
MA	Fisheries Innovation Fund	$1,750,000
RI	Direct Compensation	$4,200,000
RI	Fisherman's Future Viability Trust	$12,500,000
CT, NY, NJ	Direct Compensation	$3,300,000
South Fork Wind		
MA	Direct Compensation - Construction & Operations Mitigation Fund	$1,900,000
MA	Direct Compensation - Decommissioning Fund	$200,000
MA	Coastal Community Fund	$200,000
MA	Navigation Enhancement and Training Program	$300,000
RI	Direct Compensation	$4,250,000
RI	Coastal Community Fund	$950,000
Revolution Wind		
MA	Direct Compensation	$6,425,000
MA	Coastal Community Fund	$400,000
MA	Navigation Enhancement and Training Program	$500,000
RI	Direct Compensation	$12,000,000
RI	Coastal Community Fund	$300,000
RI	Navigation Enhancement and Training Program	$333,333
RI	Impacts Study	$300,000
RI state waters	Direct Compensation	$3,050,000
RI state waters	Coastal Community Fund	$200,000
Sunrise Wind		
MA	Direct Compensation	$9,788,000
MA	Coastal Community Fund	$1,000,000
MA	Navigation Enhancement and Training Program	$500,000
RI	Direct Compensation, commercial vessels	$15,980,000
RI	Direct Compensation, for-hire vessels	$958,000
RI	Navigation Enhancement and Training Program	$333,333
RI	Coastal Community Fund	$300,000
RI	Impacts Study	$50,000
New England Wind		
MA	Direct Compensation	$5,859,471
MA	Fisheries Innovation Fund	$1,500,000
RI	Direct Compensation	$4,373,638
RI	Commercial and Charter Fishermen Fund	$500,000
South Coast Wind		
RI	Direct Compensation	$250,000

State	Compensation Program/Fund	Compensation Amount
RI	Commercial, Charter, and Recreational Fishermen Fund	$30,000
MA	Direct Compensation Fund	$2,100,000
MA	Coastal Community Fund	$200,000
MA	Navigation Enhancement and Training Program	$300,000

Source: Adapted from Marine Affairs Institute (2024)

As shown in Table 1, developers of OSW project on the East Coast usually have created multiple funds to serve different purposes (Marine Affairs Institute 2024). Generally, developers based these funds, together with the contribution amounts, on the findings of the CZMA consistency reviews conducted by the relevant state(s) and the resulting mitigation agreements. Direct compensation funds are intended to compensate commercial and for-hire recreational fishermen for loss of income due to unrecovered economic activity resulting from displacement from fishing grounds during project construction, operations and maintenance, and decommissioning. In addition, developers have committed to creating separate funds for a myriad of other purposes. There may be funds to compensate shoreside businesses for revenue losses indirectly related to an OSW project. Eligible shoreside businesses may include fishing gear suppliers and repair services; vessel fuel and maintenance services; ice and bait suppliers; seafood processors and dealers; and seafood wholesale distributors. The Coastal Community Funds listed in Table 1 are typically grant-making entities and open to a variety of fishing interests. For example, the Coastal Community Fund established by the developer of South Fork Wind in its agreement with Massachusetts offers grants that support activities like improving infrastructure that supports the commercial fishing industry, increasing training and apprenticeship opportunities in coastal industries, and providing marketing support for local sea food products (Marine Affairs Institute 2024). For some OSW projects, developers have also agreed to create funds that 1) provide support for fishermen to upgrade their navigational and safety equipment; pay increased insurance costs related to fishing near wind farms; and develop new gear or fishing methods; and 2) provide support for studies of OSW project impacts on fisheries as well as for fisheries research and education. Generally, the agreements provide some mechanism for transferring excess funds in the direct compensation fund to funds that support fishing or coastal communities in general (Marine Affairs Institute 2024).

The fisheries compensation funds that developers have agreed to establish are administered in a variety of ways. Typically, direct compensation funds are held in escrow and administered by a third-party selected by the developer in consultation with the relevant state agency. An advisory council determines how the funds are used (Marine Affairs Institute 2024).

To date, fisheries compensation funds established for East Coast OSW projects have been designed in a project-by-project manner. Both state and federal actors have shown interest in trying to standardize this process (Marine Affairs Institute 2024). Most notably, in 2021, several East Coast states formed a working group to, among other things, support developing "a common and robust framework, methodology, criteria, and process for compensatory mitigation for fishermen that are

consistent, equitable, and transparent" (Special Initiative on Offshore Wind 2024). The group initially included Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Virginia. Delaware and North Carolina joined the effort in 2023. In April 2023, the working group published a framework to establish a regional fisheries compensation administrator that would distribute compensation based on a common set of rules and procedures for the East Coast region rather than a project-by-project approach. The framework addresses the administrator's responsibilities, a governance structure for the administrator, and the claims and appeals processes, among other things. In November 2024, through a competitively bid RFP process, BrownGreer in partnership with the Carbon Trust were selected to be the third-party independent entity to design and develop this regional fund (Special Initiative on Offshore Wind 2024). If the states successfully establish a regional fund, it may shape how current and future funds are administered along the East Coast (Marine Affairs Institute 2024).

3.2.1.2 Approaches to Estimating Revenue Exposure

The contribution to each of the direct compensation funds set up by developers of East Coast OSW projects has been based on the revenue exposure for commercial and for-hire fisheries operating from selected ports. The following sections describe approaches used to estimate the potential revenue exposure due to development of Sunrise Wind and New England Wind. The former analysis was prepared by the Woods Hole Oceanographic Institution (WHOI), and the latter was prepared by King and Associates, LLC. These two projects represent recent samples of the methods used by the two main contractors hired to develop impact assessments used for compensation agreements on the East Coast.

Sunrise Wind—Woods Hole Oceanographic Institution

WHOI was hired by Sunrise Wind to conduct fishery revenue exposure analyses for Massachusetts and Rhode Island commercial and for-hire fisheries. In the analyses for Massachusetts and Rhode Island, respectively, Kite-Powell et al. (2023a) and Kite-Powell et al. (2023b) estimated the level of pre-development fishing operations intersecting with, and landings and landed value from, the Sunrise Wind Lease Area (WLA) and Export Cable Corridor (ECC) associated with landings and revenue generated in Massachusetts and Rhode Island ports, and the potential exposure of Massachusetts-based and Rhode Island-based commercial and for-hire fishing to Sunrise Wind Farm construction, operations, and decommissioning.

The assessment method used in the WHOI analyses was consistent with the general framework described in the reports by Kirkpatrick et al. (2017a and 2017b) on socioeconomic impact of offshore wind energy development on commercial fisheries, and builds on the approach described in Rhode Island Department of Environmental Management (2017, 2018, and 2019), which develops high-end estimates of fishery impacts by including in baseline estimates the entire trip revenues from all trips that overlap with a wind lease area, regardless of how much fishing occurred inside or outside the area. The analyses assume that landings from an area where access is constrained during

construction, operations, or decommissioning are simply forgone, and not compensated by landings from fishing elsewhere.

To assess the direct economic impacts to commercial fisheries, the WHOI analyses used NMFS estimates of annual landed weight and value of fish from the WLA and ECC that were based primarily on Vessel Trip Report (VTR) and observer data (based on methods described in DePiper (2014) and Benjamin et al (2018).[7] They then estimate the fraction of this annual value that may be exposed to wind farm development based on the nature and schedule of construction activities, operating plans, and decommissioning plans, and on information from the scientific literature on the effects of wind farm construction and operation on commercial fish stocks and landings.

Five categories of possible revenue exposure for commercial fishing from the Sunrise Wind project were considered:

- Transient effects on fish availability due to construction activities and noise
- Transient effects due to constrained access to certain areas during construction
- Changes in fishing in the WLA during operations
- Transient effects due to constrained access to certain areas during decommissioning
- Transient effects on fish availability due to decommissioning activities

The assumptions and effects on fish availability and fishing activity/landings are summarized in Table 2 for each project phase and project area.

Table 2 Assumptions for Estimating Revenue Exposure of Commercial Fisheries Due to Sunrise Wind Development by Category of Potential Exposure

Area	Assumptions/Effects	Duration
Availability effects due to construction		
WTGA+5km	100% of finfish leave area	1 year
WLA	Lobster/crab landings reduced 10%	1 year
WLA	Other shellfish landings reduced 10%	4 years
ECRA, 1.6km WA	All landings reduced 10%	1 year
ECRA, 180m ECC	Lobster/crab landings reduced 25%	1 year
ECRA, 180m ECC	Other shellfish landings reduced 25%	4 years
Construction constrained access		
WLA	No fishing in 50% of area	1 year
ECRA, 1.6km WA	No fishing in 5% of area	6 months
ECRA, 180m ECC	No fishing in 100% of area	2 months

[7] As noted by WHOI, the DePiper methodology is agreed upon as the best available approach for spatially distributing reported landings to fishing effort at sea on the US East Coast. Alternate methods using VMS data have been produced, but have been shown to lead to misrepresentations of fishing locations.

Area	Assumptions/Effects	Duration
Effects during operations		
WLA	Landings reduced by 5%	30 years
ECRA, 1.6km WA	None	N/A
ECRA, 180m ECC	None	N/A
Availability effects due to decommissioning		
WLA	None beyond constrained access	N/A
ECRA, 1.6km WA	All landings reduced 5%	1 year
ECRA, 180m ECC	Lobster/crab landings reduced 12.5%	1 year
ECRA, 180m ECC	Other shellfish landings reduced 12.5%	4 years
Decommissioning constrained access		
WLA	No fishing in 50% of area	1 year
ECRA, 1.6km WA	No fishing in 5% of area	2 months
ECRA, 180m ECC	No fishing in 100% of area	2 months

Notes: WTGA = Wind Turbine Generator Area; WLA = Wind Lease Area; ECRA = Export Cable Route Area; WA = Export Cable Corridor Working Area; ECC = Export Cable Corridor. Km=kilometer, m= meter

Source: Kite-Powell et al. (2023a) and Kite-Powell et al. (2023b)

Effects During Construction

For the purpose of estimating transient effects on fish availability due to construction activities and noise, a Wind Turbine Generator Area (WTGA) was defined as the subset of the WLA in which turbine generator towers are to be located.[8] As described in Table 2, as a result of the noise effects of pile driving in and around the WLA, 100% of finfish are assumed to leave the WTGA and a 7.5 km buffer zone around the WTGA for the duration of pile driving (up to nine months) and return after a further three months (total of one year); 10% of the lobster, crab, and other shellfish populations within the WLA are assumed to be adversely affected by pile driving noise, seabed disturbance around foundations, and cable installation during construction, and thus lost to fishing.

To estimate commercial fish landings along the ECC, a 10 km-wide Export Cable Route Area (ECRA) was defined (5km on either side of the cable route). Landings were assumed to be distributed uniformly across the fished sections of the ECRA. The greatest effects of burying the cable are likely to be due to habitat disruption along the immediate cable route. Only portions of the 180 meter wide ECC centered on the export cable would be disturbed in the process. The habitat disruptions that impact non-mobile benthic species are likely to extend on average no more than 5-10m on either side of the immediate cable route—at most 12% of the ECC and 2% of the 1.6km-wide Export Cable Corridor Working Area (WA). To be conservative, it was assumed that there would be a 25% reduction in landings of all shellfish for two years and all non-mobile shellfish over five years from the ECC, and a 10% reduction in landings for all species for one year from the WA.

[8] For the WTGA, WHOI used the indicative turbine layout from the COP (Figure 3.3.4-1, Sunrise Wind LLC 2022).

With respect to transient effects due to constrained access during construction, it was assumed that fishing would be constrained in half of the WLA for two years, and in 5% of the WA for 12 months. In addition, it was assumed that fishing would be constrained within all of the ECC area immediately around the export cable route for a period of nine months as the cable is buried.

Effects During Operations

Fishing activity constraints during wind farm operations apply only to the WLA; it was assumed that fishing along the ECC would not be constrained during operations. The footprint of the Sunrise Wind project area is 43,060 hectares, of which permanent structures occupy less than 10 hectares, or 0.03% of the total area. A 100 m radius area around each of the turbine towers and the converter station accounts for about 0.7% of the total WLA, suggesting that less than 1% of the WLA area may be lost to fishing. Mobile gear (dredge, trawl) fishing accounts for less than half of landed value from the WLA. It was conservatively estimated that 5% of total baseline landings from all stocks within the WLA would be lost to fishing during operations.

Effects During Decommissioning

Because cable removal is less disruptive than burial, the availability effect for decommissioning was assumed to be half that of cable installation. The fishing activity constraints along the export cable route are assumed to be similar to those during cable laying operations, but likely for a shorter duration—5% of the WA and 100% of the ECC for a total of two months.

Impacts on For-Hire Fisheries

The WHOI analyses also estimated the gross revenue associated with for-hire charter boat fishing activity originating in Massachusetts and Rhode Island, and the fraction of this revenue that may be exposed due to development of Sunrise Wind. To obtain data on for-hire charter fishing activity in the WLA and ECC, an online survey of Rhode Island- and Massachusetts-based charter vessel operators was conducted. The survey asked operators to identify their fishing locations on a chart, and report for each location:

1) the total number of annual for-hire fishing trips that vessel took in each of the years 2017–2021;

2) the average number of passengers onboard for-hire trips in each of the years 2017–2021;

3) the average amount of time spent targeting highly migratory species relative to bottom fishing or trolling for other species during for-hire trips.

The number of anglers per year was estimated by multiplying the vessel trip number in a year and the average number of anglers per trip in that year for each vessel. The results were then summed across vessels for fishing that occurred in three areas: WLA + 7.5km buffer; WTGA + 7.5km buffer; and ECRA.

Next, the annual revenue for each area was estimated by multiplying the number of anglers in the area by VTR-based average revenue per angler estimates from NMFS. The result was then adjusted using a scale factor. For a low-end estimate, the scale factor was the ratio of the number of vessels responding to the survey to the number of these vessels for which specific fishing locations were provided. For a high-end estimate, the scale factor was increased to reflect the estimated total of vessels operating in the survey areas versus the number of vessels for which survey responses were received.

The WHOI analyses assumed that the value of charter fishing in the WLA + 7.5km buffer and ECRA is foregone during construction and decommissioning due to noise effects on fish availability. Given that much of the charter fishing around the WLA takes place outside the WLA footprint and the 1 nautical mile spacing of the turbine towers, it was assumed that charter fishing boats would be able to operate in and near the WLA during the operations phase, and, therefore, charter fishing revenue would not be affected. Therefore, the calculation of revenue exposure was based on the WLA + 7.5km buffer and ECRA. As with the revenue exposure value for the commercial fishery, a 5% discount rate[9] was applied to convert future effects to a common basis. To estimate the overall economic impact associated with changes in charter fishing direct revenue, an economic impact multiplier was calculated using data collected in a nationwide survey of marine recreational anglers (Lovell et al. 2020).

Shoreside Impacts and Multipliers

To assess indirect and induced economic impacts to commercial fisheries, the WHOI analyses developed upstream and downstream multipliers for the commercial fishing industries in the two states. Upstream multipliers were based on regional economic models for Massachusetts and Rhode Island using the IMPLAN I-O modeling software. For the Massachusetts analysis, the downstream multiplier was based on one cited in BOEM (2021)[10]; for the Rhode Island analysis, the downstream multiplier was based on discussions with Rhode Island seafood industry representatives. The upstream and downstream multipliers were combined to provide a single output multiplier for the entire commercial fishing sector in a given state.

Discount Rate and Accounting for Inflation

The WHOI analyses used the Bureau of Labor Statistics' Producer Price Index for "unprocessed and prepared seafood" to convert the historical ex-vessel value of fish landings from nominal dollars to real dollars for a common year to account for the effects of inflation over time on the base revenue exposure estimate. To calculate the present value of revenue exposure across the entire timeline of the OSW project from construction to decommissioning, these future effects were converted to a

[9] A discount rate is applied to calculate the present value of future cash flows (and is distinct from economic adjustments made to account for inflation). 5% represents the average of 3% (cited as a typical rate used in natural resource valuation) and the rate used at the time by the US government for public investment and regulatory analyses (7%).

[10] Likely based on the analysis completed by King and Associates which used the Fisheries Economics of the US report's estimate of a commercial fisheries multiplier for Massachusetts.

common basis using a real discount rate of 5%. This rate is the average of the rate usually applied in natural resource valuation (3%) and the rate usually applied by the US government for public investment and regulatory analyses (7%).

WHOI Analyses Versus BOEM Guidance

The WHOI analyses include a description of how the revenue exposure estimates provided relate to the BOEM draft fisheries mitigation guidance (see Section 2.3.2). The authors emphasize that the BOEM guidance is to ensure that adequate reserve funds are in place for direct compensation of lost fishing income, not to estimate likely losses. The authors state that their analyses represent the latter, and take into account project-level considerations, such as turbine spacing, in the assumptions about the amount of space that will be precluded from fishing, especially during operations.

Negotiated Compensation Agreement and Analysis Criticisms

The CZMA federal consistency reviews of Sunrise Wind completed by Massachusetts (Massachusetts Office of Coastal Zone Management 2023a) and Rhode Island (Rhode Island Coastal Resources Management Council 2023) noted that the developer's compensatory mitigation offers were based in part on WHOI's revenue exposure assessments. However, after consulting with a "subject matter expert" hired to analyze the WHOI analysis, the Fisheries Advisory Board of the Rhode Island Coastal Resources Management Council expressed "considerable disagreement regarding the economic exposure valuation" (Rhode Island Coastal Resources Management Council 2023).[11] Among the WHOI assumptions criticized by the consultant was the estimated 5% reduction in landings during the wind farm's operation. According to the consultant, the loss would be greater since many fishing vessels will avoid the area entirely rather than risk safety hazards of gear entanglement (Lavin 2023). Other disagreements included the choice of discount rate. Additionally, others have disputed the accuracy and precision of the NMFS data and data products used to apportion fishing effort to space. Livermore and Guilfoos (2024) describe alternate methods and suggest that multiple data products should be considered when evaluating management alternatives.

New England Wind—King and Associates LLC

While WHOI was contracted by developers for revenue exposure analyses for Revolution Wind as well as Sunrise Wind, Dr. Dennis King, of King and Associates, LLC was similarly contracted by developers of other East Coast OSW projects, including Vineyard Wind I, New England Wind, and Vineyard Wind Northeast.

Here, we briefly summarize the main components of the approach used by King and Associates for New England Wind in order to facilitate comparisons to the approach in BOEM's draft fisheries mitigation guidance and the approach used by WHOI. Information in this section comes largely from the Massachusetts's CZM Consistency Review (dated November 9, 2023, Massachusetts Office of Coastal Zone Management 2023b) and relevant attachments, for information about the original

[11] The consultant was Kyle Antonelis, a fisheries analyst with Natural Resources Consultants, Inc, Seattle, WA.

revenue exposure methods used by Dr. King, as well as additional information used for the compensatory mitigation package (Avangrid 2023, provided in Massachusetts Office of Coastal Zone Management 2023b).

The revenue exposure calculations, similar to the WHOI approach, were based on data and analysis from NMFS, consistent with BOEM's draft fisheries mitigation guidance. Additional work was done to calculate exposure for two data limited fisheries, Jonah crab and lobster. The approach generally makes reference to the BOEM guidance and generally refers to the purpose of the revenue exposure as an indicator of potential economic impacts, not predicted or expected economic impacts. It states that likely economic impacts are likely lower than the full exposure estimate, since exposure does not take into account how much fishing vessels will move their fishing operations to areas outside the OSW energy areas (reducing the amount of revenue impacted by the development) or the extent that fishing will not occur at all (which reduces costs to fishermen that otherwise would have been incurred).

Specifically, the components of revenue exposure considered in the analysis consist of the following:

- The area of impact (lease area or offshore export cable corridor [OECC] including any buffer), and baseline revenue that are attributed to that area
- The duration of impact during each phase of construction, operations, and decommissioning
- Assumptions or effects that affect the proportion of baseline revenue that will be exposed in any given year or time period

For this analysis, all of these components are summarized in Table 3 below. Largely, information about the area of impact and duration of impact come directly from the COP. The methodology used to determine the baseline revenue estimate itself varies between the lease area and the OECC.

Table 3. NE Wind Economic Exposure Analysis Assumptions by Project Phase

Area	Assumption/Effects	Duration of Economic Exposure
Construction		
Lease Area	All (100%) commercial and for-hire charter revenue lost	3 years
OECC	All (100%) commercial revenue lost from 3.14km fishing preclusions area around cable installation activities	2 years
O&M		
Lease Area	Draft BOEM guidance 1-5 years (100%–50% reduction in revenue)	5 years
Lease Area	Commercial fisheries revenue reduced by 5%	25 years
OECC	None	n/a
Decommissioning		
Lease Area	All (100%) commercial and for-hire charter revenue lost	3 years
OECC	All (100%) commercial revenue lost from 3.14km fishing preclusions area around cable installation activities	2 years

Source: Avangrid 2023

Lease Area Revenue Exposure Estimation

For the Lease area, a 14-year average fishing revenue estimate was generated from NMFS as the amount of revenue attributable to the lease area; however, it only includes fisheries where federal VTRs are submitted, so excludes some information for the lobster and Jonah crab fisheries. As a result, adjustments were made to the estimate to account for these fisheries by estimating the proportion of effort (pots) that are covered by VTRs (since they may be fishing in other federally permitted fisheries) in the relevant management area. Unreported revenue was then estimated using NMFS estimate of what the average revenue per pot fished is coming from the Lease Area, plus an adjustment factor of 25% based on expert opinion from the Massachusetts Department of Marine Fisheries (MA DMF) that suggested that non-federally permitted fishermen were more likely to have higher per-pot revenue than federally-permitted fishermen.

For-Hire Charter Fisheries Revenue Exposure was also estimated (see New England Wind COP Appendix III-N: Appendix A as provided in Massachusetts Office of Coastal Zone Management 2023b). This was based on the approach described previously used by WHOI for Sunrise Wind, including using a 2022 survey of charter vessel operators and their fishing locations, and an estimate of revenue per angler and number of anglers per trip. Here, the estimate of revenue per angler was from Steinback and Brinson (2013) instead of the VTR estimate used by Kite-Powell et al. (i.e., WHOI, described above), based on feedback from MA DMF staff.

Table 4. New England Wind For-Hire Fisheries Exposure Calculations

State	For-hire Vessels Operating Annually in Survey Area	Average Annual Trips per Vessel	Total Annual Trips by For-hire Vessels in Survey Area	Total Annual Trips by For-hire Vessels in Lease Area	Average Number of Anglers per Trip	Average Revenue per Angler ($2021)	Total Annual For-hire Fishing Revenue in Lease Area
Massachusetts	60.5	47.3	2,862	106	5.41	$184.37	$105,729
Rhode Island	39.5	47.3	1,868	69	5.41	$184.37	$68,823
Total	**100**	**47.3**	**4,730**	**175**	**5.41**	**$184.37**	**$174,552**

Source: New England Wind COP. Appendix III-N, Appendix A as provided in Massachusetts Office of Coastal Zone Management 2023b

Offshore Export Cable Corridor Revenue Exposure Estimation

As stated previously, impacts for the OECC were only assumed to occur during OECC construction and decommissioning. Thus, exposure for the OECC was estimated as the product of the annual fishing revenues per unit area in the OECC, the area unavailable to fishing (the area of installation and 1 km buffer), and the duration of construction/decommissioning.

In order to provide a more conservative estimate, high and low economic exposure estimates were also provided to reflect seasonal variability, based on monthly average fishing revenue per square kilometer in the OECC, based on data from NMFS.

Shoreside Impacts and Multipliers

Ultimately, shoreside impacts were also accounted for in the assessment of economic impacts by applying multipliers to the total commercial and for-hire fisheries exposure estimates (Avangrid 2023). The multiplier for commercial fisheries was derived from the Fisheries Economics of the US report, produced by NMFS (in contrast to the method used in Sunrise Wind, described previously), while the for-hire multiplier was derived from Lovell et al. 2020 (consistent with approach used in the Sunrise Wind).

Discount Rate and Other Economic Adjustments

The final New England Wind economic exposure analysis used for their mitigation package (Avangrid 2023) calculates the present value of the economic exposure estimates for all stages of the project development (See Table 5). For this, it first adjusts the baseline estimate from nominal values (as described in Dr. King's analysis) to real terms, using the GDP Implicit Price Deflator (consistent with BOEM guidance). It then discounts the value of revenue exposed in all future time periods using a discount rate of 5% to generate a total economic exposure amount in terms of its present value. Shoreside impacts are included in the final economic exposure calculations (Table 6) using multipliers from NMFS' Fisheries Economics of the US report (for commercial fisheries) and Lovell et al. 2020 (for for-hire fisheries).

Table 5. NE Wind Fisheries Economic Exposure Analysis Assumptions

Project Phase	Project Area	Massachusetts Fisheries Revenue
Construction	Lease Area	$819,935
Construction	OECC	$8,177
O&M	Lease Area	$967,595
O&M	OECC	$0
Decommissioning	Lease Area	$163,882
Decommissioning	OECC	$1,634
Commercial Fisheries Economic Exposure	N/A	$1,961,223
For-hire Recreational Fisheries Economic Exposure	N/A	$379,546
Total Massachusetts Fisheries Economic Exposure	**N/A**	**$2,340,769**

Source: Avangrid 2023. Values discounted using 5% discount rate. All values in 2023 dollars adjusted using the GDP Implicit Price Deflator.

Table 6. Economic Impacts with Multipliers for Commercial and For-hire Fisheries

Fisheries	Massachusetts Economic Impacts with Shoreside Multipliers
Commercial Fisheries	$5,216,854
For-hire Fisheries	$617,521
Total Fisheries	**$5,834,374**

Source: Avangrid 2023. Represents discounted value over 36 years using a 5% discount rate. Note the multiplier for MA commercial fisheries is 2.66, which includes an upstream multiplier of 1.83 and a downstream multiplier of 0.83 (based on the Fisheries Economics of the US 2020 Report) and the for-hire multiplier is 1.627 from Lovell et al. 2020.

Indirect Sources of Economic Exposure

In addition to the analysis of the potential direct sources of income loss due to OSW development, evaluations of potential indirect sources of economic exposure were also included in the analysis by Dr. King. These specifically included potential congestion impacts in areas outside of the OSW due to displaced fishing effort as well as impacts on transit routes and associated increases in operating costs. Here we briefly summarize the analyses conducted for both.

Congestion Impacts

In order to evaluate potential crowding and congestion resulting from OSW development activities, Dr. King explored related data and analyses conducted for the project, specifically Baird and Associates' Navigation Safety Risk Assessment (Baird 2021). This relied on Automatic Identification System (AIS) data to evaluate seasonal vessel traffic patterns and estimate the number of vessels transiting through the development areas. Based on this, it was determined that the vessel traffic in the development areas were relatively low and that the proportion of time vessels spent within the OSW areas compared to total effort was also low, indicating that congestion outside the areas was not expected to occur.

Impacts on Transit Costs

To evaluate impacts on transit costs, Dr. King also relied on the Navigation Safety Risk Assessment data and analysis (Baird 2021). Because it states that it was not possible to predict how many annual transits through the lease area would be rerouted around it both during and after construction, the analysis assumes that all transits would be rerouted. It uses estimates of average steaming speed, minimum and maximum increases in transit times, assumed fuel consumption rate, and dockside fuel price to estimate total annual increases in fuel costs for all AIS-equipped vessels with a history of transiting through the lease area. The analysis notes that this methodology is sensitive to its assumptions, where variability in any factor may impact the estimate. It also notes that this estimate does not account for the opportunity cost of lost fishing time or other operating costs. Despite this, the analysis suggests that the estimate is still likely conservative based on the assumption that all transiting vessels will be rerouted, since it states that it is more likely that most vessels will be able to continue transiting through the lease area.

3.2.2 California Fisheries Compensation Agreements

3.2.2.1 Commercial Fishing Industry Improvement Fund of the Central California Joint Cable/Fisheries Liaison Committee

A study of stakeholder perceptions of offshore wind energy in Humboldt County, California reported that fishermen "overwhelmingly cited an interest in developing general fund for the fleet where compensation could be held and utilized in ways that benefit the fleet as whole" (Emery et al. 2020). Fishermen cited the Commercial Fishing Industry Improvement Fund (Fund) administered by the

Central California Joint Cable/Fisheries Liaison Committee (Committee) as a potential template for allocating compensation benefits.

The Fund was established in the late 1990s as part of a mitigation package for the development of undersea telecommunications cables in Morro Bay. At the time, fishermen expressed concern about losing fishing gear that became snagged on the cables (Starosielski 2012). The Committee is a 501(c)6 nonprofit mutual benefit corporation that was formed concurrently with the execution of the 1999 *Interim Agreement Between Cable Companies and Fishermen*. The purpose of this Agreement, which was finalized in 2002, was "to identify, establish, and confirm certain mitigation measures and monitoring programs which are intended to facilitate environmental review of the cable projects, reduce potential conflicts between the installation, continuation, and maintenance of the cable projects and commercial fishing activities along the California coast" (Central California Joint Cable/Fisheries Liaison Committee 2002). The Committee is governed by a Board of Directors comprised of local trawl fishing representatives, cable company representatives, and fishermen's association representatives (Central California Joint Cable/Fisheries Liaison Committee 2024a).

Each cable company must annually deposit $100,000 per undersea cable project in the Fund for enhancement of the commercial fishing industry in San Luis Obispo County (Central California Joint Cable/Fisheries Liaison Committee 2024b). Money in the Fund is doled out as project grants. At any regular meeting of the Board of Directors, the members may award a grant to an approved project. Projects that were awarded grants in 2024 include a fishing heritage scholarship program and projects intended to protect fleet access to commercial fisheries and to preserve the Dungeness crab fishery. In addition, the Committee uses the Fund to support its Commercial Fishing Vessel Safety Equipment Reimbursement Program, which provides grants to fishermen for items such as Emergency Position Indicating Radio Beacons, VH radios, and survival suits, and for activities such as repacking life rafts at the end of the fishing season (Central California Joint Cable/Fisheries Liaison Committee 2024b).

In addition to forming the Committee and Fund, the *Agreement Between Cable Companies and Fishermen* established a separate claim procedure used to compensate fishing operations for gear loss and damage. Each cable company must pay for the full costs of gear lost or damaged by a fishing vessel as a result of being snagged on a cable owned and/or operated by that cable company. The cable company must also pay a premium in the amount of 50% of the value of the sacrificed gear to settle claims for loss of business incurred by the vessel. The cable company is responsible for disbursing payments for the gear replacement costs and claims (Central California Joint Cable/Fisheries Liaison Committee 2002).

In reviewing the literature for information about the Commercial Fishing Improvement Fund, no direct information about specific methodologies used to estimate impacts or otherwise guide the compensation agreements were identified.

3.2.2.2 California OSW Community Benefit Agreements

A Community Benefit Agreement (CBA) is a legally binding, enforceable contract signed by community benefit groups and a developer, identifying the community benefits a developer agrees to deliver in return for community support of the project. Community benefit groups consist of coalitions of stakeholders who represent the interests of residents affected by proposed developments (US Department of Energy 2017).

CBAs are not a required part of the BOEM OSW development process, but developers can choose to pursue them in parallel with BOEM-permitted surveying and additional activities. As an incentive for developers to provide CBAs during the California OSW leasing process, BOEM offered bidding credits for workforce, supply chain manufacturing, and CBAs as voluntary elements in the Final Sale Notice and December 2022 auction. Each developer included initial plans and strategies for bidding credits to BOEM in their Bidder's Financial Form (submitted before the auction), which, if accepted, reduced the cost of a developer's winning bid. In return for those reductions in payment, lessees must deliver executed CBAs by the time they submit the first Facility Design Reports or pay the value of the bid credit to the US Treasury (UC Berkeley Center for Law, Energy & the Environment 2024).

In the Final Sale Notice, BOEM defined two types of CBAs. A Lease Area Use CBA is an agreement between a developer and "one or more communities, stakeholder groups, or Tribal entities whose use of the geographic space of the Lease Area, or whose use of resources harvested from that geographic space, is expected to be impacted by the Lessee's potential offshore wind development." The other type of CBA referred to in the Final Sale Notice is a General CBA, which is established with "one or more communities, Tribes, or stakeholder groups that are expected to be affected by the potential impacts on the marine, coastal, and/or human environment (such as impacts on visual or cultural resources) from activities resulting from lease development that are not otherwise addressed by the Lease Area Use CBA."

All the OSW wind developers that won leases in the Morro Bay WEA and Humboldt WEA agreed to provide Lease Area Use CBAs but not all agreed to provide General CBAs. Table 3 shows the monetary commitments in each CBA (amounts are delineated in each executed lease). The value ranges from $5 million to roughly $6.7 million among the different lessees, depending on the amount each lessee was awarded in bidding credits (UC Berkeley Center for Law, Energy & the Environment 2024).

Table 7. Community Benefit Agreements of OSW Wind Developers in Morro Bay WEA and Humboldt WEA

Developer	Monetary Commitment Lease Area Use CBA	Monetary Commitment General CBA
RWE Offshore Wind (Humboldt)	$6,065,385	$6,065,385
California North Floating (Humboldt)	$6,684,615	$6,684,615
Equinor Wind (Morro Bay)	$5,000,000	$5,000,000
Golden State Wind (Morro Bay)	$6,012,000	$0
Invenergy California Offshore (Morro Bay)	$5,558,462	$5,558,462

Source: UC Berkeley Center for Law, Energy & the Environment 2024)

As listed in UC Berkeley Center for Law, Energy & the Environment (2024), Lease Area Use CBA requirements in the executed leases are as follows:

- Benefits delivered can include financial as well as non-monetary benefits
- However, the developers cannot include benefits in the Lease Area Use CBA that overlap with a) other benefits the developers are required to provide under other statutes (except for the Outer Continental Shelf Lands Act), or b) the benefits provided under a lessee's other bidding credits.
- The CBA "may assist fishing and related industries (including Tribal fisheries) by supporting their resilience and ability to adapt to gear changes or any potential gear loss or damage, as well as any loss of income, or other similar potential impacts that may arise from the development of the Lease Area."
- The agreement can include payments to a special fund and can include financial support for new gear, navigation and/or safety upgrades, or monies "to compensate the fishing and related industries whose use of the geographic space of the Lease Area is impacted by the Lessee's potential offshore wind development."
- Importantly, the CBA "may apply within a reasonable distance onshore."

The requirements for General CBAs overlap significantly with the Lease Area Use CBAs (UC Berkeley Center for Law, Energy & the Environment 2024). Examples of benefits that could be included in the General CBAs include:

- Payments to a community fund, with the function of providing monies to mitigate the impacts of the developer's project.
- Support for engaging in the process of developing the CBA.
- Mitigation of impacts to cultural viewsheds or to species (land and water) that are culturally significant to Tribal Nations or impacted communities.

Castle Wind Fishermen's Agreement and CBA

The OSW developer Castle Wind LLC was one of 43 entities that qualified to bid for leases in the Morro Bay WEA and Humboldt WEA (UC Berkeley Center for Law, Energy & the Environment 2024). Prior to the 2022 auctions, Castle Wind negotiated and signed a CBA with the City of Morro Bay and two commercial fishermen's organizations (Morro Bay Commercial Fishermen's Organization and Port San Luis Commercial Fishermen's Association) after several years of collaboration and discussion. Although the company did not win a lease, the Castle Wind CBA and its current

incarnation, the Morro Bay Mutual Benefits Corporation, may provide a good model for a Lease Area Use CBA.[12]

In 2018, after engaging in extensive review of the potential economic and other impacts of the proposed OSW project on commercial fishing activities in the vicinity of the project, Castle Wind and the fishermen's organizations entered into the *Fishermen's Agreement* (Castle Wind LLC 2019a). Under the agreement, Castle Wind committed to minimize and mitigate the anticipated impacts to the commercial fishermen from Morro Bay and Port San Luis who operate within the Morro Bay WEA, underwater export cable corridor, and area proximate to the OSW project. The agreement would have, among other things, created a fund for infrastructure improvements to benefit the local commercial fishing industry. The fund would have been composed of annual contributions by the developer, equal to a percentage of the annual operating fees that Castle Wind will make to BOEM after the commercial operation date. The agreement specifies that the fund would be used for improvements to port infrastructure and fishing industry grants, which could include improvements to slips and docks, safety equipment, equipment purchases or repairs, improvements of repair of storage, fuel docks, cold storage facilities, etc. Other stated uses included low-cost loans, community outreach, college scholarships, and internships (Castle Wind LLC 2019a).

Additional components of the *Fishermen's Agreement* specify the following:

- Members of the Morro Bay Commercial Fishermen's Organization and Port San Luis Commercial Fishermen's Association would have the right of first offer to provide certain qualified services to Castle Wind during construction and operation of the OSW project
- Castle Wind would provide training opportunities to qualified members of the Morro Bay Commercial Fishermen's Organization and Port San Luis Commercial Fishermen's Association to apply their existing skills to the offshore wind industry
- Castle Wind would consult with the Morro Bay Commercial Fishermen's Organization and Port San Luis Commercial Fishermen's Association about the design of the offshore wind project and would also strive to minimize restrictions on commercial fishing in the project area.

An analysis of the economic and fiscal impacts of Castle Wind's proposed OSW project was included as an attachment to the Castle Wind CBA (Castle Wind LLC 2019b). Using IMPLAN I-O modelling software, the study largely focused on the potential direct, indirect, and induced impacts of the project on local economies. However, with respect to fisheries specifically, the study also summarized findings presented in Kirkpatrick et al. (2017a), which reported that the potential economic impacts to commercial fisheries as a result of OSW development on the East Coast ranged between a -2.2%

[12] Winning bidders can choose to sign onto the Morro Bay Mutual Benefits Corporation, or they may opt to design their own CBAs in coordination with the relevant communities. In addition, the organization is open to any fisher that can prove they have been fishing in the Morro Bay WEA even if they are not members of the above-mentioned fishermen's organizations (UC Berkeley Center for Law, Energy & the Environment 2024).

and 0.6% change in annual operating fishing revenue (revenue minus operating costs). The study notes that Kirkpatrick et al. concluded that these deviations were within interannual variations, resulting in generally neutral impacts.

4 Socioeconomic Impacts of OSW on Fisheries

4.1 Socioeconomic Impacts of OSW on Fisheries

There is a growing body of literature devoted to evaluating the socioeconomic impacts of OSW development on fisheries. Here, we focus on providing a high-level overview of recent studies which have synthesized information about what is known about economic impacts of OSW on fisheries (Chaji and Werner 2023), and indicators available for assessing socioeconomic impacts (Willis-Norton et al. 2024). These studies are highly relevant in terms of characterizing what is known about key impacts and available methods. We provide this review in order to facilitate comparison to the information and approaches used in extant compensation-related methodologies and the types of impacts that are covered by these methods.

4.1.1 Economic Impacts to Fisheries

Chaji and Werner (2023) provides an overview of industry perceptions, methods, results, and knowledge gaps with respect to economic impacts of OSW on the fishing industry. The paper focuses on four key areas of interest: fuel expenditures; insurance costs; fishing revenues, incomes, and livelihoods; and fishing support businesses. These areas of interest were informed by a group of fishing industry and offshore wind experts and built off of a series of workshops held in October of 2020. The paper reviewed both published works and relevant white papers relevant to both commercial and recreational fisheries; however, it notes that fewer resources were available to evaluate recreational fisheries, potentially due to more limited models on recreational demand and lack of spatial catch data. Here we summarize findings across the major areas of interest.

Fuel Expenditures

Chaji and Werner (2023) note that at the time of their review, few studies were available that explicitly estimated potential impacts on fuel expenditures, though some studies have evaluated impacts on net revenue, including changes to all operating costs and revenue (Kirkpatrick et al. 2017a), Despite this, the paper notes that increases in fuel usage have been observed (for example, in European contexts) or are expected to occur given disruptions in vessel navigation and changes in fishing location. Several mitigation measures have been proposed to offset increases in fuel expenditures spanning fuel subsidy programs, vessel engine replacement programs, and designated transit lanes. For the latter, it notes that several research projects are underway to better understand and map vessel navigation through East Coast wind energy areas. The paper underscores that to understand specific impacts to fuel expenditures, baseline data are needed, which on the East Coast are not collected systematically and fuel costs have not been estimated specifically. In addition, once baseline data are available, an understanding of how transiting and fishing location patterns would change would also be needed, necessitating the development of location choice models.

Fishing Industry Revenues, Income, and Livelihoods

Chaji and Werner discuss that while prior work on fishing industry perceptions have found that there are widely held expectations of negative impacts to commercial fishing revenue and income resulting from displacement, overcrowding, and property loss or damage, there are limited studies on the realized magnitudes of these impacts. Prior quantitative studies evaluating the impacts of OSW on revenue and income in the US have largely been based on revenue exposure calculations and have not explicitly captured impacts due to displacement, overcrowding, or property loss or damage. Chaji and Werner discuss how different methods have been used to determine revenue exposure on the East Coast that use different spatial fishery data spanning vessel trip reports, observer data, vessel monitoring system data, and combinations of data sources (primarily those used by Kirkpatrick et al 2017a; DePiper 2014; Benjamin et al. 2018; and RI DMF 2017). The authors note that a primary limitation of using revenue exposure for an indicator of potential impacts is that it does not consider changes in harvesters' participation or fishing behavior, including the ability to recoup losses from alternate fishing locations. Further, the authors note that understanding recreational demand and changes in response to OSW development is another knowledge gap with limited preexisting literature.

Cost of Insurance

Chaji and Werner discuss several concerns with respect to the cost of insurance when fishing in OSW development areas including:

- Premium increases due to increases in navigational hazards
- Liability for damage to subsea cables
- Validity of current insurance when fishing in OSW areas
- Avoidance of OSW development areas due to insurance concerns

However, despite these concerns, there has been limited evaluation of potential or realized insurance effects due to OSW development. The authors note that in prior compensation agreements, potential insurance-related effects have been included in direct compensation agreements, based on revenue exposure calculations. The authors suggest that both data on past insurance rates as well as an improved understanding of factors that determine rates are needed to estimate changes in insurance rates due to OSW development. However, the authors note that even then, considerable obstacles would remain in accurately estimating insurance effects.

Support Businesses

Chaji and Werner describe how to fully account for economic impacts to fisheries, both upstream and downstream impacts of offshore wind development activities must be considered on fisheries supply chains and associated businesses. However, like other types of impacts, the authors note that there

are considerable data and knowledge gaps about these related industries. Despite these limitations, recommended methodologies for evaluating these impacts have coalesced around using regional economic impact models (also called I-O models) to evaluate total economic impacts associated with fishing industries, which rely on assumptions about connections and relationships between industries in the regional economy based on information about expenditures in one sector (here, the fish harvesting sectors). Such methods evaluate direct, indirect and induced impacts with respect to employment, income, output, and tax revenue. The paper goes into greater detail about the variety of both general and specific models that have been applied in commercial and recreational fisheries contexts for OSW development and the general limitations of these models.

4.1.2 Indicators Available to Evaluate Socioeconomic Impacts of OSW Development

Willis-Norton et al. (2024) synthesized available information on data and indicators used to evaluate impacts of fishery displacement effects and shifts in fished species to inform OSW analyses, including the design of monitoring plans and impact analyses. Table 4 provides a high-level summary of the types of indicators reviewed and their availability to inform consideration of what indicators might be included in a socioeconomic impact methodology for California fisheries. An important consideration for the methodology will be how to adapt indicators for prospective use, or to understand impacts of OSW projects before construction begins, which may be different than how they may be used in retrospective analysis settings.

Table 8. Summary of Indicators for Assessing Socioeconomic Impacts of OSW on Fisheries

Indicator Category	Indicators	Availability and Analysis Summary and Notes
Changes in catch and revenue	Total catch, % of region wide landings from closed areas, total revenue, % of region wide revenue from closed area, catch quality (size of fish), catch composition and quality, catch per unit effort/area, value per unit effort, value per unit fuel	Public and confidential datasets exist for most indicators, data for assessing localized changes are likely confidential
Changes in time spent on the water and distance to port	Time at sea, steaming time/distance traveled, fishing effort, relative fishing effort, number of fishing trips, primary landing port	Public and confidential datasets exist for most indicators, though data for assessing localized changes are likely confidential
Competition and safety concerns	Competition (vessel density or crowding), collision and capsizing risk, trips during dangerous conditions	Public and confidential datasets exist for most indicators, though data for assessing localized changes are likely confidential
Shifts in fishing costs	Fixed costs (insurance, moorage), capital expenses (gear type changes, new licenses), variable costs (fuel, repair, maintenance, labor costs), average fleet cost (total cost divided by catch)	Some cost data do not have available datasets, for others generally confidential datasets exist. Exceptions include Value per Unit Effort (VPUE) and fuel price where there are publicly available datasets
Shifts in fishery profit	Profit, gross value added, resource rent	Some publicly available data, though data for assessing localized changes are likely confidential
Livelihood and economic well-being effects	Income, entrance and exit of vessels, access and ability to switch into other jobs, economic wellbeing	Availability varies across indicators from confidential to no available datasets (requires primary data collection)

Indicator Category	Indicators	Availability and Analysis Summary and Notes
Community-level impacts	Total income in county generated from fishing, fishing community infrastructure, tourism, food security,	Hackett et al. 2009 provide multipliers for fisheries in California, for other indicators primary data collection is required
Cultural and identity consequences	Place-based identity/place attachment, job satisfaction, traditional knowledge/cultural heritage, mental health	No publicly available or confidential datasets, primary data collection required
Highest Impacts or Vulnerability	Gear type/target species, vessel specifications (age, size), number of target species/fisheries/permits, vessel homeport, dependence on fishing, wealth reserves, underrepresented groups, years spent fishing, other/previous employment, ability to fish out of other ports/boats, member of fishing association/coop	Some datasets for some indicators have publicly available or confidential sources, while others would need to be filed by surveys or interviews

Source: Summary of information provided in tables 2 and 3 in Willis-Norton et al. 2024

4.1.3 Impact Analysis Approaches Used in Spatial Fisheries Management Actions

As a complement to the analyses, guidance, and papers on the impacts of OSW on fisheries, here we briefly summarize the methods used in an Environmental Impact Statement for a recent spatial fisheries management action on the West Coast.

4.1.3.1 Amendment 28 to the Pacific Coast Groundfish Fishery Management Plan

In 2019, the Pacific Fishery Management Council took final action on changes to closed areas to certain gear types to protect essential fish habitat (EFH), including changes to rockfish conservation areas (RCAs). These closed areas were specifically closed to bottom-contact gears, specifically bottom trawls (NMFS 2019).

The final Environmental Impact Statement (FEIS) describes the analysis used to evaluate socioeconomic impacts resulting from the EFH closure changes (NMFS 2019). The FEIS describes that socioeconomic impacts were generally evaluated qualitatively because of multiple factors, including the complexity of the action which included closing previously open areas and re-opening previously closed areas, as well as the lack of specific models and data which could predict the net economic impacts of these changes. Specifically, the action describes a lack of analytical ability to "predict how fishermen will redeploy, increase, or decrease their effort, or how the resultant catches will change" (page 4-8, NMFS 2019).

Specifically for areas proposed to be closed under the action, the FEIS describes that quantitative data were provided on all bottom trawl fishery activity for 5 years, the most recent data available since the implementation of a major management change (implementation of the West Coast groundfish trawl catch share program). These data were used to determine the potential importance of particular grounds retrospectively, as an indicator of future importance, but noted that future importance will depend on other factors. The FEIS describes that it is difficult to predict how fishing behavior would change in response to reconfiguring closed areas because of the many factors that

can influence trawl vessels' participation decisions, including their participation in other fisheries. It notes that in response to the loss of some fishing grounds, some operators may choose to increase effort in other fisheries or exit the fishery entirely.

In addition, the FEIS describes the use of social factor analysis to help identify social and cultural effects of the action. This cites NMFS' guidance for social impact analysis (SIA) and other work (such as Clay et al. 2014) to describe the five categories or social factors considered: size and demographic characteristics; attitudes, beliefs, and values; social structure and organization; non-economic social aspects; and historical dependence and participation. The FEIS notes that due to available data and indicators (landings, permit holdings, and vessel ownership), social impacts were primarily assessed in terms of historic dependence and participation in the fishery. The other four impact factors were evaluated qualitatively based on the economic analyses and available social science literature in terms of the likely magnitude and direction of effects.

4.2 Socioeconomics of California Fisheries in Relation to Offshore Wind

Recent work from NMFS and BOEM reviews West Coast data, fisheries, and analysis approaches relevant for consideration in OSW development processes. In this section, we provide a high-level summary of this work as well as additional resources specific to California.

Pfeiffer et al. (2024) describes West Coast commercial and recreational fisheries and fisheries information pertinent to consider in OSW development processes. Specifically, that report has three goals:

- Provide an overview of West Coast fisheries and fishing communities, including supportive industries (primary and secondary/ancillary markets), fishing-related infrastructure, fishing sector interconnections, and potential connections between fishing sectors and OWE development
- Summarize relevant sources of fisheries socioeconomic information available for West Coast fisheries
- Provide relevant examples of fisheries socioeconomic methods routinely used by NMFS in analyzing potential impacts to fisheries participants and communities of proposed fisheries management actions as well as to assess impacts from other drivers, such as changes in fish stock abundance, market forces, and climate variability, etc.

The report focused on commercial and recreational fisheries in federal waters where turbine infrastructure for OSW is expected and states that individual Tribes should be engaged directly about their Tribal fisheries and potential impacts from OSW. The report notes that BOEM has provided funding for some Tribal Nations to develop Tribal Cultural Landscape Assessments (as defined by Tribes) near West Coast offshore wind-energy planning areas, including the coast and offshore.

4.2.1 Summary of Fisheries Socioeconomic Data and Tools

4.2.1.1 Summary of Relevant Commercial and Recreational Data and Available Tools

Table 25 in the Pfeiffer et al. report summarizes the data owners, administrators, and coverage of different West Coast commercial fisheries datasets, while Table 26 summarizes the availability of different information across data sources. Most relevant to this work is that spatial fishing effort information is collected in multiple data sources, including fish tickets, logbooks, observer records, Electronic Monitoring, and VMS. The availability of logbook spatial fishery data, which may be most equivalent to the VTR data used by the East Coast methodologies, and observer data may be the most important for eventual tools and analyses that spatially apportion landings to fishing locations and offshore wind areas. However, similar to East Coast fisheries, Table 25 notes that logbook data coverage is variable across fisheries and spatial information in particular may be reported inconsistently. Observer data coverage is also dependent on the fishery, spanning from full coverage in the West Coast groundfish trawl catch share program and highly migratory species (HMS) fisheries to partial coverage in many others. Other relevant datasets include the fish ticket and permit databases, VMS and AIS spatial data, cost and earnings datasets, and the fishing participation social survey. It is worth noting that for West Coast groundfish trawl catch share program participants, more extensive cost and earnings datasets as well as social survey information is available.

For recreational fisheries, several datasets are described in the report that may be used to describe both private and for-hire recreational fisheries on the West Coast which may be helpful for characterizing effort, expenditures, and in the case of for-hire operators, earnings, across the state of California. However, as noted in Section 4.2.1.3 below (*Data and Analysis Needs)*, the location of recreational fishing effort offshore is noted as an outstanding need that would need to be filled to adopt similar for-hire revenue exposure estimates as suggested by the BOEM draft fisheries mitigation guidance and used in East Coast compensation agreements.

4.2.1.2 Summary of Available Tools and Indicators

Sections 5.1.2–5.1.4 in Pfeiffer et al. further describe the types of indicators and tools used to evaluate socioeconomic impacts on West Coast fisheries. This includes NMFS' Community Social Vulnerability Indicators[13] (Jepson and Colburn 2013), commercial fishery indices used in the California Current Integrated Ecosystem Assessment (CCIEA, NMFS 2022), and economic impact modeling tools. Each indicator, index, or tool is listed below. A full description of each is provided in the report.

Coastal Community Social Vulnerability Indicators

- Commercial fishing engagement: presence of commercial fishing
- Commercial fishing reliance: presence of commercial fishing relative to population size

[13] More information including online tools available here: https://www.fisheries.noaa.gov/national/socioeconomics/social-indicators-supporting-information

- Recreational fishing engagement: presence of recreational fishing
- Recreational fishing reliance: presence of recreational fishing relative to population size
- Environmental justice indicators: poverty, population composition, personal disruption
- Climate change indices: sea level rise risk, storm surge risk
- Workforce and housing indicators: labor force structure, housing characteristics
- Gentrification pressure indicators: housing disruption, retiree migration, urban sprawl

Commercial Fishery Indices

- Fishery participation networks: illustrations of cross-participation across fisheries
- Fishery fleet revenue diversification: effective Shannon Index
- Measures of revenue concentration: geographic concentration of fishery revenues

Economic Impact Modeling

- Fisheries Economics of the United States: national economic impact model
- Input-Output Model for Pacific Coast Fisheries (IOPAC): model developed specifically for West Coast

4.2.1.3 Data and Analysis Needs

While the report details the availability of a wealth of data and analytical tools available for assisting with the evaluation of fishery impacts analysis in relation to OSW development, it also notes that many data that may be needed to evaluate impacts either do not exist or are not currently publicly available. We summarize these data below.

Data that are available but not public

- Number and location (port) of commercial fishing vessels
- Commercial fishing vessel lengths
- Location of commercial fishing effort (offshore)
- Number and location of fish buyers
- Revenue of fish buyers

Data that are likely to be needed but new data collections need to be developed

- Number and location (port) of recreational fishing vessels
- Location of recreational fishing effort (offshore)
- Characteristics of recreational fishing vessels

- Number of land-based (shore/jetty) recreational fishing trips in Oregon and Washington
- Operating costs for non-groundfish fisheries
- Number, location and characteristics of fish processing facilities

The report notes that a publicly available tool is in development and will inform offshore wind development analyses. The Pacific Fishing Mapping Project (PacFEM) will integrate spatial fisheries data to support, among other purposes, offshore wind-related analyses for commercial fisheries. It notes that there is a need to integrate recreational fishing data into the tool but this component is currently unfunded. It also notes that current available input-output models such as IOPAC are unlikely to be sufficient to evaluate the impacts of offshore wind development.

4.2.2 Other Relevant Data Resources and Tools

The California Offshore Wind Energy Gateway[14] provides a compilation of resources, including datasets and tools, related to offshore wind development in California. Datasets and maps provided include data on essential fish habitat, CDFW and federal fisheries datasets, including VMS data, and community-based mapping efforts in each of the WEAs, including:

- Northern CA Commercial Fishermen's Associations Community-Mapped Fishing Grounds[15]
- Central Coast Fisheries Heritage Mapping Project[16]

In addition, the white paper produced by the California Fishermen's Resiliency Association (CFRA) "The Value of Fishing Grounds—California North Coast" provides additional information about local fisheries operations, such as gear types used and the spatial characteristics and requirements for operations by fishery as well as typical prices, landing volumes, and revenue (CFRA 2023).

4.3 Potential Socioeconomic Impacts in California

In 2024, the California Energy Commission (CEC) released its final strategic plan for offshore wind development in federal waters off the California coast, per the requirements of AB 525. Part of the plan identifies potential impacts to fisheries as well as potential mitigation measures (Jones et al. 2024). The impacts ultimately included reflect numerous Tribal consultations, weekly and biweekly meetings, working group calls, workshops, and in-person meetings to solicit input on potential impacts and strategies to address them.

This report underscored that defining potential impacts for a new floating offshore wind industry is challenging, as no commercially deployed floating offshore wind projects exist in the US and the technology is constantly evolving. Thus, potential impacts reflect those that are anticipated or those

[14]Available at: https://caoffshorewind.databasin.org/
[15] Accessible at: https://storymaps.arcgis.com/stories/ec90562aada545acb6bb1bf6f3c8f228
[16] Accessible at: https://caoffshorewind.databasin.org/datasets/7ea9f5e0e5c149ef9c5286b39c4753d2/

that have been observed for other major offshore infrastructure projects, including wind facilities, oil and gas platforms, pipelines, and sub-sea fiber optic cables that can serve as examples. It notes that more specific impacts may be identified and assessed once specific locations for projects are identified. Table 5 lists the potential sources of impacts by location, as described in the report.

Table 9. Potential Sources of Impacts of Offshore Wind Activities

Offshore and Nearshore	Ports and Harbors	Onshore
Construction and O&M of floating wind turbines, including mooring cables and anchors Construction and O&M of floating substations and cables to shore Construction and O&M of inter-array electric cables between turbines Marine vessel operation to support construction of turbines and associated facilities	Construction and O&M of new or expanded ports, coastal construction yards, and laydown areas, wet and dry storage areas, warehouses, parking areas, and service facilities New dredging projects to deepen existing channels to accommodate larger vessels Marine vessel and helicopter operation and services at port facilities	Construction and O&M of onshore transmission lines, substations, manufacturing facilities, and energy storage facilities, including vehicle, equipment, and helicopter use Horizontal drilling for bringing electrical cables onshore from turbines or offshore substations Development of housing and parking for long-term construction and permanent O&M workforce Construction of new or upgraded infrastructure, including roadways or railways providing access for equipment and project workforce

Adapted from Jones et al. 2024

4.3.1 Commercial and Recreational Fisheries Impacts

Jones et al. (2024) incorporates impacts identified for both the Humboldt WEA and Morro Bay WEA in the Coastal Commission's Consistency Determinations, which focused on effects of lease exploration activities but also described high-level foreseeable impacts associated with construction and operation. The strategic plan lists impacts identified by fishermen and the fishing industry including:

- Lost or reduced access to fishing areas
- Vessel safety concerns
- Gear loss or damage
- Uncertainty with survey work: including displacement of fish species and lack of access to fishing areas, as well as potential lethal impacts to fish species
- Food security: impacts stemming from a loss of fresh local seafood, disruption to markets
- Impacts from port activities: reduced dock space, increased vessel traffic, and competition for port space. In addition, dredging, filling or deepening of ports and harbors may affect fisheries.

- Disruption of fisheries data collection: impacts to NMFS scientific surveys and other long-term monitoring efforts.
- Cumulative effects

In addition, the strategic plan makes the following recommendation for determining impacts:

> The latest commercial, recreational, subsistence, and cultural fishing data should be used to conduct analyses assessing spatial and temporal trends in fishing effort and value metrics in the offshore and nearshore environments, in consultation with California Native American Tribes and fishing representatives, including those on the California Offshore Wind Fisheries Working Group. (page 88, Jones et al. 2024)

BOEM's Draft PEIS additionally describes the potential impacts of wind energy development in each leased area and potential mitigation measures that can be implemented to avoid or reduce various impacts (BOEM 2024a). Specific to commercial fisheries, the PEIS describes trends and average commercial fishery landings and revenues from port complexes near the WEAs, spatial commercial fishing effort in the groundfish trawl catch share program, and gear-types and target species in each WEA. For recreational for-hire fisheries, RecFIN data were used to characterize monthly patterns of for-hire fisheries in northern and southern sub-regions of California, which partially overlap with the WEAs, and finer-scale RecFIN catch data were used to characterize targeted species and species groups for each WEA. Impact issues and associated indicators included in the PEIS include the following:

- *Port Access*: congestion, reduced access to services, increased costs for services, displacement to other ports.
- *Fishing Access*: increased operating costs, lower revenue, increased conflict, area avoidance, loss of fishing, temporary displacement due to all phases (surveys, cable installation, maintenance, and decommissioning).
- *Loss of or Damage to Fishing Gear*: costs of repair/replacement, lost revenue while gear is being repaired/replaced.
- *Change in the Distribution of Target Species*: change in revenue.
- *Social and Cultural Impacts*: wellbeing, community dependence, increased stakeholder pressure, social stratification and change in ownership patterns, fisheries participation and employment structure, access to social capital, impacts on identity and livelihoods.
- *Shoreside Business Impacts*: impacts on shoreside support businesses.

The PEIS describes potential impacts of one representative project in each WEA as well as potential impacts of five representative projects and cumulative impacts. Here we summarize impacts described for one representative project:

- *Anchoring:* temporary navigational hazards and seafloor impacts.
- *Cable installation and maintenance*: temporary seafloor disturbance and fishery displacement for fixed and mobile gear types during installation. Permanent displacement to avoid gear interactions with cable protection fixtures on seafloor. Occasional spatial closures during maintenance and surveys.
- *Invasive species*: increased invasive species risks due to increased vessel traffic.
- *Noise*: Noise during surveys, construction, operations, and maintenance may induce temporary and localized changes in species distributions.
- *Port utilization:* additional vessels and vessel traffic in ports may reduce available dockage and reduce access to port services.
- *Presence of structures*: presence of structures may cause long term impacts on fish aggregation, habitat conversion, allisions, fishery displacement, gear loss/damage, navigational hazards, fisheries management mechanisms, space-use conflicts, and other safety issues. Positive impacts may result from fish aggregation and habitat conversion, particularly to for-hire fisheries, but negative impacts may result from all other impacts.
- *Vessel traffic*: Increased vessel traffic would occur most significantly during construction and decommissioning, causing displacement of fishing vessels from the cable corridor and WEA and potentially causing temporary increases in transit times.

In 2024, California Ocean Science Trust compiled the latest research to produce seven fact sheets on potential impacts of floating offshore wind in California's federal lease areas.[17] While impacts to fisheries and fishing industries were not one of the topic areas of focus, general impacts, impacts from electromagnetic fields and noise and impacts to seabirds, marine mammals and fish and seafloor habitats were included, all of which may indirectly affect fisheries. Their general conclusions included the following, which may be most relevant for determining impacts on fisheries:

- The complete scope of potential negative or positive impacts will be uncertain until the technology is deployed and effects have been studied in local marine ecosystems.
- Data and information from similar industries activities in the marine environment can be used to understand likely impacts, mitigation measures, and areas for additional research.

[17] All fact sheets are available at: https://www.oceansciencetrust.org/projects/windfactsheets/

- Potential stressors on marine life and habitats include electromagnetic fields, seafloor disturbances, noise, water quality, changes to wind and oceanographic patterns, and the risk of species' interactions with physical structures. In particular, Bay species and ecosystems may be affected by port redevelopment and related activities.
- Many potential impacts may be avoided, minimized, or mitigated based on research on similar ocean energy technologies.
- The combination of multiple stressors over time should be considered for determining impacts in addition to individual impacts by species or development phase (CA OST 2024)

The Pacific Northwest National Laboratory (PNNL) and the National Renewable Energy Laboratory are jointly leading an effort to facilitate knowledge transfer for offshore wind research around the world. Specifically, the U.S. Offshore Wind Synthesis of Environmental Effects Research (SEER) effort aims to synthesize key issues and disseminate existing knowledge about environmental effects, inform applicability to U.S. waters, and prioritize future research needs.[18] SEER maintains a Project Finder tool, which is a searchable database of planned, ongoing, and recently completed research projects relevant to better understanding the environmental effects of offshore wind development along the US Pacific Coast. The scope of projects includes both field and other non-field research activities related to wildlife, habitat, and ecosystem processes.

Emery et al. 2020 documented stakeholder concerns with respect to offshore wind development on the North Coast of California and grouped concerns into several general areas of impacts:

- *Loss of Ground and Potential Crowding*: uncertainty about ability to fish in the wind energy areas and interactions with subsea cables, including electromagnetic effects.
- *Safety and Displacement from Bay Resources*: navigational safety and access to port and harbor resources.
- *Fishing and Climate Change*: climate change impacts may pose a greater issue for fisheries than offshore wind.
- *Mobilization of the Fleet and Having a Voice*: challenges with advocating for fishing interests and being represented in the process.

4.3.2 Tribal Fisheries Impacts

Fisheries Impacts to Tribes are discussed in the California Offshore Wind Draft PEIS in the Tribal Values and Concerns section, and specifically detail the following impact indicator: "assessment of impacts on fisheries from offshore wind development (construction and operation); potential for conflict with one or more treaties between Tribes and the U.S. government" (BOEM 2024a). Specific

[18] Available at: https://tethys.pnnl.gov/us-offshore-wind-synthesis-environmental-effects-research-seer

impacts to fisheries are not described, but the following is provided to describe the determination of impacts on any particular resource of Tribal value and concern:

> The impact of any proposed measure on any particular resource of Tribal value and concern needs to be assessed when project-specific specific information (such as anticipated to be included in lessees' COPs) in tandem with engagement and consultation between BOEM and Tribal Nations. (BOEM 2024a, 3.4.5-15)

Other relevant Tribal concerns that were identified as part of a study of stakeholder concerns on the north coast of California included effects to Tribal resources, both biological and cultural, noise and vibration impacts, harbor development, and long-term impacts for future generations (Emery et al. 2020). In the section that reviewed Tribal concerns, no direct impacts to fisheries were described, though concerns about impacts to fisheries were raised elsewhere in the report.

Overall, a review of the literature including resources discussed earlier in this report indicates a general paucity of state or federal data for Tribal fisheries in general or specific to California that is similar to the types of data available for commercial and recreational fisheries that have been used in past impact analyses or methodologies for compensation. While Tribes along the West Coast have strong cultural and spiritual ties to fishery resources along the coast, a limited number have dedicated treaty and access rights to various species (PFMC 2024). The majority of these Tribes are located in Washington state, of which four have defined Usual and Accustomed fishing areas that extend into the offshore environment. In California, the Yurok and Hoopa Valley Tribes have a federally reserved right to harvest up to half of the harvestable surplus of Klamath River Fish (PFMC 2024). Both Tribes manage their harvests on their Tribal lands and associated waterways.

Beyond data limitations, it may not be consistent with expectations of procedures and individual concerns to try to generally describe how to quantify or qualify impacts to Tribes in California for the sake of compensation. AB 525 required the CEC to prepare a strategic plan that identified and proposed strategies for potential impacts to Native American and Indigenous people. Through that process, in 2022 and 2023 the CEC consulted with California Native American Tribes on the impacts of potential development of offshore wind. Overall, the strategic plan emphasizes that many Tribal comments expressed a need to work towards government-to-government decision-making, including early and consistent consultations with the relevant state and federal agencies and the opportunity to co-create strategies and recommendations specifically to "build their priorities into permit and mitigation requirements" (page 68, Jones et al. 2024).

5 Conclusions

Throughout this review, we find that multiple quantitative methodologies for direct compensation for commercial and for-hire fishery income loss as a result of OSW development have been employed for compensation agreements on the East Coast. In our review of recent applications, we find that methods generally align with BOEM's draft guidance on compensatory mitigation as well as the academic literature. However, differences do exist, primarily in terms of closing the gap between revenue exposure as a conservative indicator of income impacts and estimating these income impacts more explicitly. For the methods used in past East Coast compensation agreements, primary differences include determining exposure periods and the percentage of revenue exposed for various fisheries and at different development stages (e.g., construction and operations). BOEM's guidance suggests a conservative approach to include all revenue in the development areas during construction, decommissioning, and the first year of operations, and declining proportions of revenue in the first five years of operations. Evaluation of potential impacts specific to fuel costs and displacement related effects would be enabled by the development of fishing participation and location choice models. In addition, questions remain about how to best adapt revenue exposure methodologies for use in California including:

- Availability and form of NMFS spatial data tools to determine commercial fishing effort and revenue exposure
- Availability of spatial for-hire recreational fisheries data
- What impacts are and are not covered by revenue exposure (e.g., crowding, navigational hazards, insurance and other costs, etc.)
- Other methodological considerations pertaining to the configuration of OSW specifically in California and changes for floating OSW technology

In addition, methodologies for characterizing other impacts or information used to inform resiliency funds and other lump-sum compensation vehicles are not well documented in prior compensation agreements, so there is more uncertainty about if and what information was used in negotiations and how to characterize similar information in the methodology. However, throughout this review, we highlight previous work that explores the social and economic impacts of OSW on fisheries, data and methods available to qualitatively or quantitatively describe impacts, and current descriptions of potential impacts on California fisheries, which may be useful for the methodology to consider. Social, economic, and community-level indices available through NMFS or other indices suggested in the academic literature may be a good starting point for the methodology to consider and further informed by data availability and the set of impacts identified in the draft PEIS and other documents.

Finally, we did not identify preexisting information about if or how to compensate for Tribal fisheries impacts. Prior work on understanding Tribal impacts as a result of offshore wind development in California suggests that overarching concerns with respect to offshore wind may vary across Tribes, and separate processes may be preferable for Tribes to work independently to find solutions that meet their individual needs and preferences for Tribal consultation.

5.1 Preliminary Set of Knowledge Gaps and Questions

Lessons Learned and Approaches from Prior Compensation Agreements

- What social and economic information were used to inform negotiations on resiliency funds and/or safety/navigation funds
- How shoreside impacts as considered in revenue exposure and reserve fund calculations connect with eligibility (i.e., when shoreside businesses aren't eligible to submit)

Data and Information Availability for the Methodology

- How NMFS West Coast Fisheries Data and Offshore Wind Effort and Revenue Exposure Methods will differ from East Coast methods (i.e., PacFEM)
- What types of impacts can be included/covered by revenue exposure (including pre-construction activities)
- How IOPAC or other I-O models may be used/referenced by the methodology
- California-specific resources for filling data gaps to determining spatial revenue exposure for commercial or for-hire fisheries

Other

- Differences between floating offshore wind turbines and export cable configurations that would affect exposure calculations
- If/how to include Tribal fisheries in this work

6 References

Avangrid, 2023. New England Wind (Lease Area OCS-A 0534) MA Fisheries Mitigation Proposal. Presentation dated September 8, 2023. As provided in the MA CZM Conditional Concurrence dated November 9, 2023.

Baird and Associates Ltd. 2021. New England Wind Navigation Safety Risk Assessment.

Benjamin, S., M. Y. Lee, and G. DePiper. 2018. Visualizing fishing data as rasters. Northeast Fisheries Science Center, Reference Document 18-12, Woods Hole, Massachusetts.

BOEM (Bureau of Ocean Energy Management), US Department of the Interior. 2021. Vineyard Wind 1 Offshore Wind Energy Project Final Environmental Impact Statement, Vol. IV.https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/Vineyard-Wind-1-FEIS-Volume-4.pdf

BOEM. 2022. Guidelines for Mitigating Impacts to Commercial and Recreational Fisheries on the Outer Continental Shelf Pursuant to 30 CFR Part 585. June 23, 2022.

BOEM. 2024a. California Offshore Wind Draft Programmatic Environmental Impact Statement. https://www.boem.gov/renewable-energy/state-activities/california-offshore-wind-programmatic-environmental-impact

BOEM 2024b. Conditions of Construction and Operations Plan Approval Lease Number OCS-0487. June 21, 2024.

California Coastal Commission. Undated. https://documents.coastal.ca.gov/assets/upcoming-projects/offshore-wind/CCC-Offshore%20Wind-FAQ.pdf

California Coastal Commission. Federal Consistency. https://www.coastal.ca.gov/fedcd/fedcndx.html

CRFA (California Fishermen's Resiliency Association). 2023. Value of Fishing Grounds California North Coast. https://www.californiafishermensresiliencyassociation.com/resources

CA OST (California Ocean Science Trust). 2024. Potential Environmental Impacts of Floating Offshore Wind in California's Federal Lease Areas: Understanding Potential Environmental Impacts with Existing Research. June 2024. Available at: https://www.oceansciencetrust.org/wp-content/uploads/2024/07/OST-Science-Factsheet-1-General-Takeways-Final.pdf

Castle Wind, LLC. 2019a. Commercial Leasing for Wind Power Development on the Outer Continental Shelf Offshore California Call for Information and Nominations. Exhibit C: Summary of

Fishermen's Agreement. https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/CA/CastleWInd-Nomination.pdf

Central California Joint Cable/Fisheries Liaison Committee. 2002. Agreement Between Cable Companies and Fishermen. https://climate.law.columbia.edu/sites/default/files/content/CBAs/Cable%20Companies%20Agreement.pdf

Central California Joint Cable/Fisheries Liaison Committee. 2024a. Introduction to the Committee. http://www.cencalcablefishery.com/

Central California Joint Cable/Fisheries Liaison Committee. 2024b. Commercial Fishing Industry Improvement Fund Grant Program Overview. http://www.cencalcablefishery.com/commercial-fishing-industry-improvement-fund.html

Chaji, M. and S. Werner. 2023. Economic Impacts of Offshore Wind Farms on Fishing Industries: perspectives, methods, and knowledge gaps. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science.

Clay, P. M., Kitts, A., & da Silva, P. P. 2014. Measuring the social and economic performance of catch share programs: Definition of metrics and application to the US Northeast Region groundfish fishery. Marine Policy, 44, 27-36.

PFMC (Pacific Fishery Management Council). 2024. Tribes. Accessed 12/20/2024 at https://www.pcouncil.org/fishing-communities/tribes/

Emery, C., Richmond, L., Casali, L., Severy, M. and Jacobson, A. 2020. Stakeholder Benefits and Concerns. In M. Severy, Z. Alva, G. Chapman, M.Cheli, T. Garcia, C. Ortega, N. Salas, A. Younes, J. Zoellick, & A. Jacobson (eds.) California North Coast Offshore Wind Studies. Schatz Energy Research Center. Humboldt, CA. https://schatzcenter.org/pubs/2020-OSW-R21.pdf

DePiper, G. S. 2014. Statistically assessing the precision of self-reported VTR fishing locations. NOAA Technical Memorandum NMFS-NE-229.

Ecology and Environment, Inc. 2014. Development of Mitigation Measures to Address Potential Use Conflicts between Commercial Wind Energy Lessees/Grantees and Commercial Fishermen on the Atlantic Outer Continental Shelf Report on Best Management Practices and Mitigation Measures. A final report for the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewal Energy Programs, Herndon, VA. OCS Study BOEM 2014-654. 98 pp.

Jepson, M. and L.L. Colburn. 2013. . Development of Social Indicators of Fishing Community Vulnerability and Resilience in the U.S. Southeast and Northeast Regions. U.S. Dept. of

Commerce, NOAA Tech. Memo. NMFS-F/SPO-129, 64 p. https://spo.nmfs.noaa.gov/sites/default/files/TM129.pdf

Jones, Melissa, Jim Bartridge, and Lorelei Walker. 2024. Assembly Bill 525 Offshore Wind Energy Strategic Plan. California Energy Commission. Publication Number: CEC-700-2023-009-V2-CMF.

Kirkpatrick, A.J., S. Benjamin, G.S. DePiper, T. Murphy, S. Steinback, and C. Demarest. 2017a. Socioeconomic impact of Outer Continental Shelf wind energy development on fisheries in the U.S. Atlantic. Volume I – Report Narrative. U.S Dept. of the Interior, Bureau of Ocean Energy Management, Atlantic OCS Region. Washington, D.C. https://espis.boem.gov/final%20reports/5580.pdf

Kirkpatrick, A.J., S. Benjamin, G.S. DePiper, T. Murphy, S. Steinback, and C. Demarest. 2017b. Socioeconomic impact of Outer Continental Shelf wind energy development on fisheries in the U.S. Atlantic. Volume II – Appendices. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Atlantic OCS Region. Washington, D.C. https://espis.boem.gov/final%20reports/5581.pdf

Kite-Powell , H., Di Jin, and M. Weir. 2023a. Fisheries Exposure in Massachusetts from the Sunrise Wind Lease Area and the Sunrise Export Cable Route. Marine Policy Center, Woods Hole Oceanographic Institution. Woods Hole, MA.

Kite-Powell , H., Di Jin, and M. Weir. 2023b. Rhode Island Fisheries Exposure from the Sunrise Wind Lease Area and the Sunrise Export Cable Route. Marine Policy Center, Woods Hole Oceanographic Institution. Woods Hole, MA. http://www.crmc.ri.gov/meetings/2023_0822semipacket/SW_FisheriesExposure_2023-08-10.pdf

Lavin, N. 2023. RI coastal regulators affirm NY wind farm project. *Rhode Island Current*. https://rhodeislandcurrent.com/2023/08/23/ri-coastal-regulators-affirm-ny-wind-farm-project/

Livermore, J. and T. Guilfoos. 2024. Scallop fishing activity characterization in Southern New England: Offshore wind demands and fisheries-dependent methods. November 11, 2024. https://doi.org/10.1371/journal.pone.0313197

Lovell, S.J., Hilger, J., Rollins, E., Olsen, N.A. and Steinback, S., 2020. The Economic Contribution of Marine Angler Expenditures on Fishing Trips in the United States, 2017. National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Silver Spring, MD. https://spo.nmfs.noaa.gov/sites/default/files/TM201.pdf

Marine Affairs Institute. 2024. Fisheries Compensation Agreements & Offshore Wind. https://marineaffairsinstitute.org/wp-content/uploads/2024/04/NY-Fisheries-Compensation-Agreements-2024.pdf

Massachusetts Office of Coastal Zone Management. 2023a.CZM Federal Consistency Review of the Sunrise Wind Farm and Sunrise Wind Export Cable. Boston, MA. https://www.mass.gov/doc/offshore-wind-sunrise-wind-federal-consistency-determination-with-attachments-10-6-23/download

Massachusetts Office of Coastal Zone Management. 2023b .CZM Federal Consistency Review of Park City Wind, LLC's New England Wind Project (Phase 1 and 2) - Subpart E – Consistency for Outer Continental Shelf (OCS) Exploration, Development and Production Activities and Subpart D – Consistency for Activities Requiring a Federal License or Permit Action; Massachusetts.. Boston, MA.

NMFS (National Marine Fisheries Service). 2019. Changes to Pacific Coast Groundfish Essential Fish Habitat Conservation Areas and Boundaries of the Trawl Gear Rockfish Conservation Area Final Environmental Impact Statement, Magnuson Stevens Act Analysis, Regulatory Impact Review, and Regulatory Flexibility Analysis. accessed 12/19/2024. https://media.fisheries.noaa.gov/dam-migration/feis-groundfish-am28-7-19.pdf

NMFS. 2022. 2021–2022 California Current Ecosystem Status Report. NOAA. https://www.pcouncil.org/documents/2022/02/h-2-a-cciea-team-report-1-2021-2022-california-current-ecosystem-status-report-and-appendices.pdf/

Pfeiffer, L., Alkire, C., and Ise, J.L. 2024. Socioeconomic Characterization of West Coast Fisheries in Relation to Offshore Wind Energy Development. BOEM 2024-054. August 2024.

Rhode Island Department of Environmental Management. 2017. Spatiotemporal and economic analysis of Vessel Monitoring System data within wind energy areas in the greater North Atlantic, Addendum I. Rhode Island Department of Environmental Management Division of Marine Fisheries. Providence, RI. http://www.crmc.ri.gov/windenergy/vineyardwind/RIDEM_VWFishValue_20190114.pdf

Rhode Island Department of Environmental Management. 2018. Spatiotemporal and economic analysis of Vessel Monitoring System data within the New York Bight call areas. Rhode Island Department of Environmental Management Division of Marine Fisheries. Providence, RI. https://dem.ri.gov/sites/g/files/xkgbur861/files/programs/bnatres/fishwild/pdf/RIDEM_VMS_Report_2018.pdf

Rhode Island Department of Environmental Management. 2019. Rhode Island fishing value in the Vineyard Wind Construction and Operations Plan area. Rhode Island Department of

Environmental Management Division of Marine Fisheries. Providence, RI. http://www.crmc.ri.gov/windenergy/vineyardwind/RIDEM_VWFishValue_20190114.pdf

Rhode Island Coastal Resources Management Council. 2023. RI CRMC Federal Consistency Review of the Sunrise Wind Project. Wakefield, RI. http://www.crmc.ri.gov/windenergy/sunrisewind/SW_FedConDecision_20230906.pdf

Starosielski, N., 2012. Warning: do not dig: Negotiating the visibility of critical infrastructures. *Journal of Visual Culture* 11(1): 38-57. https://journals.sagepub.com/doi/full/10.1177/1470412911430465

Special Initiative on Offshore Wind. 2023. Nine Atlantic Coast States Final Scoping Document: Framework for Establishing a Regional Fisheries Compensation Fund Administrator for Potential Impacts to the Fishing Community from Offshore Wind Energy Development. Revised and Released on April 13, 2023. https://offshorewindpower.org/wp-content/uploads/2023/04/RFA_RevisedScopingDoc_FINAL.pdf

Steinback S, Brinson A. 2013. The economics of the recreational for-hire fishing industry in the Northeast United States. Northeast Fisheries Science Center reference document; 13-03. https://repository.library.noaa.gov/view/noaa/4373

UC Berkeley Center for Law, Energy & the Environment. 2024. Offshore Wind & Community Benefits Agreements in California. Berkely, CA. https://www.law.berkeley.edu/wp-content/uploads/2024/04/Offshore-Wind-CBAs-in-CA-1.pdf

US Department of Energy. 2017. Guide to Advancing Opportunities for Community Benefits through Energy Project Development. https://www.energy.gov/justice/articles/community-benefit-agreement-cba-resource-guide

Willis-Norton, E., T. Mangin, D.M Schroeder, R.B. Cabral and S.D Gaines. 2024. A synthesis of socioeconomic and sociocultural indicators for assessing the impacts of offshore renewable energy on fishery participants and fishing communities. Marine Policy. Vol 161, 106013

Summary of Interviews

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Introduction

On December 31, 2024, Northern Economics provided a review of relevant literature to members of the project team[1] and on January 7, Northern Economics staff presented a summary of that review to members of the California Offshore Wind Energy Fisheries Working Group. At that meeting, a preliminary set of knowledge gaps and questions that were identified from the literature review were presented alongside a set of contacts who may be able to help fill knowledge gaps through interviews.

Between January 8 and February 21, Northern Economics conducted a series of semi-structured interviews with fishery stakeholders, Tribal representatives on the working group, offshore wind (OSW) energy developers, scientists engaged in research projects on OSW, and state and federal agency representatives. In total, 18 total interviews were conducted with 24 distinct people (some interviews were group calls with multiple participants). Honoraria were offered to support the participation of fishery stakeholders/representatives and Tribal fisheries representatives and knowledge holders. Interview questions depended on the knowledge gap to be filled, and therefore there was no standardized interview protocol.

[1] The project team includes members of the California Coastal Commission, grant managers from California Ocean Protection Council, and the chair of subgroup 5.

Summary of Knowledge Gaps

Knowledge gaps that interviews sought to fill are summarized below.

Lessons Learned and Approaches from Prior Compensation Agreements

- What social and economic information was used to inform negotiations on resiliency funds and/or safety/navigation funds?
- How shoreside impacts as considered in revenue exposure and reserve fund calculations connect with eligibility (i.e., when shoreside businesses aren't eligible to submit)

Data and Information Availability for the Methodology

- How National Marine Fisheries Service (NMFS) West Coast Fisheries Data and Offshore Wind Effort and Revenue Exposure Methods will differ from East Coast methods (i.e., the Pacific Fishing Mapping Project (PacFEM))
- What types of impacts can be included/covered by revenue exposure (including pre-construction activities)
- How IOPAC or other IO models may be used/referenced by the methodology
- California-specific resources for filling data gaps to determining spatial revenue exposure for commercial or for-hire fisheries

Other

- Differences between floating offshore wind turbines and export cable configurations that would affect exposure calculations
- Whether and/or how to include Tribal fisheries in the currently defined scope of work (see literature review for more information.)[2]

[2] As noted in the literature review: "We did not identify preexisting information about if or how to compensate for Tribal fisheries impacts. Prior work on understanding Tribal impacts as a result of offshore wind development in California suggests that overarching concerns with respect to offshore wind may vary across Tribes, and separate processes may be preferable for Tribes to work independently to find solutions that meet their individual needs and preferences for Tribal consultation" (page 42)

Summary of Interviews

The following subsections provide a summary of insights and information gathered from interviews.

Lessons Learned from Past Compensation Agreements

Key Takeaways:

- Some quantitative information on costs of additional safety equipment and training programs have informed past safety and navigation fund amounts.
- Across East Coast OSW compensation agreements and California compensation agreements, little to no documented information on impacts has been used to determine resiliency/innovation fund amounts.
- Supplemental analyses on potential congestion impacts and re-routing may be helpful as a qualitative source of information.

In interviews with representatives from offshore wind developers and those familiar with past compensation methodologies, we sought to better understand if and what information has been used to inform safety and navigation funds as well as other funds that have been provided, such as resiliency or innovation funds. In general, safety and navigation fund amounts have been informed by the amounts/precedence of past agreements and information on the cost of safety equipment, such as Automatic Identification Systems (AIS), doppler, Emergency Position Indicating Radio Beacons (EPIRBs), and immersion (also called "gumby") suits, as well as the cost of providing safety training programs. Any calculations were described as relatively rough and high-level, and no specific formulas or approaches were disclosed.

While some quantitative information has been used to inform safety and navigation fund amounts, it does not appear that this has been the case for community, resilience and/or any innovation funds. Across interviews, no methods or specific data were indicated as being the foundation for negotiated amounts for these purposes. In interviews with those knowledgeable about past compensation agreements in California, interviewees noted that past agreements have not relied on impacts information to determine funds. While each of the four past cable agreements includes an annual payment schedule (generally per cable) that is deposited into a fund, the final agreed-upon amounts were determined through individual discussion and negotiations. No interviewee was aware of any specific analysis or information used to justify the negotiations.

In interviews we also sought to understand how negotiated funds for direct income impacts connected with eligibility, especially for shoreside businesses that in past agreements may have been included in the impacts analysis (as multipliers) but later were not eligible to submit claims for impacts. Specifically, Massachusetts and Rhode Island commercial vessel owners and onshore

dealers were eligible to submit claims for direct compensation for the Vineyard Wind project, but for the South Fork Wind Farm, only commercial vessel owners and party/charter vessel owners were eligible to submit for its direct compensation program. [3] In both cases, shoreside impacts were evaluated in the underlying methodology using similar methods. During interviews, interviewees discussed that there has been variability to whom and when funds are provided, and different processes for determining who is eligible, which in part is the rationale for the ongoing process to establish a regional fund administrator on the East Coast.[4]

We also interviewed those with experience with past compensation methodologies about the utility of analyses that explored potential congestion and vessel transit re-routing impacts. Congestion impacts refer to impacts associated with displacement from the OSW project areas—increasing potential gear entanglements or safety hazards—while impacts to vessel transit routes include increased fuel costs associated with needing to transit around OSW project areas to access fishing grounds. For some East Coast projects, supplemental analyses developed by other contractors were used to explore the potential for these types of impacts. These analyses were not directly combined with the revenue exposure analyses because they conflict with the assumptions of the revenue exposure calculations. Specifically, the revenue exposure approach assumes all revenue associated with trips in the development area will not occur, while for fuel impacts to occur, some proportion of trips must still take place in areas outside of the offshore wind development area. Because of this, we conclude that such analyses are better to provide qualitative information when combined with revenue exposure approaches.

Data and Information Available for the Methodology

Key Takeaways:

- PacFEM is distinct in its approach compared to East Coast methods.
- Not all California commercial fisheries are or will be represented in PacFEM.
- For fisheries not in PacFEM, a variety of different approaches may be needed.
- Fishing block location information is available for all commercial and for-hire recreational fisheries in California and may be used to inform revenue exposure estimates for data-limited species.

[3] Example where shoreside businesses have not been eligible for direct compensation: *https://www.fisheriescompensationprogram.com/rhode-island-fisheries-direct-compensation-program*; example where shoreside businesses have been eligible: *https://vw1fisheriescomp.com/*

[4] More information here: *https://offshorewindpower.org/fisheries-mitigation-project*.

- Ongoing and recently completed projects in California may have additional value and utility for the methodology.

Our main questions for interviewees revolved around how data and tools available for methodology to consider may be similar or different from the approaches used on the East Coast. The majority of interviews for these questions revolved around federal and state data sources, starting with better understanding PacFEM, which is being developed by NMFS and Pacific States Marine Fisheries Commission (PSMFC) in partnership with the Bureau of Ocean Energy Management (BOEM), Oregon Department of Fish and Wildlife (ODFW), Washington Department of Fish and Wildlife (WDFW), California Department of Fish and Wildlife (CDFW) and other NMFS line offices.

While a publication fully describing PacFEM's methodological approach is currently being developed, we were able to review a presentation[5] during interviews that described PacFEM's approach and ask questions about its similarities and differences to the methods used on the East Coast. We learned that while PacFEM is similar in that it is a tool that can spatially apportion fishing effort, landings, and revenue to space in the ocean, it is distinct primarily because of the differences in the underlying fisheries data. Specifically, PacFEM primarily leverages logbook (or observer) data on where trips start and end, where sets/hauls occur, VMS data, and fish ticket data on total landings and revenue, to create fused "fishing tracks" combining multiple data sources' information. Information from trips is combined and gridded on an online dashboard to allow for different confidential (for internal uses) and nonconfidential (for public use) purposes. In addition, nonconfidential data summaries can be generated to describe patterns for specific landing ports of interest.

From these conversations, we learned that some California fisheries are not included in PacFEM due to data availability. In the case of recreational fisheries, there is also no funding currently available to include them in PacFEM. During interviews, we worked to better understand which fisheries may not be represented at all in PacFEM, have some limited representation, or be fully represented, since data availability varies by state and fishery (primarily for logbooks).

In some cases, data will be more available in the future than in the past. For some fisheries, logbooks were not required prior to certain years. For example, in the California limited entry and open access sablefish fisheries, logbooks were not required prior to 2023, so only comprehensive data from 2023 forward are available in PacFEM, though some limited data from observed trips will be available in previous years. Dungeness crab also will have data after 2024 for California, when a mandatory electronic logbook program was implemented. We also learned that at least one recreational fishery, Pacific albacore, is not currently included in PacFEM but does have enough spatial data that could facilitate its inclusion later. It is our understanding that most of the California fisheries that are not included in PacFEM are excluded because of a lack of logbook data. Such fisheries include Pacific sardine and other coastal pelagic species, spot prawn, rock crab, the salmon troll fishery, and hagfish.

[5] *https://geo.psmfc.org/portal/apps/storymaps/stories/7bc1a025e2fd43e49efb011cd15e1d4e*

One fishery, Pacific halibut, is not limited by data, but by lack of data-sharing between the International Pacific Halibut Commission (IPHC) and PacFEM-affiliated agencies.

For California fisheries that are partially represented in PacFEM (currently only identified as the limited entry and open access sablefish fisheries), it may be possible to apply the PacFEM estimate to the proportion of trips that are not included in the tool, similar to the approaches used on the East Coast to adjust for data-limited species like Jonah crab and lobster. However, for all other California fisheries that are not represented at all, an alternative method to PacFEM would be needed to identify trips and associated revenue associated with offshore wind development areas.

For fisheries not represented at all in PacFEM, CDFW data may be used to develop estimates. Specifically, for all California commercial and for-hire fisheries, some spatial fishery information is available stemming from the fishing block (10 nautical mile squares) reported on fish tickets or in the case of for-hire fisheries, on monthly logbooks. It may be possible to develop estimates of fishing revenue per unit area of block areas that overlap OSW project areas; however, interviewees noted that the fishing block identifier reported on fish tickets is not validated, which limits the robustness of the data. For for-hire fisheries, additional spatial data (by the micro block, or 1 square nautical mile) are collected by the California recreational fisheries survey (CRFS), but there are additional questions about if and how to merge this information with the trip-level information that is needed to estimate revenue impacts, since CRFS data do not contain estimates of the number of recreational fishing trips. For revenue exposure calculations, information is needed about both the spatial fishing location on for-hire fishing trips and the number of trips in those areas, from which revenue derived from those trips can be calculated using survey data (specifically Lovell et al. 2020).[6] Additional information that could be used includes data from California's Seafloor Mapping Program,[7] which could be combined with information about the suitability of habitat for various species and fisheries, such as the community mapping projects and documents estimating the value of fishing grounds.[8]

Interviews also discussed ongoing projects in California that may inform the methodology or could inform future applications of the work. An ongoing BOEM-funded study led by researchers at the University of California, Santa Barbara (UCSB) looks at displacement effects from OSW and includes two scenarios—one where fishing trips in the OSW lease areas do not occur and one where trips are displaced to other areas—and estimates impacts on profitability in both scenarios.[9] Another part of the project will incorporate impacts due to climate change on species distributions. The results of

[6] Lovell, S.J., Hilger, J., Rollins, E., Olsen, N.A. and Steinback, S., 2020. The Economic Contribution of Marine Angler Expenditures on Fishing Trips in the United States, 2017. National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Silver Spring, MD. *https://spo.nmfs.noaa.gov/sites/default/files/TM201.pdf*

[7] *California Seafloor Mapping Program | U.S. Geological Survey*

[8] North Cost: *https://storymaps.arcgis.com/stories/ec90562aada545acb6bb1bf6f3c8f228* and Central Coast: *https://caoffshorewind.databasin.org/datasets/7ea9f5e0e5c149ef9c5286b39c4753d2/* , Value of Fishing Grounds California North Coast: *https://www.californiafishermensresiliencyassociation.com/resources*

[9] *https://emlab.ucsb.edu/projects/facilitating-resilience-and-adaptation-commercial-fisheries-response-offshore-renewable*

this study and its methods are both informative for the methodology to consider, especially if tools are produced that can be applied in the future. Additionally, researchers at the University of California, Santa Cruz (UCSC) have been working on a project to understand fishing community resilience, social cohesion, and offshore wind energy development in California. During interviews we were informed that a manuscript of this work is nearing completion and once accepted for publication, it may also be a potential resource for the methodology to include.

Finally, multiple interviews touched on how it may be important to consider a diversity of information in the methodology and allow flexibility to consider the best information available. One interviewee suggested that approaches used in fishery management that consider a broad range of quantitative and qualitative information to characterize fishery and fishing community impacts may be helpful to adapt for the methodology. One interviewee cautioned that federal fishery management indicators and approaches may not fully be able to capture impacts in California, due to the importance of state-managed fisheries. Another interviewee expanded on potential data limitations and noted that data confidentiality restrictions can reduce the ability to identify or describe impacts stemming from less than three individuals.

Tribal Fisheries Impacts

Key Takeaways:

- Developing an analogous methodology as is being considered for commercial and recreational fisheries in California is likely not culturally appropriate or practically feasible.
- Excluding Tribal fisheries from the methodology is not desirable, but inclusion should be sensitive in its treatment to allow for Tribal preferences to take precedent.
- The methodology may want to highlight the need for consultation and to work directly with Tribes to determine any compensation and methods to determine compensation amounts.
- The methodology may be able to provide sources of information that may be helpful for understanding potential impacts on Tribal fisheries.

Interviewees knowledgeable about offshore wind development and Tribal fisheries in California discussed if and how the socioeconomic impact methodology could and should consider Tribal fisheries. Across interviews, interviewees described both practical and cultural difficulties of determining a similar quantitative approach for determining compensation amounts as are being explored for commercial and recreational fisheries. Practically, data on Tribal fisheries are sparse, especially for Tribes without explicit rights to fish, which is the majority of California Tribes. As discussed in the literature review, only two California tribes have explicit rights to fish, the Yurok and Hoopa Tribes.

Culturally, interviewees described challenges with conflating use with monetary value for species collected for subsistence and traditional purposes. However, despite the challenges with such an approach, interviewees described a desire to not leave Tribal fisheries out of the methodology and described potential information or data sources that may be helpful to provide as background resources, as communicated and supported by individual Tribes. Some of those information sources included:

- Tribal fishery management plans (Yurok and Hoopa Tribes specifically)
- Recent federal salmon fishery management decisions
- Environmental Impact Statements from dam removal projects
- Tribal Cultural Landscape Assessments (TCLA)[10]
- Tribes with MOUs with the state of California for expanded take and who submit scientific collections reports
- Federal Fishery Disaster Declarations and Funding for California Tribes

Interviewees noted that there are advantages and disadvantages to the approaches and information contained in any of the above resources. For TCLAs specifically, it was noted that each is different and some have fisheries information and some do not, since they are guided by the types of information and data that Tribes want to share. Recent federal fishery disasters may also provide some information, since both federally recognized and non-federally recognized Tribes in California have received compensation for recent salmon fishery disasters specifically for subsistence and cultural uses. Specifically, the Pulikla Tribe of Yurok People requested disaster relief in 2023 for Klamath River and ocean salmon stemming from a complete closure of the fishery in 2023. As a result, their request for a determination of a subsistence and ceremonial fishery resource disaster was approved in 2024.[11]

Interviewees generally underscored the importance of early, often, flexible, and individual engagement with Tribes. Interviewees also highlighted that fisheries are just one component of the impacts that Tribes may experience, and the cumulative impacts of development alongside other pressures that Tribes face (e.g., climate change) should be taken into consideration. One interviewee suggested that the methodology for Tribal fisheries be considered a living document and be able to be flexible and adaptable over time.

[10] *https://www.boem.gov/PC-21-01*

[11] Determination letter can be found here: *https://www.fisheries.noaa.gov/s3/2024-09/CA-Pulikla-Tribe-Salmon-Determination-2023.pdf*

In addition, because another subgroup (Subgroup 4) is focused on Tribal fisheries, we are exploring having additional opportunities to collaborate and work with this subgroup to align our work with its activities, including roundtable discussions planned for later this year. This was identified as a pathway to help ensure the methodology benefits from the subgroup's expertise as well as a broader group of Tribal fisheries representatives.

Floating Offshore Wind Implications for Methodology

Interviewees generally underscored that floating offshore wind technology is still very nascent as is any information about potential impacts, which is a challenge for the methodology to prospectively consider. In particular, the final BOEM fisheries mitigation guidance document is explicitly limited to fixed-bottom offshore wind structures and focuses on the Northeast Atlantic.

One interviewee discussed how currents and gear deployment/retrieval considerations may affect fishing decisions around OSW project areas. Because of the risk of entanglements or collisions with structures, the area of impacts may extend beyond the footprint of the project. Additionally, because of this additional area of impact, the likelihood or degree of congestion/compaction outside of the OSW development areas could also increase.

Others discussed how the design parameters and specifics of individual floating offshore wind projects will have a large bearing on if and what mitigation measures are considered and the ultimate impacts to fisheries. Because the design may have different effects for different types of fishing gear (based on depth), interviewees indicated that it is hard to generalize across fisheries about areas of exclusion or whether additional buffers outside of development areas are needed. One interviewee indicated that the eventual Construction and Operations Plan (COP) documents should provide the necessary information for the methodology to consider design parameters.

Conclusions

Interviews were helpful to answer initial questions coming out of the literature review and identify additional areas where more research, work, and conversations will be needed to advance the methodology. To prepare the skeleton methodology and workshop, the project team will continue to explore the following areas:

- Back-up revenue exposure methods for California fisheries not included or partially included in PacFEM
- Best ways to quantify and/or qualify shoreside impacts
- How ongoing research projects in California (and elsewhere) can inform the methodology
- The most socioculturally appropriate way to advance work on Tribal fisheries, including working more directly with Subgroup 4
- Additional lessons learned from the East Coast

Over the coming months, the project team will continue working to fill knowledge gaps and collect necessary information to inform the methodology from available sources, including potentially conducting additional informal follow-up interviews or meetings with contacts relevant to this work.

Socioeconomic Impact Methodology Expert Workshop Report

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Abbreviations

CCC	California Coastal Commission
OSW	Offshore Wind
SB	Senate Bill

Introduction

This report summarizes the results of a virtual expert panel workshop held on May 1, 2025, organized and facilitated by Northern Economics, Inc. The goal of the workshop was to review and provide feedback on a high-level outline of a socioeconomic impact methodology (referred to as the 'skeleton methodology'), pursuant to a broader project Northern Economics is conducting with the California Coastal Commission (CCC) and the Offshore Wind Energy Fisheries Working Group to develop such a methodology. The recommendations summarized here will be reviewed and considered by the CCC and the Offshore Wind Energy Fisheries Working Group in their development of the socioeconomic methodology.

How this Report is Organized

This report is organized into 6 main sections. The first section summarizes relevant background information for the project, followed by a description of the workshop goals and structure. The bulk of the report summarizes each discussion session of the workshop, including participants' recommendations for changes to the methodology. There were four main discussion sessions:

1. Icebreaker: Biggest challenges for the development of a socioeconomic impact methodology
2. Big picture reactions to the skeleton methodology as a whole
3. Key questions and recommendations for Step 3 (direct income impacts)
4. Key questions and recommendations for Steps 4 and 5 (dependence and vulnerability and supplementary analyses)

The final sections provide a summary of conclusions from the workshop as well a list of additional resources shared by participants. Also included as appendices are the workshop agenda, draft socioeconomic impact methodology, and the workshop goals and key questions, which were all provided to the participants a week prior to the workshop.

The full report outline is as follows:

- Background
- Workshop Goals and Structure
- Workshop Discussion Summaries
    - Biggest challenges
    - Big Picture Reactions
    - Income Impacts and Data Considerations
    - Dependence & Vulnerability and Supplementary Analyses
- Conclusions
- Additional Resources
- Appendices

Background

Background

Under a grant from the California Ocean Protection Council, Northern Economics, Inc. is working to develop a socioeconomic impact methodology for fisheries and offshore wind (OSW) projects in California. This project is pursuant to the requirements of California Senate Bill (SB) 286, which directs the CCC and the Offshore Wind Energy Fisheries Working Group to develop such a methodology.

Project Objective and Purpose

The objective for this project is to produce a socioeconomic impact methodology (henceforth referenced as the methodology) that will enable consistent, thorough, and objective evaluations of OSW impacts on fisheries in California. The methodology will be used to inform guidance and determinations for compensatory mitigation agreements resulting from unavoidable OSW impacts in California. Specifically, the methodology will describe steps and approaches that can be used to inform the development of direct compensation and resiliency funds, considering possible data and information limitations and project-specific considerations. The methodology is anticipated to be generalizable and flexible to apply to various OSW projects across the state but detailed enough to allow for ease of use and consistent application.

Workshop Goals and Structure

Workshop Goal

The overarching goal of the workshop was to gather experts from various fields who have worked with or adjacent to OSW projects previously and solicit their feedback on a draft high level outline of the methodology, the skeleton methodology, (*Appendix 2: Draft Socioeconomic Impact Skeleton Methodology*) for evaluating socioeconomic impacts of proposed OSW projects. The specific goal was to come away with suggestions and modifications to the skeleton methodology that would ensure it is thorough, objective, able to guide compensatory agreements, and able to be used consistently across different projects. Recommendations and suggestions provided by the workshop participants will be considered and integrated, as appropriate, based on review from the project team, CCC, and Offshore Wind Energy and Fisheries Working Group. As a result, not all recommendations and suggestions may be integrated, depending on determinations about scope, definitions, or consistency with other parts of the statewide strategy or the California Coastal Act.

Workshop Objectives

We had three main objectives to achieve during the workshop that were shared with the experts:

- Review the skeleton methodology
    - Identify strengths, gaps, suggest improvements
- Identify additional analyses, resources, or indicators that may be utilized or referenced
- Document expert recommendations for improvements to the methodology to ensure it meets its goals

Workshop Participation

In total, nine experts attended the workshop (Table 1). Experts were affiliated with west coast public and private universities, state and federal government agencies, and private research institutions. Experts were invited to attend the workshop based on their knowledge and expertise in economics, anthropology, sociology, regulatory analysis, and fisheries science. Experts were prioritized for invitation based on relevant subject matter expertise—specifically, analyses or methods that have informed prior compensation agreements, or experience with studying the socioeconomic impacts of OSW on fisheries. Experts with familiarity and experience with these topics in the state of California were also prioritized. The expertise sought for this workshop was on methodological

development. The subgroup and full working group will serve as an important source of expertise to advance the draft methodology in later stages of methodology development.

Cumulatively, the workshop participants had developed frameworks for evaluating impacts, contributed to analyses in support of previous OSW compensation agreements, and studied the impacts of OSW including economic, community, and fisheries impacts.

Table 1. Number of Workshop Participants by Affiliation Type

Affiliation	Number of Participants
Public and Private Universities	4
State and Federal Government	4
Private Research Institutions	1

Workshop Structure and Discussion Framework

At the workshop, participants received a presentation on the skeleton methodology and were led through several targeted discussions to gather feedback in key areas of interest. The agenda for the workshop can be found in *Appendix 1: Workshop Agenda*. In total, four main workshop topic discussions were held with participants to gather feedback and recommendations for the methodology. These discussions were as follows:

- An icebreaker discussion on the biggest challenges for developing and OSW socioeconomic impact methodology
- A discussion on 'big picture' reactions to the skeleton methodology as a whole
- A targeted discussion on key questions and challenges for Step 3, "Estimate Direct Income Impacts"
- A targeted discussion on key questions and challenges for Steps 4 and 5, "Assess Dependence and Vulnerability" and "Other Supplemental Analysis"

Each discussion is summarized in the following section.

Workshop Discussion Summaries

Biggest Challenges

The first discussion of the day focused on what workshop participants perceive to be the biggest challenge for developing a socioeconomic impact methodology for OSW and fisheries. This was used as an icebreaker to warm workshop participants up and to identify what might be key discussion themes throughout the workshop but not used to solicit specific recommendations for the methodology.

Discussion Structure

For this discussion, workshop participants were asked "What do you think is the biggest challenge for developing an OSW socioeconomic impact methodology for fisheries in California?" Participants were given 5 minutes to write down their thoughts on an interactive PowerPoint slide. They then were provided with an additional 5 minutes to review the collective set of challenges and place dots on challenges that resonated with them as being most important (Table 2, note dots were replaced for readability and noted as the frequency of concurrence).

Table 2. Biggest Challenges for Developing a Methodology Discussion

Challenge	Frequency of Concurrence
Lack of Accurate spatial fisheries data and estimating non-catch related impacts from shoreside and transit effects	5
Identify the appropriate data sources and accurately evaluating impacts to commercial and for-hire recreational fishers	5
Data limited fisheries	4
Limited attention & understanding regarding social organization of fisheries/fishing communities; social information and assessment needed	4
Incorporating all/sufficient number of potential impacts	4
Availability and quality of appropriate datasets	4
High resolution mapping of fishing revenues	0
Focus on mitigate and compensate instead of avoid	0
Cause other problems to solve energy security problem	0

Note: Dots were used by participants to indicate notes that workshop participants thought were important beyond what they had chosen to write. The number of dots were counted, and the value was placed in the right column as the frequency of concurrence.

Discussion Summary

As shown in Table 2, nine main challenges were identified by workshop participants, however, some were identified as being more important than others (as shown by the frequency of concurrence). With five concurrences apiece, limitations of spatial fisheries data and ability to evaluate shoreside and transit effects and identifying appropriate data sets for analysis were identified as the most important challenges. Other top challenges included the limited attention and understanding of

fisheries social information and ensuring all impacts or potential impacts are addressed. Some of the participants were careful to distinguish quantitative data from qualitative data, and the different challenges associated with considering each. Multiple participants agreed that both types of data were critical in understanding the entire picture and integrating it into the methodology. Additionally, participants discussed how the data used should be evaluated at different levels including region, community, fishery, and gear type. Participants supported the use of local fisheries and ecological knowledge to ensure methods used are appropriate and results are valid. Part of the discussion also acknowledged that previous compensation agreements benefitted from stakeholder review and feedback.

Big Picture Reactions

After a presentation of relevant background and an overview of the skeleton methodology, the participants were led through a discussion to gather their thoughts on the methodology as a whole and to solicit their feedback and recommendations for improvement generally.

Discussion Structure

Participants were prompted with a few questions about whether the methodology seemed practical, what they thought was missing, what challenges they envisioned, and what they liked about the methodology. This worked to ensure that the draft was not missing any key steps or information. Experts had time to write their individual reactions and answers to the questions below, review all reactions, and identify which resonated with them before discussing as a group. The group generally discussed challenges for the methodology and potential things that might be missing.

- Does this approach provide a generalizable way to analyze and describe socioeconomic impacts of OSW projects in California?
- Are these steps able to capture the key impacts of OSW projects needed to inform compensation agreements?
- What do you think should be added or clarified?
- What challenges do you foresee?

Table 3. Big Picture Reactions to the Skeleton Methodology Discussion

Reaction	Frequency of Concurrence
Complexities and dynamics of fisheries hard to capture and interpret with quantitative data identified	4
The CDFW fishing block data is notoriously terrible. Ecotrust did an evaluation of it for MPA process and found that it is so inaccurate to not be useable	3
Fishing communities (especially fixed gear) have expressed concern around further exclusion from additional transit lanes related to OSW activities	3
Revenue exposure focuses people on money from get-go when understanding spatial dimensions dynamics, and connectedness if key to understanding and addressing individual and collective impacts	3
Marine space use conflict following displacement	3
Loss of markets to shorewide businesses also impact at sea businesses and can often last for decades	2
Considering equity implications of direct one time payments to individual fishers vs. resiliency funds that support current and future fishermen and the community as a whole include future generation of fishers in the compensation model	2
Fishery and place substitution complexities. Fishermen can't hop from one fishery to another	2
Effects of schedule changes in construction, operation, and maintenance	1
Equity and justice (cost and benefit for all)	1
Viability goes beyond money when it comes to people	1
Balancing mitigation with ratepayer effects	1
Habitat changes resulting from construction (boulder relocation)	0

Note: Dots were used by participants to indicate notes that workshop participants thought were important beyond what they had chosen to write. The number of dots were counted, and the value was placed in the right column as the frequency of concurrence.

Discussion Summary

The discussion about the overall methodology ranged from defining what a "fishery" is and who it includes to ensuring that both quantitative and qualitative data are considered as part of the methodology. Initial reactions were positive in that the methodology, as presented, should be replicable across projects in terms of location and time. Some of the specific suggestions can be found in Table 3. Participants discussed the challenge of bringing together quantitative and qualitative data in a cohesive manner that supported calculations while also including community impacts beyond those who own vessels, quota, or shoreside businesses. Additionally, participants discussed uncertainty around some traditionally public datasets (e.g., fishing block location) and how changes to data and tools over time will affect what analyses can be constructed.

There were a few general themes of recommendations that were discussed during this session. One suggestion was to incorporate an adaptive element to the methodology, including potential follow-up studies, and/or monitoring. Several participants noted that including an explicit retrospective element into the methodology would ensure that it could be more easily applied over time.

Another theme was to consider impacts that may occur outside of the lease and cable areas that may not be captured by an impact analysis that focuses on revenue exposure within development areas. Some of those impacts may include congestion within the harbor, changes to species distributions, and higher competition for space on the waterfront (e.g., storage, business, and other opportunities).

Recommendations

Recommendations were summarized after the discussion and presented to participants at the end of the workshop for review and refinement. Participants discussed the recommendations and requested edits and additions. Below are the revised recommendations for the methodology overall:

- Allow for integration of qualitative and quantitative data.
    - Describe perceived impacts of concern identified by stakeholders (e.g., Emery et al. 2020).
- Outline an iterative process for identifying and evaluating social and economic impacts of the OSW project.
    - Work with state agencies to identify impacts, methods, information, and tools.
    - Provide opportunities for stakeholders to review and provide feedback on impact analyses.
- Clarify terms. The term fisheries should be clarified as one that reflects three interwoven components: the fish (resources and habitat), the people (individuals and businesses), and the place (communities, including those of place and of interest).
- Recognize impacts outside of the lease and construction areas (e.g., port congestion impacts, species distributional shifts, impacts on transit pathways, etc.)
- Ensure the methodology can consider the past, present, and future, incorporating reflection and validation.

Other Reactions, Thoughts, and Questions

Other parts of the discussion that were not part of the final set of recommendations from this discussion are summarized below as other reactions, thoughts, and questions.

- Does the methodology include aquaculture or mariculture under the scope and definition of 'fisheries'?
- It is difficult to create a process that is generalizable and can be applied to specific scenarios with imperfect data.
- It would be good to acknowledge the trade-offs and lessons learned of how various compensation vehicles affect outcomes for individuals and communities (e.g., one-time individual payments versus community-focused funds).
- Other situations may have important lessons learned for the methodology, such as disasters (including fisheries but other disasters too), area closures, COVID-19 pandemic, tariffs, etc.
- Equity in the ultimate compensation agreements should be a criterion.

Income Impacts and Data Considerations

A key part of the methodology is the evaluation of potential income impacts (Step 3); however, it is also one of the most complicated due to data limitations and uncertainty about floating OSW impacts on the ability for fishermen to fish in and around the OSW development areas. Because of this, a specific session at the workshop was held to ask participants for their recommendations to ensure this step of the methodology is as robust as possible.

Discussion Structure

Experts were asked to provide insight into potential analyses, data sets, and activities that could be used and considered as part of the assessment. Participants were asked to respond to a specific set of questions and they discussed important considerations for the income impact analyses, including the scale and scope of impacts, changes in data over time, the need for conservative assumptions under uncertainty, and consideration of indirect effects.

The session on Income Impacts and Data Considerations aimed to gather information from participants with regards to how they had or had not seen income impacts calculated previously from other OSW projects. The discussion started with the questions below:

- What additional information can be used to inform revenue exposure analyses to account for future management changes or distributional impacts?
- What recommendations do you have for the area/duration of impacts for floating offshore wind given uncertainty?
- What are the best sources of information/approach for estimating revenue exposure for data-limited fisheries?
- What is the best way to estimate impacts on shoreside businesses? If available multipliers (Specifically, Lovell 2020 and NOAA Fisheries FEUS) are used, what guidance should be provided for their interpretation?

Discussion Summary

The discussion and resulting recommendations focused initially on data availability, particularly for long-term monitoring projects and the implications for the analysis of changes in these datasets, as well as other potential examples of impact analyses. Participants shared some specific suggestions for considerations in Table 4. Some of the initial suggestions for other methods/approaches to examine income impacts methods included the whale entanglements with crab traps and the associated impacts, impacts from harmful algal blooms and the Dungeness crab fishery, groundfish closures, and impacts from marine protected areas. These types of projects occurred in California and had restrictions on fishing in both timing and/or space due to certain management decisions,

which would be similar to certain phases of OSW projects. One participant also suggested examining methods used to examine impacts of other shocks, like the COVID-19 pandemic and tariffs.

Additionally, due to the nature of floating OSW compared to fixed bottom OSW, the impacts of projects in California will likely be different when compared to those in the Atlantic, which are the primary source of previous projects in the United States. Participants discussed how conservative assumptions are likely necessary given major sources of uncertainty about displacement from OSW development areas for floating OSW.

The discussion included other concerns about capturing all impacts to income, including shoreside businesses and ecological changes that may also affect fishing opportunities. Participants described the challenges of compensating crew for impacts due to more limited data about crew and their participation and earnings. There was also acknowledgement that additional OSW development factors other than displacement can affect fishing income, such as oceanographic changes and changes to species distribution and habitat.

Table 4. Considerations for the Methodology Income Impacts Discussion

Data or information sources to adjust revenue exposure for management or distributional changes?	Recommendation for the area or duration of impacts for floating OSW?	Other information sources for estimating revenue exposure for data-limited stock in CA?	How to best estimate impacts on shoreside businesses?
Fisherman & fishery support business including port manager	The level and duration of impacts will be dependent. Some fisheries may be able to adapt to utilize the developed area and some probably won't	Data-limited "fisheries" (stocks & people & activities)	Start with conversations with fishing community to identify impacts and then
Maybe look at other fisheries closures and processes like CA crab for whale entanglements	Including ports/estuaries in area of impacts	Account for existing space uses and coordination (e.g. crabber-towboat agreement)	How far along the impact chain should shoreside services be eligible for compensation in fisheries management
Note that fishery data originate with CDFW (from fishermen & 1st receivers/buyers). Engage CDFW staff as well as fishing community members)	Considerations for duration: potential biological spillover effects could occur slowly. Aggregation effects quickly.		Could possibly look at impacts of COVID and tariffs (some data is being pulled together on this)
Future changes/improvements in fisheries data collection (e.g. D. Crab electronic logbook program starting in 2024)	Climate change may exacerbate/lessen specific fishing-related impacts over time		Look at what happened with markets with the groundfish closures (lasting market changes, consolidation of the fleet, etc.)
Recent work by NMFS (Kelly Andrews) to model future changes in fish stock distribution in response to climate change in the lease areas	The duration of impacts can be informed by fisheries monitoring post construction. Maybe the methodology could allow for flexibility in the duration of impact based on monitoring		Note that NMFS community vulnerability indicators are not commensurate w fishing community

Recommendations

Draft recommendations for Step 3 (direct income impacts analysis) were summarized after the discussion and presented to participants at the end of the workshop for review and refinement. Participants discussed the recommendations and requested edits and additions. Below are the revised recommendations as part of the income impacts session:

- Consider conservative assumptions about area and duration of impacts if there is uncertainty about impacts concerning floating offshore wind.
    - Specifically, it may be warranted to assume complete displacement of fishing operations during construction and/or operations from the OSW development areas (including any buffers).
- Plan for long-term changes in data availability.
    - Data requirements are constantly changing across fisheries, and tools that are available now may not exist or may look different in the future. In addition, new information, data, and/or tools may become available.
- Include impacts on ports and estuaries.
    - Estuarine fishery activities may be disrupted.
    - Port congestion may displace homeported vessels, and vessels who use ports during storms or periodically throughout the year and thereby impact fishery support businesses and the seafood supply system.
- Consider making the methodology adaptive to allow for revising or updating impacts based on post-construction monitoring.
- Consider looking at whale entanglement, Dungeness crab closures, MPAs, the fisheries disaster relief program, as additional methodological examples of social and socioeconomic impact assessments.
- Consider potential indirect economic impacts deriving from any ecological impacts of OSW.
    - If OSW affects fisheries, habitats, listed species, oceanographic conditions, or processes, how will that affect regional fisheries overall?

Other Reactions, Thoughts, and Questions

- The whole is greater than the sum of parts. Sum of income impacts is not equal to community impacts. Impacts are felt throughout the community and not just by the person who owns the vessel, quota, etc.
- Fishing block information on fish tickets is an unreliable indicator of where fishing effort occurred, but it can be groundtruthed and supplemented by knowledgeable fishery participants.

- Unit of analysis (vessel owner) may be important for compensation considerations. How to ensure other affected groups are not left out (e.g., crew)?
- If and how to include potential beneficial impacts of OSW in the analysis?
- Analyses should be inclusive with results reported in ways that are consistent with confidentiality rules.

Dependence & Vulnerability and Supplementary Analysis

The last session of the workshop focused on Steps 4 and 5 of the skeleton methodology and focused on other possible social and community impact analyses and other supplementary analyses that may qualitatively inform compensation agreements (i.e., do not produce quantitative estimates of impacts). The skeleton methodology includes indicators of dependence and vulnerability, specifically citing Community Social Vulnerability Index (CSVI) indicators developed by researchers at NOAA Fisheries (Jepson and Colburn 2013) that may help identify which fisheries and fishing communities may be most dependent and/or vulnerable on OSW development areas, which may be helpful information for the development of community resilience funds. For supplemental analyses, the skeleton methodology suggests a vessel traffic and re-routing analysis be included which may help identify potential congestion or fuel cost impacts.

Discussion Structure

The discussion was framed with the following questions about additional methods and indicators that could be considered by the methodology:

- What important impacts are not covered by analyses/indicators so far?
- Other information to use other than NMFS/federal-level indicators?
- Is there any way to connect analyses to determine amounts for compensation?
- Are there any issues or challenges you see with the recommended analyses?

Discussion Summary

During this discussion, participants generally re-iterated similar concerns as raised in previous discussions. Workshop participants also discussed some of the common dependence and vulnerability indicators and associated tradeoffs. Participants made thoughtful suggestions to broaden and deepen analyses to better account for community impacts and posed questions about how the analysis may support the development of community-focused compensation agreements. One participant discussed how the suggested indicators for this analysis (Jepson and Colburn 2013) rely on information from the US census bureau in a given community and therefore these indicators cannot specifically evaluate the vulnerability specific to members of the community who directly

compose the fishing community. There was a short discussion on how to define a fishing community as a result. However, recommendations were not made for alternate indicators or specific information sources to be used instead.

Participants also discussed how the design of compensation agreements themselves impact the effectiveness of compensation, particularly for community impacts (Table 5). Workshop participants discussed pitfalls from previous agreements to account for broader community impacts and provide effective compensation. Participants discussed how many compensation agreements, inside and outside of fisheries, have prioritized individual compensation over community compensation. The choice to compensate an individual versus a community, intended or not, may not correctly compensate those who worked for those individuals and the importance of accounting for that in compensation calculations. Some of the other considerations for compensation were navigation training for vessel captains and search and rescue training to understand impacts from the OSW project on operations, impacts on infrastructure such as utilities, and cumulative impacts on the community for the length of the project or additional projects.

Table 5. Qualitative and Supplemental Analyses Discussion

Suggestions for additional impacts/analysis?	Suggestions for additional information for analysis to use?	How to use analysis to determine compensation?	Challenges or issues with proposed approaches
Ecological impacts to fisheries/marine mammals and how those lead to impacts to fisheries	NMFS eng & deo measures use "permits" as metric for participants. Need to account for fishermen *licenses* (to fish in general) and permits (for selected fisheries) and vessel (owner) permits (again, for selected fisheries), etc.	Weigh direct compensation of individuals against providing support for community as a whole and future generations	Account for dockside sales?
There was a recent study at the MMI of OSU looking at the impact of OSW and whale entanglement	Highly recommend you look at the socioeconomic section of this report	Don't fall into the hole of just highliners or just boat owners	How to deal with unanticipated impacts (will compensation be constrained by a scope?)
Link fishery impacts to fishing communities (interest, place; at sea, shoreside) port communities, associated coastal communities	Grey and ref'd lit on CA fisheries, fishing communities, etc.		Cumulative impacts noted in doc; important to fully define and account for – e.g. multiple leases, other sources of changes in access, activity, over time and space
Impacts on transiting and loss of waterfront space will be important	There is a lot of published material about social or community vulnerability related to coastal communities		Different impacts for mobile and fixed fishing gears
	Maybe consider looking to NOAA's Voices from the Fisheries database and search for spatial conflicts		How to consider predicted/computed impacts (e.g. expected revenue exposure) vs. observed impacts once implemented

Recommendations

The recommendations for Steps 4 and 5 of the methodology (Vulnerability and Dependence and Supplemental Analyses) were summarized after the discussion and presented to participants at the end of the workshop for review and refinement. Participants discussed the recommendations and requested edits and additions. Below are the final recommendations as part of the dependence and vulnerability and supplemental analyses session:

- Link fishery impacts to fishing communities (interest, place; at sea, shoreside), port communities, and associated coastal communities.
- Consider impacts to fishery participants and communities not at/adjacent to project areas that also "use" or support "use" of those areas—e.g., Trinidad (and other ports, e.g., San Francisco to Crescent City, as well as Eureka).
- Consider how analysis can direct compensation for fishing communities (as opposed to direct compensation for individual harvesters or businesses)
- Consider adding cumulative impacts analysis to address how other projects and reasonably foreseeable actions may affect outcomes.

Other Reactions, Thoughts, and Questions

- Any impact analysis may be limited in its ability to prospectively assess impacts over the long term. How can a methodology or compensation framework be adaptive as possible to adjust over time to the type of impacts and who may incur impacts?
- Consider that longer-term compensation for a community may differ in the first few years compared to 20 or more years in the future. Goals for end compensatory agreements may need to evolve over time.
- Suggest making funds available for specific purposes that were identified by the community.
- NMFS social community vulnerability indicators rely on US Census Bureau data and information at the community level, which is not the same as data at the fishing community level.

Conclusions

Overall, workshop participants provided a wealth of information and feedback for consideration in the methodology, but recommendations for improvement consisted of relatively minor adjustments to individual steps, as opposed to large structural changes to the methodology overall. The biggest recommended changes were to consider adding an evaluation of cumulative impacts to the 'other supplementary analysis' section and to describe the process in which the methodology will be applied (How will stakeholders be allowed to review and how will past impact evaluations be reviewed and validated?)

In addition, throughout the workshop, there were several common themes across participants' recommendations and feedback. The first theme surrounded the challenges with limited data and uncertainty of impacts and the desire of workshop participants to ensure that the methodology could be both iterative and adaptive. This was emphasized in the recommendation to allow for iterative development of analyses with experts and stakeholders, the recommendation to validate analyses (retrospective evaluation of impact analyses), and to plan for long-term changes in data availability.

Another key theme was the scope of the impact assessment and the definition of fisheries being used in the methodology. Participants were concerned about how the methodology captured both at-sea and shoreside impacts that occur outside of the construction areas (lease and cable corridor) as well as indirect effects of ecological changes on fishery activities. Participants were furthermore concerned that impacts on mariculture or aquaculture operations in estuaries and bays would not be considered nor would disruptions in and around port areas due to congestion and competition in port. This discussion highlights broader needs for a definition of the scope and scale of impacts considered by the methodology for where impacts occur, consideration of ecological impacts, and impacts to aquaculture activities.

A third theme centered on elevating and refining social impact analyses considered by the methodology. Participants recommended allowing for the integration of qualitative data into the methodology, noting that the current framework was very focused on quantitative data. Participants also thought the definition of fishing community should span communities of interest, as well as at-sea and shoreside and that impacts to communities not adjacent to the development areas should also be considered.

Lastly, participants consistently discussed how the methodology should ideally set up compensation for the community as well as impacted individuals. For participants, this was reflected in the sentiment that the whole is greater than the sum of its parts. Participants expressed concern that if the analysis focuses on summing individual impacts to determine total impacts, important community impacts may be missed. Furthermore, participants feared that an individual-focused methodology would also lend itself to a compensation framework that favored individuals at the expense of communities. Overall, participants recognized the challenges of developing this methodology and were thoughtful about suggesting additions to make it more thorough.

Additional Resources

Below are sources of information shared by participants at the workshop as resources for the methodology to consider.

Hogan, F., B. Hooker, B. Jensen, L. Johnston, A. Lipsky, E. Methratta, A. Silva & A. Hawkins. 2023. Fisheries and Offshore Wind Interactions: Synthesis of Science. *NOAA Technical Memorandum* Northeast Fisheries Science Center. NOAA NMFS. *https://repository.library.noaa.gov/view/noaa/49151*

Industrial Economics Inc. 2012. Identification of Outer Continental Shelf Renewable Energy Space-Use Conflicts and Analysis of Potential Mitigation Measures. 414 pp. Herndon, VA: U.S. Department of the Interior, Bureau of Ocean Energy Management. *https://espis.boem.gov/final%20reports/5203.pdf*

Socioeconomics of offshore wind website: *https://www.fisheries.noaa.gov/resource/data/socioeconomic-impacts-atlantic-offshore-wind-development*

BOEM's site for funded research on offshore wind: *https://www.boem.gov/environment/environmental-studies/renewable-energy-research*

BOEM-funded larval hydrodynamics studies:

- *https://espis.boem.gov/final%20reports/BOEM_2021-049.pdf*
- DHI Report: *https://espis.boem.gov/final%20reports/BOEM_2025-015.pdf*
- Technical Summary: *https://espis.boem.gov/technical%20summaries/BOEM_2025-015.pdf*
- RPS Report: *https://espis.boem.gov/final%20reports/BOEM_2025-016.pdf*
- Appendices: *https://espis.boem.gov/final%20reports/BOEM_2025-016A.pdf*
- Technical Summary: *https://espis.boem.gov/technical%20summaries/BOEM_2025-016.pdf*

California Joint Fisheries Liaison Office (JOFLO): *https://caseagrant.ucsd.edu/news/sharing-sea*

Emery, C., Richmond, L., Casali, L., Severy, M. and Jacobson, A. (2020). Stakeholder Benefits and Concerns. In M. Severy, Z. Alva, G. Chapman, M. Cheli, T. Garcia, C. Ortega, N. Salas, A. Younes, J. Zoellick, & A. Jacobson (Eds.) California North Coast Offshore Wind Studies. Humboldt, CA: Schatz Energy Research Center. schatzcenter.org/pubs/2020-OSW-R21.pdf.

Pomeroy, Carrie, Debbie Aseltine-Neilson, Nicole Georgilas, and Ryan Bartling. "Socioeconomic Guidance for Implementing the California Marine Life Management Act." (2018).

“Cumulative Effects.” NEPA | National Environmental Policy Act - Cumulative Effects. Accessed May 15, 2025. https://ceq.doe.gov/publications/cumulative_effects.html.

Pomeroy, C. & C. McCaw. 2025. Fishing Community Resilience, Social Cohesion and Offshore Wind Energy Development in California. White Paper prepared under contract to the Alliance of Communities for Sustainable Fisheries. 25 p. Santa Cruz, CA: University of California, Santa Cruz.

Clay, P. & L. Colburn. 2020. A Practitioner's Handbook for Fisheries Social Impact Assessment. In *NOAA Technical Memorandum*, 89 p.: U.S. Department of Commerce; National Oceanic and Atmospheric Administration; National Marine Fisheries Service.

Appendices

Appendix 1: Workshop Agenda

8:00 am—Welcome, Introductions

- Plan for the day
- Introductions
- Icebreaker

8:15 am—Project Background/Orientation

- Overview of SB 286
- Background of CA OSW and Fisheries WG
- Northern Economics' Scope of work
- Project objectives and constraints

8:30 am—Workshop Goals and Objectives

8:35 am—Presentation: Foundations of the Methodology and Overview

- Brief review of foundational documents from literature review and interviews
- Overview of high-level methodology steps
- Q&A

9:00 am—Discussion Part 1: Big Picture Reactions

9:30 am—Discussion Part 2: Step 3- Income Analysis and Data Considerations

10:30 am—Break

10:45—Discussion Part 3: Steps 4 & 5- Qualitative and Supplementary Analysis

11:45 am—Synthesis & Recommendations

12:30 pm—Next Steps and Closeout

12:45 pm—END

Appendix 2: Draft Socioeconomic Impact Skeleton Methodology

Below is a high-level outline of what is currently envisioned to be the core components of the eventual socioeconomic impact methodology—referred to as the 'skeleton methodology'.

Once these high-level steps have been reviewed and refined, the eventual methodology will flesh each step and sub-step out with more information, resources, caveats, and other information needed for eventual users to apply the methodology to evaluate unavoidable impacts of offshore wind development on fisheries.

Please refer to the *Literature Review* and *Interview Summary* documents for more information on key concepts and resources (**blue bold text**), if needed.

Outline

1. Survey Available Data and Tools
2. Summarize Project, Affected Fisheries, and Communities
    a. Describe project, determine areas and duration of impacts, including any buffers, by fishery or gear type
        i. Lease area
        ii. Cable corridor
        iii. Onshore locations
    b. Using available information, summarize affected fisheries and fishing communities
        i. Commercial participation, effort, and landings trends
        ii. For-hire effort, targeted species
    c. Describe management context, recent trends
3. Estimate Direct Income Impacts (commercial and recreational)
    a. Select tools and data for use
        i. If methods to predict income impacts are not available, use **revenue exposure**[1]

[1] Quantitative impacts of OSW on fisheries have previously primarily been based on calculations of revenue generated in the areas that may be affected or "exposed" to OSW activity. Chaji and Werner (2023) examines the various methods of calculating revenue exposure and its limitations.

ii. If using revenue exposure, potential data sources and tools

1. NOAA Fisheries **PacFEM**[2]**—**available for most commercial fisheries
2. Logbook data—for fisheries that are not available on PacFEM and have logbook data
3. Fish Tickets—landings and revenue, **fishing block location**[3]
4. **Community fishery mapping projects**[4]
5. Revenue estimates per trip for hire trips and **shoreside multipliers**[5] for for-hire fisheries: **Lovell et al. 2020**[6]
6. Commercial fishery shoreside multipliers for California—**NMFS FEUS**[7] **(Seafood Industry Impacts Tool)**[8]**, IOPAC**[9]**, or IMPLAN**[10]

b. Make adjustments to allow for revenue exposure calculations

i. Data-limited fisheries (estimate revenue exposure using best information available)

ii. Adjust for inflation, convert to common base year

[2] Pacific Fishing Effort Mapping Project. PacFEM incorporates institutional knowledge and expertise from state departments of fish and wildlife, NMFS, PSMFC, and the Pacific Fishery Management Council.

[3] In California, a fishing block is a 10 square nautical mile location that is reported as the fishing location on fish tickets for landings in commercial fisheries and in the monthly logbooks in for-hire fisheries.

[4] Two specific community mapping projects and their data products exit through the California Offshore Wind Energy Gateway (*https://caoffshorewind.databasin.org/datasets/7ea9f5e0e5c149ef9c5286b39c4753d2/*): the Northern CA Commercial Fishermen's Associations Community-Mapped Fishing Grounds (*https://storymaps.arcgis.com/stories/ec90562aada545acb6bb1bf6f3c8f228*) and Central Coast Fisheries Heritage Mapping Project (*https://caoffshorewind.databasin.org/datasets/7ea9f5e0e5c149ef9c5286b39c4753d2/*).

[5] Multipliers can be developed for shoreside impacts using NMFS' Fisheries Economics of the US report for commercial fisheries and Lovell et al. 2020 for for-hire fisheries.

[6] Lovell, S.J., Hilger, J., Rollins, E., Olsen, N.A. and Steinback, S., 2020. *The Economic Contribution of Marine Angler Expenditures on Fishing Trips in the United States, 2017*. National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Silver Spring, MD. *https://spo.nmfs.noaa.gov/sites/default/files/TM201.pdf*

[7] All of the past Fisheries Economics of the United State Reports can be found at: *https://www.fisheries.noaa.gov/national/sustainable-fisheries/fisheries-economics-united-states*

[8] Fisheries economics data and visualizations can be found at: *https://www.fisheries.noaa.gov/data-tools/fisheries-economics-united-states-data-and-visualizations*

[9]The Input-Output Model for Pacific Coast Fisheries (IOPAC) model was developed specifically for West Coast fisheries and a full description of the model can be found at *https://www.fisheries.noaa.gov/data-tools/fisheries-economics-united-states-data-and-visualizations*.

[10] IMPLAN (IMpact analysis for PLANning) is an input-output model that is used by NMFS to better understand regional economic impacts of potential management decisions.

c. Apply multipliers to estimate shoreside impacts

i. Commercial

ii. For-Hire

d. Develop baseline estimate

e. Consider accounting for future trends including management and climate change

f. Estimate total at-sea and shoreside impacts over lifetime of project

4. Assess Dependence and Vulnerability

a. Dependence of individual fisheries on OSW area (percent of landings, revenue, trips)

b. Dependence of individual fishing communities on OSW area

i. Total and by species/fishery and community

c. Vulnerability of affected fishing communities

i. Community Social Vulnerability Index[11]

5. Other Supplemental Analysis

a. If using revenue exposure—**Vessel traffic and re-routing analysis**[12]

Appendix 3: Workshop Goals and Key Questions

Project Objective

Produce a socioeconomic impact methodology which will enable **consistent**, **thorough**, and **objective** evaluations of offshore wind (OSW) impacts on fisheries to **guide compensatory agreements** in California (see Northern Economics' *Scope of Work* for more information). The methodology will be used to inform guidance and determinations for compensatory mitigation resulting from unavoidable OSW impacts in California. Specifically, the methodology will describe steps and approaches that can be used to inform the development of direct compensation and

[11] Described in Jepson and Coburn 2013 and expanded for offshore wind projects on the west coast by Pfeiffer et al. 2024. (Jepson, M., and L.L. Colburn. 2013. *Development of Social Indicators of Fishing Community Vulnerability and Resilience in the U.S. Southeast and Northeast Regions*. U.S. Dept. of Commerce, NOAA Tech. Memo. NMFS-F/SPO-129, 64 p. *https://spo.nmfs.noaa.gov/sites/default/files/TM129.pdf* and Pfeiffer, L., Alkire, C., and Ise, J.L. 2024. *Socioeconomic Characterization of West Coast Fisheries in Relation to Offshore Wind Energy Development*. BOEM 2024-054. August 2024.)

[12] Impacts on vessel traffic and routing are anticipated with OSW development activities, called re-routing analysis. This analysis has typically been done using Automatic Identification System (AIS) data to evaluate the number and patterns of vessel traffic in the area.

resiliency funds, considering possible data and information limitations and project-specific considerations. The methodology is anticipated to be generalizable and flexible to apply to various OSW projects across the state but detailed enough to allow for east of use and consistent application.

Skeleton Methodology

The 'skeleton methodology' is a high-level outline of the major steps and components of the socioeconomic impact methodology as it is currently envisioned. It is informed by current practices on the US East Coast, similar methodologies including BOEM's draft fisheries mitigation guidance, and adapted to the data and methods specific to California fisheries and with consideration of knowledge gaps and sources of uncertainty with respect to floating offshore wind technology. In addition, information gathered in interviews has also informed the skeleton methodology (see the *Literature Review* and *Interview Summary* for more information).

Workshop Goal

Review and suggest modifications to the skeleton methodology to ensure the final methodology is:

- Thorough
- Objective
- Able to guide compensatory agreements
- Able to be used consistently

Workshop Objectives

- Review the skeleton methodology: identify strengths, gaps, suggest improvements
- Identify additional analyses, resources, or indicators that may be utilized or referenced
- Document expert recommendations for improvements to the methodology to ensure it meets its goals

Key Issues and Questions for Discussion

- Does this approach provide a generalizable way to analyze and describe impacts of any potential OSW projects in California into the future?
- Are these steps able to capture the key impacts of OSW projects that directly connect to and inform compensation agreements (design, negotiated amounts)?
- What (if anything) is missing from the methodology?
- What additional information can be used to inform revenue exposure analyses to account for future management changes or distributional impacts?

- What advice or challenges exist for using revenue exposure as basis for compensation agreements?
- What are the best sources of information/approach for estimating revenue exposure for data-limited fisheries?
- What is the best approach to estimate impacts on shoreside businesses? If available multipliers (Specifically, Lovell et al. 2020 and NOAA Fisheries FEUS) are used, what guidance should be provided for their interpretation?
- What supplementary or qualitative analysis should be provided to inform negotiations? Are there any changes or additions to suggested approaches?

Appendix B: Socioeconomic Methodology for Tribal Fisheries

Socioeconomic Impact Methodology for Tribal Fisheries and Offshore Wind Projects in California

Prepared for

California Coastal Commission

April 2026

Northern Economics

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Contents

Abbreviations

MOA	Memorandum of agreement
MOU	Memorandum of understanding
OSW	Offshore wind
SB	Senate bill
TCL	Tribal Cultural Landscape
TK	Traditional Knowledge

Background

This document is a methodology for a comprehensive project-level socioeconomic analysis of direct and indirect impacts to commercial and recreational fishing industries and tribal fisheries. The methodology was developed to support the California Offshore Wind Energy Fisheries Working Group, which has been tasked with developing a Statewide Strategy to address fisheries impacts from offshore wind development. For more information on how this methodology fits within the larger Statewide Strategy, as well is how it relates to the development of compensatory mitigation agreements, please refer to the Statewide Strategy. This document only lays out a methodology for tribal fisheries; commercial and recreational fisheries are addressed in Chapter 5. Please refer to the scope section below for more information about this distinction.

Scope

As described above, a separate methodology is produced for commercial and recreational fisheries in California (see Chapter 5). However, as defined in Chapter 7, tribal fisheries include commercial, recreational, and subsistence fishing activities conducted by Tribes and tribal members. As a result, it is important to clarify which tribal fisheries activities are covered by this methodology and which are covered by the other. Commercial and recreational fisheries that are covered by the methodology in Chapter 5 include commercial and for-hire fisheries managed by the state of California or the US federal government. That methodology focuses on potential income and economic impacts that may result to fishing businesses and associated impacts to shoreside fishing businesses (processors, fish dealers) and fishing communities. Thus, income impacts to tribal members who are also commercial or for-hire fishermen permitted by the state or federal government are not considered here. This methodology considers all unique or non-overlapping aspects of tribal fisheries, such as subsistence fisheries, including subsistence harvest while participating in commercial, for-hire, or private fishing activities, or commercial or recreational fisheries managed by Tribes (such as those with explicit rights to fish and who manage fisheries on their lands).

Key Terms and Definitions

Offshore Wind (OSW) Leaseholder: Refers to an individual, corporation, or consortium, holding a state or federal permit in a California wind energy area for the purpose of wind energy extraction and electricity production and export.

Socioeconomic impacts: The direct and indirect effects of a project on the social and economic aspects of a community that are felt across societal structures and financial systems such as employment, education, community health, and quality of life, which are all crucial for understanding a community's overall well-being.

Tribal subsistence fishing: Tribal subsistence fishing is defined as the non-commercial catching or gathering of natural aquatic resources, including fish and shellfish, for consumption by individuals, households, or communities of California Native American Tribes to meet needs for sustenance.[1]

Tribes: All California Native America Tribes, including federally recognized and non-federally recognized Tribes.

Tribal fisheries: Tribal fisheries include commercial, recreational, and subsistence fishing activities conducted by Tribes and tribal members.

Traditional Knowledge (TK): The non-native definition of TK is "a cumulative body of knowledge, practice and belief evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment" (NOAA 2023b).

Outline of Steps

Below is an outline of the major suggested components of the socioeconomic impact methodology for tribal fisheries. It should be noted that while these components are outlined as steps, they may not always occur sequentially, and may be performed iteratively, as needed. Specifically, Step 3 may be completed concurrently with Steps 1 and 2; however, it is likely that OSW leaseholders will identify potentially impacted Tribes prior to working with them to evaluate impacts. It is also acknowledged that communication with Tribes is likely to be occurring outside of the evaluation of impacts, and it is not expected that the ordering of these steps should be taken literally in that respect.

Step 1: Project description

a. Describing the Project
b. Identifying Potentially Impacted Tribes

Step 2: Identify Approach, Compile Information

a. Possible Public Information Sources

Step 3: Work with Tribes

a. Communication with Tribes
b. Confidentiality
c. Integrating Traditional Knowledge
d. Determining Impacts of Concern
e. Evaluating Impacts

[1] Definition comes from the California Water Boards Tribal Beneficial Uses. *https://www.waterboards.ca.gov/tribal_affairs/docs/tbu_fact_sheet_v04.pdf*.

Step 1: Project Description

This step focuses on describing the project and identifying potentially impacted Tribes associated with the OSW development to initiate communication and possible collaboration for evaluating potential impacts. Some OSW leaseholders may have started communication with impacted Tribes prior to starting this methodology. This step is provided as a starting place if those communications have not already occurred. The number of Tribes that may be impacted by OSW development may be the same as or a subset of the Tribes identified in Chapter 7 that have current and traditional ties to the lease areas and other infrastructure areas. This step starts with the OSW leaseholder looking broadly at the project footprint and possible impacts to Tribes, from which more specific impacts may be identified.

Describe the Project

Describe the project including areas and duration of potential impacts to help determine potentially impacted Tribes and prepare for starting or maintaining communication with those Tribes. This should include information from the Construction and Operations Plan (COP) that describes the expected duration of different project phases (construction, operation and maintenance, and decommissioning), as well as maps of project areas, and landfall locations. Maps should detail the full spatial footprint of the proposed project in the lease area, cable corridors, and onshore areas. Details about the technology used, configuration of cables, and depth of floating and buried components should also be identified, which may include a range of options given the bounds of project design and permitting. Given construction may have an indeterminate timeline due to supply chain constraints, permitting, deployment, weather, and other factors, a conservative construction timeline (i.e., accounting for possible delays) should be described and this period should be explicitly explained where possible. As much as possible, this description should be written in clear and accessible language to facilitate understanding and interpretation by Tribes.

Identify Potentially Impacted Tribes

Established pre-consultation practices or procedures should take precedence in this step including BOEM Tribal Communication Plans, the Communication Protocol (from Chapter 7), and any existing developer-specific communication plans (developer-specific Native American Tribes Communication Plan (NATCP) and the Joint NATCP[2]). The Tribes that are identified as potentially impacted should be noted for use in the subsequent steps of this methodology. It is important to note that this step may not identify all the impacted Tribes that would be interested in participating in further steps of this methodology.

[2] *https://atlaswind.com/wp-content/uploads/2024/08/Central-California-Joint-NATCP-rev4_clean-1.pdf*.

Step 2: Compile Relevant Information

In this step, available information about current and traditional tribal fisheries is compiled to begin the process of identifying what information is available to support evaluations of impacts. Subsequent steps focus on working with Tribes to fill information gaps and evaluate impacts, potentially including through the gathering of Traditional Knowledge (TK), which is described in more detail in Step 3.

Possible Public Information Sources

It is recommended that all publicly available data or information sources should be compiled and reviewed to gain a preliminary understanding of what tribal fisheries may be affected by the proposed project before reaching out to Tribes to discuss potential impact evaluations. While it is ultimately important to confirm and use the information, data, and/or any knowledge that Tribes expressly wish to be used, a review of all public information is recommended as a starting place. The overarching theme for the methodology is to support Tribes in leading and determining the types of data that are needed and appropriate, the standards appropriate for that data, and accessibility to those outside the Tribe.

While Tribes along the West Coast have strong cultural and spiritual ties to coastal fishery resources, a limited number have dedicated treaty and access rights to harvest various species (PFMC 2025), which affects the extent to which fisheries are managed by Tribes and what information about harvest levels and use are available to support impact assessments. The majority of Tribes on the West Coast with defined treaty rights are located in Washington state with four having defined Usual and Accustomed fishing areas that extend into the offshore environment. In California, the Yurok and Hoopa Valley Tribes have a federally reserved right to harvest up to half of the harvestable surplus of Klamath River Fish (PFMC 2025). Both Tribes manage their harvests on their tribal lands and associated waterways. As a result, tribal fishery management programs are potentially a good source of information to better understand these fisheries (Table 1). In general, because the Pacific Fishery Management Council works with Tribes along the West Coast to co-manage fisheries, their website is a good source of information on those fisheries.[3]

Fishery management or other development of projects and supporting analyses of impacts may also contain information about tribal fisheries. Such sources include Environmental Impact Statements (EIS) of federal fishery management actions, or other OSW projects. Non-OSW projects may also be helpful, such as the dam removal on the Klamath River.[4] The Tribal Cultural Landscape (TCL)

[3] *https://www.pcouncil.org/fishing-communities/tribes/*.

[4] *https://www.ferc.gov/news-events/news/ferc-staff-issues-final-environmental-impact-statement-lower-klamath-and-klamath*.

approach developed by BOEM can provide more information about the cultural significance of tribal spaces and resources may also contain information about tribal fisheries uses (BOEM 2015). These documents contain information that may be considered Traditional Knowledge (TK, discussed below in Step 3), which may limit their public availability, and the approach may not have been completed by every tribe that is impacted. Another helpful resource is the Federal Fishery Disaster Assistance Program,[5] which may compensate for financial losses associated with fishery disasters, including impacts on tribal fisheries. These are some of the available resources at the time of writing this methodology that may help foster understanding of tribal fisheries and how impacts to fisheries may connect to compensation.

As mentioned above, TCLs (Table 1), are one source of information for understanding relationships between Tribes and their environment. Additionally, the guidance available to develop TCLs may also be relevant for those using this methodology. While the TCL process has the slightly different goal of long-term co-management with federal agencies than the methodology outlined in this document, it does have a few key aspects that would be helpful in understanding cultural linkages between a specific Tribe and the area of impacts. Some of those aspects include their collaboration with Tribes as part of the TCL process and the details of the process. Such details include identifying the type of information used to describe the area (and impact, for the purposes of this methodology) of interest, data security, data collection, contextualizing data, and any presentation of the data through reports, presentations, or visits in concert with Tribes (BOEM 2015).

[5] *https://www.fisheries.noaa.gov/national/funding-financial-services/fishery-resource-disaster-assistance*

Table 1. Public Information Sources on Tribal Fisheries

Title	Description	Access
California Truth & Healing Council: Principles for Respectful Meetings	The Council developed this document to support public participation in making better decisions that incorporate the interests and concerns of all communities.	*https://tribalaffairs.ca.gov/wp-content/uploads/sites/10/2022/06/CTHC-Respectful-Engagement_Final.pdf*
Tribal Memorandums of understanding (MOUs) with California	MOUs between a tribal entity and a California state agency or department	e.g., *https://www.yuroktribe.org/post/yurok-tribe-caltrout-and-farmers-ditch-company-sign-historic-mou*
Environmental Impact Statements (specifically affecting fisheries e.g., dam removal projects)	Description of the project and impacts on tribal entities, their fisheries, and other environmental impacts.	e.g., *https://www.ferc.gov/news-events/news/ferc-staff-issues-final-environmental-impact-statement-lower-klamath-and-klamath*
BOEM Tribal Cultural Landscapes	Guide and case studies to describe interests across landscapes to federal and other natural resource agencies prior to any proposed projects.	*https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Pacific-Region/Studies/BOEM-2015-047.pdf* *https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Pacific-Region/Studies/BOEM-2017-001-Vol2.pdf*
NOAA Federal Fishery Disaster Assistance Program	A program for commercial, recreational, and tribal fisheries that can compensate for financial losses due to unexpected changes in biomass or access to a fishery. Tribal fisheries have previously been approved for allocation.	*https://www.fisheries.noaa.gov/national/funding-financial-services/fishery-resource-disaster-determinations*
Pacific Fishery Management Council	Regional Fishery Management Council works with federally recognized Tribes on the West Coast with treaty-reserved fishing rights to manage fisheries that they participate in.	*https://www.pcouncil.org/fishing-communities/tribes/*
Tribal Fisheries Websites	Descriptions of fisheries resources, seasonal management plans, and other fisheries related work	e.g., Yurok Tribal Fisheries Program: *Fisheries | Yurok Tribe*; Hoopa Valley Tribe Fisheries Department: *Fisheries | Hoopa Valley Tribe*

Step 3: Work with Tribes to Evaluate Impacts

The third step outlines the major aspects of working with Tribes to assess the socioeconomic impacts on tribal fisheries and outlines best practices for understanding and applying Traditional Knowledge (TK). This step includes guidance for communicating with Tribes and treatment of confidential information, and refers to best practices for integrating TK. It also provides information for determining impacts of concern and evaluating those impacts, including possible quantitative and qualitative approaches. The process should be guided by tribal preferences throughout. As described in Chapter 7, each Tribe may have different processes and preferences for communication and information sharing, which must be respected. Nothing in this methodology should be interpreted as supplanting each Tribe's preferences and wishes for how information on impacts or current and traditional fisheries practices should be used. It is important to note that each of these sub-steps is expected to occur with each impacted Tribe.

Communication with Tribes

All communication with Tribes for the purposes of identifying, describing, or assessing tribal fisheries impacts should refer to established guidance and communication plans with individual Tribes. Refer to Chapter 7 for guidance and best practices on communication, pre-consultation, and engagement with Tribes. All communications with Tribes should happen early, often, and meaningfully, recognizing the sovereignty of the Tribe and working to address issues that come up through appropriate communication, coordination, and collaboration efforts.

As part of this communication, there may be an opportunity to understand each Tribe's capacity for engagement and their desire and ability to contribute to this effort. Early on in communications with Tribes about plans to assess impacts this methodology recommends exploring whether a data sovereignty agreement, memorandum of understanding (MOU) and/or memorandum of agreement (MOA) is appropriate and desirable either as part of this methodology or as part of another agreement that is being developed between the OSW leaseholder and the Tribe.[6] Such agreements would outline the process and plans for collecting and assessing tribal fisheries impacts and the Tribe's role in this assessment, including compensation for any services performed by the Tribe, or honoraria for tribal representatives to attend or engage in activities such as meetings and interviews. It is recommended that this be developed after Steps 1 and 2 are completed but before Step 3 is completed.

[6] The recommendation for an agreement (data sovereignty, MOU, or MOA) comes out of interviews with tribal members and was discussed and supported at the Tribal Roundtable discussions hosted by the California Coastal Commission.

Confidentiality

Please refer to sections of Chapter 7 for information about the confidentiality of any information shared by Tribes for the purpose of assessing potential impacts (under Communications Protocols). A signed data sovereignty agreement specifically for the purposes of assessing impacts on tribal fisheries (described above) will outline specific requirements for confidentiality for information shared or collected for the purposes of assessing tribal fisheries impacts.

Integrating Traditional Knowledge

Under this methodology, Tribes may share TK for the purposes of describing areas and resources of concern, potential impacts of concern, or to support the evaluation of potential impacts. Such knowledge must be respected and only gathered and utilized in a manner expressly granted by the Tribe. To support the proper identification and consideration of TK, this section summarizes relevant best practices as a starting point. However, it should be noted that nothing in this section supersedes definitions, best practices, or policies that individual Tribes have concerning use of their TK. Users of this methodology should defer to individual tribal preferences and policies with respect to TK. It also should be noted that each Tribe may have a different term they use to refer to their knowledge. Here, the term TK is used and includes knowledge, practices, and beliefs handed down through generations by cultural transmission about the relationship of living beings with one another and their environment (as Traditional Ecological Knowledge defined by NOAA (2023b).

This process may result in non-public TK being shared with OSW leaseholders and others seeking to apply this methodology to assess impacts. Therefore, respect and care should be used to adhere to established best practices for integrating TK as well as deferring to tribal rights and preferences for use of such information. This may mean that some Tribes prefer not to share their knowledge of the impacted area and fisheries. Users should also refer to the best practices laid out in Chapter 7 (under Communication Protocols), which direct OSW leaseholders to understand and respect the confidentiality of any information shared. These two aspects of interacting with Tribes—communication and data sovereignty—should be conducted with particular care before collecting and applying TK (NOAA 2023a). TK should be considered expert opinion (Native American Cultural Preservation 2020). Users of this methodology should work with individual Tribes to develop agreed-upon methods for each step of bringing TK into impact assessments (NOAA 2023a).

Currently available best practices suggest that when appropriate and only with the Free, Prior and Informed Consent[7] of TK holders, TK may be utilized for the purposes of assessing impacts (NPFMC

[7]Following the definition by NOAA (2023a) for Free, Prior, and Informed Consent of Indigenous Knowledge (IK) is defined as: Free: IK holders should not be coerced or pressured into sharing IK. Prior: This term ensures that, procedurally, IK holders should be involved at the earliest stage. Prior refers to a process to obtain consent before IK is accessed. For some undisclosed knowledge, consent may not be given. Informed: Existing treatments of the

2023). If Tribes choose to share TK, best practices suggest that it is vital to identify TK holders within the Tribe appropriately and accurately. Those who may be TK holders can typically be identified by their peers as having the expertise and authority to share their knowledge. TK holders may be elders in the community who have participated in fisheries and other cultural gathering practices, know and make oral histories, or have extensive fishing experience (NPFMC 2023). Users of this methodology should expect to discuss TK with multiple TK holders with the impacted Tribe and be prepared to integrate different types of TK from oral histories and storytelling to descriptions of fishing practices. The processes and level of comfort with sharing TK may differ between Tribes.

There are various methods of collecting TK and each Tribe's preferences may differ. Those who are allowed to collect TK may be expected to take on the role of the student with the knowledge holder as the teacher, no interruptions may be expected while the TK holder is speaking, and a form of compensation for the TK holder's time should be offered (Ferguson and Messier 1997). Some specific methods of collecting TK include semi-directive interviews, questionnaires, analytical workshops, or collaborative field work (Huntington 2000). Each Tribe may have different expectations of those collecting TK and a preferred method of collection, which should be discussed before the start of any collection processes.

There are a number of different methods that can be employed to integrate TK into natural resource decisions. Some characteristics that are common across these processes of integration are open decision-making processes, early and continuous goal setting, acknowledging the legitimacy of and trusting other stakeholders, providing resources, and sharing authority and benefits (Donoghue et al. 2010). Other important guidelines for integrating TK include identifying holders of TK, leveling the power between Tribes and holders of TK and other stakeholders (e.g., recognizing Tribal sovereignty, embracing transparency where reasonable, building capacity collaboratively where needed, etc.), and having or building the capacity to work with TK needed to effectively integrate and consider TK in natural resource discussions of impacts to tribal resources (NPFMC 2023; Raymond-Yakoubian et al. 2017; Lertzman 2010; Hoagland 2017). These aspects should be considered if a Tribe is willing to share knowledge of their fisheries, and, through discussion with each Tribe, a process should be identified to gather, secure, and apply TK to the potential impacts of concern.

Determine Impacts of Concern

As discussed in Chapter 7, representatives of the California Offshore Wind Energy Fisheries Working Group (Working Group), and California Native American Tribes (through consultation) identified potential adverse impacts that are unique to tribal fisheries. This set of potential impacts may be

meaning of "informed" have emphasized the need to address costs and benefits, risks and opportunities, and the facts surrounding any given situation. Consent: This term ensures that processes for obtaining consent should first affirm the right of IK holders to decline to engage in mobilizing IK for the purposes of this methodology.

considered a starting point from which potential impacts of concern to individual Tribes may be determined (see Tables 1–4, in Chapter 7).

During the engagement process, describe the project to the potentially impacted Tribes identified in Step 1. The Tribes may be willing and/or able to provide a greater understanding of the current status of the potentially impacted areas (identified in Step 2) and what impacts may be felt in those areas including commercial, recreational, and subsistence as well as current and traditional cultural fishing practices that may be impacted by the project. This is the step where Tribes may be willing and able to define what is significant within their communities using their own criteria and not as defined by external sources or criteria (BOEM 2015). As mentioned above, each Tribe can choose how and what information to share with the developer. If a Tribe chooses not to share information, the OSW leaseholders may work with that Tribe to determine the next best steps. If a Tribe decides to share information, there should be a clear understanding of how that information can be used and shared. The information that Tribes choose to share will likely differ between Tribes depending on the type of fishing activity (commercial, recreational, subsistence, or cultural) and may look different between Tribes for the same fishery.

Evaluate Impacts

While public information sources may be a good starting point to understand tribal fisheries, individual Tribes should be consulted to identify the information sources and analytical methods that they would like used to evaluate the likelihood, magnitude, scale, and duration of impacts relative to status quo (i.e., without the action). If a quantitative method can be identified and is supported by the Tribe for use to evaluate impacts, such a method is preferable to a qualitative method for the purposes of developing compensation agreements if agreed upon by the OSW leaseholder and the Tribe. Here, a quantitative method for evaluating socioeconomic impacts means it can generate either dollar value estimates of impacts or other numerical outputs that describe impacts (such as impacts to income or other businesses, number of fishing trips, pounds of fish, or number of tribal fisheries users). One method that has been used to quantify subsistence fisheries is that of replacement cost. Replacement cost was used to compensate Tribes due to the Exxon Valdez oil spill,[8] has been calculated for the Bristol Bay salmon fishery,[9] and is calculated every few years by the Alaska Department of Fish and Game.[10] To calculate replacement costs for lost subsistence resources, information on market price of a similar replacement product available at a local supermarket, the quantity required per person or per household, the number of people or households affected, and the other incidental costs such as transportation, preparation, storage, and taxes could all be collected and considered as part of a quantitative evaluation of socioeconomic impacts. Another method may

[8] *Exxon to pay Alaska natives $20 million - UPI Archives*.

[9] *https://static1.squarespace.com/static/56b0dfb660b5e98b87fc3d52/t/6053de8bc8cb7e2a25d62028/1616109201185/Final+Economic+Benefit+of+Bristol+Bay+Salmon+3_17_21.pdf/*

[10] *subsistence_update_2017.pdf*.

consider the cost of measures that may mitigate or offset impacts, including the cost of raising replacement fish in a hatchery or habitat restoration projects. In other cases, a quantitative analysis may be used but impacts may need to be described qualitatively. In cases that rely on oral accounts or other non-numerical information, a qualitative assessment of impacts may be used (see below for best practices for utilizing traditional knowledge).

Qualitative descriptions of impacts should provide an indication of the impact type (direct or indirect[11]), including the likelihood of impact, and the magnitude, scale, and direction of impacts (examples provided in Table 2) as well as whether the impacts will be short term (e.g., immediate but temporary) or long term (e.g. occur later in time or occur over an extended period of time including after the project's completion). For example, OSW leaseholders may describe their understanding of the type of impact and work with Tribes to describe the other factors outlined below. Additionally, any uncertainty about the impact can be described as relevant using a range of potential impacts in terms of magnitude, scale, direction, or duration (e.g., neutral to low positive impacts).

Table 2. Example Qualitative Impact Factor Descriptions

Impact Type	Magnitude	Direction	Duration	Scale (size of geographic area affected)	Likelihood
Direct	Negligible	Positive	Short Term	Localized	Very Unlikely
Indirect	Slight	Neutral	Medium Term	Broad	Unlikely
–	Low	Negative	Long Term	–	Likely
–	Moderate	–	Irreversible	–	Very Likely
–	High	–	-	–	–

[11] This methodology adopts the same definition of direct and indirect effects as used by the National Environmental Policy Act (NEPA) where direct effects are immediate effects in place and time and indirect effects occur later in time or farther away but are reasonably foreseeable (40 CFR § 1508.1(i))

Conclusion

It is expected that the three steps of this methodology will be applied consistently with Tribes to evaluate the remaining socioeconomic impacts to tribal fisheries in California after all avoidance, minimization, and mitigation measures have been implemented. As outlined throughout Chapter 7 and this methodology, tribal preferences and processes must take precedence throughout the application of this methodology to evaluate unavoidable socioeconomic impacts on tribal fisheries. This methodology describes an iterative process of identifying impacted Tribes, compiling relevant information and data, and working with Tribes to assess unavoidable socioeconomic impacts. It is expected that this process will end with a completed socioeconomic impact assessment for each individual Tribe expected to experience unavoidable impacts on tribal fisheries.

Acknowledgments

This methodology was developed with the California Coastal Commission's Offshore Wind Energy Fisheries Working Group and specifically the working subgroup that consisted of tribal representatives and developer representatives, including tribal liaisons with a focus on unique considerations for tribal impacts including socioeconomic impacts. We would also like to acknowledge and thank all of the tribal members and citizens across California who were willing and able to make time for interviews or who attended roundtable meetings hosted by the California Coastal Commission.

References

BOEM. 2015. Https://Www.Boem.Gov/Sites/Default/Files/Environmental-Stewardship/Environmental-Studies/Pacific-Region/Studies/BOEM-2015-047.Pdf. OCS Study BOEM 2015-047. https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Pacific-Region/Studies/BOEM-2015-047.pdf.

Donoghue, Ellen, Sara Thompson, and John Bliss. 2010. "Tribal-Federal Collaboration in Resource Management." Journal of Ecological Anthropology 14 (1): 22–38. https://doi.org/10.5038/2162-4593.14.1.2.

Ferguson, Michael A.D., and François Messier. 1997. "Collection and Analysis of Traditional Ecological Knowledge about a Population of Arctic Tundra Caribou." ARCTIC 50 (1): 17–28. https://doi.org/10.14430/arctic1087.

Hoagland, Serra Jeanette. 2017. "Integrating Traditional Ecological Knowledge with Western Science for Optimal Natural Resource Management." Published in IK: Other Ways of Knowing 3: no. 1. https://doi.org/10.18113/P8IK359744.

Huntington, Henry P. 2000. "Using Traditional Ecological Knowledge in Science: Methods and Applications." Ecological Applications 10 (5): 1270–74. https://doi.org/10.1890/1051-0761(2000)010[1270:UTEKIS]2.0.CO;2.

Lertzman, David Adam. 2010. Best of Two Worlds: Traditional Ecological Knowledge and Western Science in Ecosystem-Based Management. 10 (3).

Native American Cultural Preservation, No. 275 (2020). https://nahc.ca.gov/wp-content/uploads/2023/03/Unit-6-Law-Library.pdf.

NOAA. 2023a. NOAA Guidance and Best Practices for Engaging and Incorporating Indigenous Knowledge in Decision-Making. https://www.noaa.gov/sites/default/files/2023-07/NOAA_IK_Guidance_FINAL_2023.pdf.

NOAA. 2023b. NOAA Procedures for Goverment-to-Government Consultation With Federally Recognized Indian Tribal Governments. https://www.noaa.gov/sites/default/files/2023-07/NOAA_Tribal_Consultation_Handbook_2023_FINAL.pdf.

NPFMC. 2023. Protocol for Identifying, Analyzing, and Incorporating Local Knowledge, Traditional Knowledge, and Subsistence Information into the North Pacific Fishery Management Council's Decision-Making Process. https://meetings.npfmc.org/CommentReview/DownloadFile?p=01b5068d-0440-46af-ab1e-50b899ae2faf.pdf&fileName=LKTKS%20Protocol.pdf.

PFMC. 2025. "Tribes - Pacific Fishery Management Council." https://www.pcouncil.org/fishing-communities/tribes/.

Raymond-Yakoubian, Julie, Brenden Raymond-Yakoubian, and Catherine Moncrieff. 2017. "The Incorporation of Traditional Knowledge into Alaska Federal Fisheries Management." Marine Policy 78 (April): 132–42. https://doi.org/10.1016/j.marpol.2016.12.024.

Supplemental Materials

For more information on the process used to develop the methodology as well as summaries of information and steps used to gather information and feedback for the methodology, several supplementary materials are included here. These include the scope of work funded by OPC, results of an initial literature review, a summary of initial interviews conducted to fill knowledge gaps, and a summary of an expert panel workshop that reviewed an initial draft of the methodology. Please note that the scope of work was expanded in June of 2025 to include additional tasks specific to developing a tribal fisheries methodology independent of the commercial and recreational fisheries methodology.

State of California Natural Resources Agency

Ocean Protection Council

Grantee Name:	Northern Economics, Inc.
Project Title:	Socioeconomic Impact Methodology for Fisheries and Offshore Wind Projects in California
Agreement Number:	C0223028
Term of Agreement:	Upon Approval through April 30, 2026

Project Summary:

Per the requirements of California Senate Bill 286 (McGuire, 2023), the California Coastal Commission's (Commission) Offshore Wind Energy Fisheries Working Group (hereafter referred to as the 'Working Group') must produce, among other items, a methodology to guide project level socioeconomic analysis of direct and indirect impacts to commercial, recreational, and tribal fisheries and fishing industries. This methodology will be used to inform guidance and determinations for compensatory mitigation resulting from unavoidable offshore wind (OSW) impacts in California. Specifically, the methodology will describe steps and approaches that can be used to inform the development of direct compensation and resiliency funds to mitigate unavoidable impacts as a result of OSW development, considering possible data and information limitations, project-specific considerations, and other circumstances, as necessary. The methodology is anticipated to be generalizable and flexible to apply to various OSW projects across the state but detailed enough to allow for ease of use and consistent application.

In conjunction with the Working Group, Northern Economics will produce the methodology in two parts: a commercial and recreational fisheries methodology using a combination of methods including a targeted review of relevant literature, expert and stakeholder interviews, and a one-day workshop; a tribal fisheries methodology using information derived from the literature review, interviews, and roundtables with California tribes in the summer and fall of 2025.

This project supports the Ocean Protection Council's (OPC) objective 4.4, Guide Sustainable Renewable Energy Projects, by working in a science-based and

collaborative way to minimize impacts on fishing and cultural resources. This project also helps support the 2024 target action to develop a statewide policy to establish criteria to ensure responsible evaluation and implementation of OSW projects.

Objective:

The objective for this project is to produce a socioeconomic impact methodology which will enable consistent, thorough, and objective evaluations of OSW impacts on fisheries to guide compensatory agreements in California. This directly supports OPC's Strategic Plan objective of guiding sustainable renewable energy projects.

Project Tasks and Deliverables:

Task 1: Ongoing Project Management and Ad-Hoc Meetings
Throughout the project, Northern Economics staff will work to manage the project, including monitoring project progress, meeting internally to set internal tasks and deliverables, creating and submitting invoices, and communicating with OPC points of contact, as necessary. Northern Economics includes time throughout the project to communicate and meet with other members of the project team for both Subgroup 4 and Subgroup 5, including Commission staff and members of the facilitation team for each subgroup and the full working group.

Task 2: Review of Current Practices and Guidance on Compensation and Economic Impacts
Deliverable: Review Summary Report
Information will be collected on how economic information and impact assessments have informed past compensation agreements, lessons learned from these agreements, available policy guidance, information on data availability and limitations, and available methodologies and resources available to inform impact analyses for compensatory mitigation in California, including those used by NMFS to inform economic impact analyses as a result of spatial management actions. It is acknowledged that recent and forthcoming work from NOAA and BOEM reviews west coast fisheries, data availability, and impact analysis approaches relevant for the development of OSW (Pfieffer et al. in prep)[1] and while the work will undoubtedly draw information from this report (especially on data sources and availability), the literature review will be more narrowly focused at

[1] Pfieffer, L., C. Alkire, and J.L. Ise. In prep. **Socioeconomic Characterization of West Coast Fisheries in Relation to Offshore Wind Energy Development.** Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management. xxx p. Report No.: OCS Study BOEM 2024-xxx. Interagency Agreement Number M22PG00032.

the nexus of socioeconomic impact analysis as used to inform the development of compensation agreements and draw from a distinct literature as a result. Where overlaps in content may exist, duplication with this report will be avoided and instead information will be incorporate by reference. The first deliverable will be a summary of the review, to be provided to the working group planning team and, if desirable, distributed to the sub-group and full working group for review. It is expected that this would be provided for informational purposes only, to increase awareness of the work and understanding of the issues, data sources, and background with respect to the methodology.

Task 3: Interviews
Deliverable: Interview Summary Report
This task will build on the literature review to collect information needed to understand lessons learned from past compensation agreements and data and determine information needs for the methodology to provide. This might be particularly important for understanding whether and how to provide guidance for groups where past compensation agreements have been more limited, such as for the private recreational industry or tribal fisheries. Others who will be important to interview include researchers in California and in other regions working on approaches to understand impacts that are difficult to quantify or sources of uncertainty, such as impacts resulting from environmental changes, or unique impacts resulting from floating wind turbines. This is particularly important given the amount of ongoing work and research in this area.

Interviews will be used to primarily to gather additional information on what methodologies are available and suitable for evaluating a range of socioeconomic impacts in California but also to gather information about other potential approaches, data availability and sources, and challenges. Interviews will assist with identifying who may be best to include in efforts to review and provide feedback on the draft methodology.

It should be noted that for impacts where limited pre-existing research exists (such as impacts on recreational and tribal fisheries or communities), there may be a need for considerable research about realized or expected impacts; however, given this project's timeline and goals, this is not included in this scope of work. Instead, the proposed project plans to identify and discuss where data or knowledge limitations exist as a consideration for the design of compensatory agreements.

To appropriately capture impacts and perspectives from a range of sources, 22 interviews are expected to be needed from several groups spanning federal fishery and OSW experts (i.e., NMFS and BOEM staff), researchers from public or private institutions working on OSW and compensatory mitigation or to understand socioeconomic impacts of OSW (including, but not limited to, social scientists,

economists, and biologists), state agencies or organizations engaged in past compensation agreements (including OSW developers), and various commercial, recreational, and tribal fishery representatives. The project budget includes funds for honoraria for participation of industry or tribal representatives. The estimated number of interviews needed by group is detailed in Table 1, noting that the exact number by group may depend on information needs as informed by the first tasks. Potentially more interviews may be needed with tribal or recreational fishery experts or representatives to fill key informational gaps for these groups.

Table 1. Estimated Number of Interviews by Group

Interview Group	Expected Number of Interviews
Federal Fishery and OSW Experts	3
Economists and other researchers working on OSW and Compensatory Mitigation	3
State Agencies and/or Organizations Engaged in East Coast Compensation Agreements	4
Commercial Fishing Industry Representatives	4
Recreational Fishery Representatives and Experts	4
Tribal Fishery Representatives and Experts	4
TOTAL	**22**

Note: this illustrates the approximate number of interviews required to get a variety of perspectives across groups and to gain needed information for this work; however, the number of interviews across groups is subject to change based on the results of the literature review and availability and willingness of potential interviewees.

As with the literature review, the interview process will be described in a supplementary report that includes who was interviewed and a summary of information gathered from these interviews. This will also be included as an appendix to the final methodology to record methods and processes used to inform the methodology, but also may be used to keep the workgroup planning team, sub-group, and full working group apprised of progress.

Additional interviews to gather further information and expert feedback may occur after the interview summary report has been produced to support the development of the methodology, particularly the tribal component.

Task 4: Skeleton Socioeconomic Impact Methodology

Based on the previous two tasks, Northern Economics will create a ‘skeleton’ version of the methodology that lists various impacts, how they connect to various compensation programs, and possible methodological approaches. As much as possible, this information will be presented in a flowchart that connects key informational or data needs to possible methodologies and compensation vehicles (e.g., direct impacts or

resiliency funds), in addition to a brief description of important information for each and key methodological questions or considerations for designing ultimate compensation programs. The skeleton methodology will be primarily used to inform key questions and discussion for the workshop in task 5 and will not be submitted to the working group or OPC and thus is not an official deliverable of the project.

Task 5: Workshop
Deliverable: Workshop Summary Report

In light of key sources of uncertainty and possible impacts that may be difficult to quantify, as well as ongoing processes to develop federal and regional guidance in this area (e.g., BOEM's Draft Fisheries Mitigation Guidance), there may be much to be gained if the methodology can be reviewed by experts who can weigh in on if and how to modify it to ensure it is as useful and comprehensive as possible and reflects best available knowledge and science. For example, NOAA's presentation to the working group on May 21 established that compensation agreements have heavily relied on revenue exposure for determining compensation amounts on the East Coast; however, this may fail to account for other impacts and is dependent on historical information which may not be a good predictor of future exposure and impacts. Northern Economics proposes to account for other impacts and uncertainty about future impacts in the methodology and suggests that the most feasible way to do so is based on the previous steps (literature review, interviews) combined with direct feedback from relevant experts. In addition, there may be different implications from how the impact analysis is designed and what data are used, such as the unit of analysis (e.g., permit or vessel owner), that may affect the design and use of compensation agreements. Such considerations may need to be preemptively addressed in the methodology. This review ensures that the design of this methodology benefits from broad expertise and lessons learned by past compensation agreements.

Northern Economics proposes to convene a one-day virtual workshop of 5-10 experts from around the country to discuss the skeleton methodology and provide feedback. This provides a novel venue for those who all have different experiences and expertise in compensation agreements to collaboratively provide insight and feedback, since while some regions are in the process of developing guidelines and best practices for compensation, no global consensus on these topics exists. This brief meeting will have substantial benefits for the methodology, including the ability to leverage the group's collective expertise to provide best practice recommendations for how to account for data or knowledge gaps, and notably, potentially suggestions for uncertainty buffers in compensation agreements based on certain conditions.

Northern Economics will work to ensure that this workshop and participants is not duplicative of the workgroup and sub-group roles to review the methodology, but to

provide for a diverse set of perspectives, especially those who have experience in these topics from the East Coast. Possible participants include researchers who have worked on past economic impact analyses for OSW; other researchers including social scientists and biologists; NOAA, BOEM, and other federal agency staff; state government representatives; Responsible Offshore Science Alliance and Responsible Offshore Development Alliance representatives; and if deemed appropriate, representatives from commercial, recreational, and tribal fisheries. If industry and tribal representatives are included, honoraria may be provided to support their participation. Northern Economics will work with the working group planning team and/or the sub-group to determine the appropriate size and composition of the workshop to maximize productivity and utility, while reducing redundancy with the sub-group and full working group.

Northern Economics will work to identify potential workshop participants, schedule the workshop and determine a workshop agenda, organize and send workshop invitations, prepare workshop materials including presentations, and facilitate the workshop discussions.

Northern Economics will summarize the workshop structure, participation, and summary of feedback received in anticipation of including it as an appendix to the final methodology and for having documentation to present to the sub-group and working group.

Task 6: Draft Commercial and Recreational Fisheries Methodology Preparation
Deliverable: Draft Methodology

Following the workshop, feedback and other adjustments will be incorporated into the skeleton methodology as necessary to prepare the draft methodology for working group consideration. Northern Economics will work to ensure all necessary background and information is contained within the appendices and focus on preparing a short, 10–20-page document that is an accessible guide for determining what approaches and methods are appropriate for determining various impacts, what compensation vehicles are most appropriate, and key factors, assumptions, or caveats that may be important for determining ultimate compensation amounts and eligibility. It will also include a flowchart or similar diagram showing which methodologies may be most appropriate based on certain conditions, and what additional research or guidance is needed to develop methodologies for determining certain impacts or impacts to certain groups, like tribal fisheries.

Task 7: Working Group and Subgroup Meetings
Northern Economics will solicit feedback throughout the process, as appropriate, from Subgroup 4, Subgroup 5 and the full working group on progress made, draft products, including the literature review and interview summaries, list of potential interviewees,

workshop feedback, and the draft and final methodologies. Northern Economics plans to attend up to five full working group meetings, seven Subgroup 5 meetings, six Subgroup 4 meetings, and additionally allocate time for coordination and communication time in between meetings, as needed throughout the project.

Task 8: Final Methodology Preparation
Deliverable: Final Methodology

Based on sub-group and working group review and feedback, the methodology will be revised accordingly, and a final methodology or preliminary final methodology will be submitted ahead of the seventh working group meeting in August or September. Submitting a preliminary final methodology would allow more time to incorporate feedback and prepare the final methodology ahead of the ~~8~~th **final** working group meeting.

Task 9: Tribal Fisheries Roundtable Meetings

Northern Economics will attend the tribal fisheries roundtables planned by OPC and the Commission for the summer and fall of 2025. Attendance at roundtables will assist in the collection and summarization of relevant information for the methodology and ensure that the methodology has benefitted from broader tribal engagement and feedback. This task includes travel and labor costs to travel to two in-person roundtable meetings and virtually attend a third. This task assumes that two staff will attend one in-person roundtable in Humboldt and the virtual roundtable, and one staff will travel to the final roundtable in Morro Bay. Each roundtable is expected to be 4 hours, but the Humboldt in-person roundtable will be spread across multiple days, so for that meeting 4 days of lodging and rental car use may be needed if flying in and out is not possible on the day of the meetings.

Task 10: Tribal Fisheries Methodology Preparation

Deliverable: Final Tribal Fisheries Methodology

Northern Economics will conduct additional research, as necessary, to follow-up on ideas or information sources gathered from the roundtables that will inform the development of the methodology and work to write up a separate methodology for tribal fisheries for the working group to consider. This methodology will include a description of data sources and information that can be used to support analyses of impacts to tribal fisheries or other background information on tribal fisheries in California.

Accessibility:

All public-facing products will be produced in accordance with California Department of Rehabilitation guidelines as per https://dor.ca.gov/Home/WebAccessibilityToolkit.

Project Timeline:

This proposal assumes work will begin by December 2024 and finish **March 30, 2026** with a contract end date of **April 30, 2026**. This assumes that work would begin before the fifth working group meeting, with a draft methodology presented by September 2025 and a final work product delivered by **March 2026**.

	Dec' 24	Jan '24	Feb '24	Mar '25	Apr '25	May'25	Jun '25	Jul '25	Aug '25	Sep '25	Oct '25	Nov'25	Dec '25	Jan '26	Feb '26	Mar '26
Task 1: Ongoing Project Management and Ad-Hoc Meetings																
Task 2: Literature Review																
Task 3: Interviews																
Task 4: Skeleton Socioeconomic Impact Methodology																
Task 5: Workshop to Solicit Expert Feedback																
Task 6: Draft Methodology Preparation																
Task 7: Working Group and Sub-Group Meetings*	SG	#5	SG	SG	#6	#6	SG	SG	#7	#7	SG	SG	SG	#8	#8	SG
Task 8: Final Methodology																
Task 9: Tribal Fisheries Roundtables																
Task 10: Tribal Fisheries Methodology																

** Note: 'SG' stands for 'Sub-Group Meeting" while numbers indicate the working group meeting number.*

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Socioeconomic Impacts of Offshore Wind on Fisheries and Compensation Agreements: A Review of the Literature

Prepared for

California Coastal Commission's Offshore Wind Energy Fisheries Working Group

February 2025

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Abbreviations

AIS	Automatic Identification System
BOEM	Bureau of Ocean Energy Management
CBA	Community Benefit Agreement
CCC	California Coastal Commission
CCMP	California Coastal Management Program
CDP	Coastal Development Permit
CEC	California Energy Commission
CFR	Code of Federal Regulations
CFRA	California Fishermen's Resiliency Association
COP	Construction and Operations Plan
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
ECC	Export Cable Corridor
ECRA	Export Cable Route Area
EFH	essential fish habitat
EIS	Environmental Impact Statement
FCP	Fisheries Communication Plan
FEIS	Final Environmental Impact Statement
GAP	General Activities Plan
HMS	Highly migratory species
I-O	Input-Output
MA DMF	Massachusetts Department of Marine Fisheries
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
OCS	US Outer Continental Shelf.
OCSLA	Outer Continental Shelf Lands Act
OECC	offshore export cable corridor

OSW	offshore wind
PEIS	Programmatic Environmental Impact Statement
PNNL	Pacific Northwest National Laboratory
RCA	Rockfish conservation area
ROD	Record of decision
SAP	Site Assessment Plan
SEER	Synthesis of Environmental Effects Research
SIA	Social impact analysis
VMS	Vessel monitoring system
VTR	Vessel Trip Report
WA	Working Area
WEA	Wind Energy Area
WHOI	Woods Hole Oceanographic Institution
WLA	Wind Lease Area
WTGA	Wind Turbine Generator Area

1 Introduction

1.1 Purpose

Under a grant from the California Ocean Protection Council, Northern Economics, Inc. is working to develop a socioeconomic impact methodology for fisheries and offshore wind (OSW) projects in California. This project is pursuant to the requirements of California Senate Bill (SB) 286, which directs the California Coastal Commission (CCC) and the Offshore Wind Energy Fisheries Working Group to develop such a methodology. This methodology will be used to inform guidance and determinations for compensatory mitigation resulting from unavoidable OSW impacts in California. This report reviews relevant literature to better understand similar methods used in other regions, available policy guidance, and potential impacts of concern and methods that can be used to describe impacts to West Coast and California fisheries. The goal of this report is to identify primary information and knowledge gaps that can be filled by conducting interviews with experts, stakeholders, and other relevant parties during the next stage of the project.

1.2 How This Report is Organized

This report is organized in five main sections:

1. **Introduction**
2. **Background:** Includes a brief description of SB 286 and the regulatory context for compensation agreements and the forthcoming methodology.
3. **Compensation Methodologies:** Focuses on compiling information on available Bureau of Ocean Energy Management (BOEM) guidance on compensation agreements (3.1) and examples of methodologies used for fisheries OSW compensation agreements on the East Coast (3.2.1) and similar fisheries agreements in California (3.2.2).
4. **Socioeconomic Impacts of OSW on Fisheries:** Compiles and summarizes information on socioeconomic impacts resulting from OSW on fisheries broadly (4.1), information available to inform socioeconomic impact analyses in California (4.2), and a high-level review of potential socioeconomic impacts in California (4.3).
5. **Conclusions:** Summarizes overall conclusions of the review and a preliminary set of knowledge gaps and questions to be informed by interviews in the next phase of work.

2 Background

2.1 California Senate Bill 286

SB 286, which Governor Newsom signed into law on October 7, 2023, is designed to ensure that OSW development in the state proceeds in a way that minimizes and compensates for economic disruptions to fisheries, thereby helping to protect the viability of these coastal communities while supporting renewable energy goals.

The legislation requires that the California Coastal Commission, in coordination with the California Department of Fish and Wildlife, convene a California Offshore Wind Energy Fisheries Working Group for the purpose of:

> …developing a statewide strategy for ensuring OSW projects avoid and minimize impacts to ocean fisheries to the maximum extent possible, avoid, minimize, and mitigate impacts to fishing and fisheries in a manner that prioritizes fishery productivity, viability, and long-term resilience, and fairly and reasonable compensate persons engaged in the commercial and recreational fishing industries and Tribal fisheries for economic impacts to ocean fisheries resulting from offshore wind energy projects.

Under SB 286, the statewide strategy must include best practices for addressing impacts to the commercial and recreational fishing industries, Tribal fisheries, and environmental resources associated with offshore wind energy projects, and specifically needed to include both a methodology for "comprehensive project-level socioeconomic analysis of direct and indirect impacts to commercial and recreational fishing industries and Tribal fisheries" as well as a "framework for reasonable compensatory mitigation for unavoidable impacts to the commercial and recreational fishing industries and Tribal fisheries." The legislation outlines that once adopted, applicants seeking approval or concurrence from a state agency for an offshore wind energy project shall comply with the terms, recommendations, and best practices established in the statewide strategy.

This project seeks to develop the requirement for a socioeconomic impact methodology under Sec 4(c)(2) of SB 286, specifically in a way that directly connects to the design and structure of compensation agreements for unavoidable impacts.

2.2 Regulatory Context for Compensation Agreements

BOEM oversees offshore wind leasing on the US Outer Continental Shelf. Under the Outer Continental Shelf Lands Act (OCSLA) and National Environmental Policy Act (NEPA), BOEM must ensure OCS leasing activities prevent interference with fisheries uses and evaluate social and economic impacts of potential OSW projects. As described in BOEM's Draft Fisheries Mitigation Guidance (BOEM 2022),

a lessee's Site Assessment Plan (SAP), General Activities Plan (GAP), or Construction and Operations Plan (COP) should contain the necessary information for these assessments. In addition, the lessee's plans should provide proposed measures for avoiding, minimizing, reducing, eliminating, and monitoring environmental impacts. Once the COP is submitted to BOEM, BOEM begins the preparation of the Environmental Impact Statement (EIS). Once the EIS is complete, a record of decision (ROD) is issued as well as the terms and conditions for the permit. However, the permit cannot be issued until affected states concur with the applicant's certification under the Coastal Zone Management Act (CZMA, Marine Affairs Institute 2024, UC Berkeley Center for Law, Energy & the Environment. 2024).

The CZMA at 16 U.S.C. §§ 1451 et seq., provides that a state with a federally approved coastal management (CZM) program may review any proposed activity requiring a federal license or permit if the activity would affect any land or water use or natural resources of the state's coastal zone. In the case of an OSW project developer seeking a federal license or permit from BOEM, a CZM program has federal consistency review authority for the project pursuant to the CZMA and its regulations at 15 C.F.R. part 930, subparts D and E.

A state CZM program cannot require monetary compensation as part of its federal consistency review and decision. Therefore, the program cannot object to an OSW project consistency certification solely for a failure to reach a compensatory mitigation agreement with the project developer. A state CZM program and a developer can, however, mutually agree that a compensation amount is sufficient in-part to meet enforceable policies to modify a project to mitigate potentially adverse impacts (Marine Affairs Institute 2024).

Once a compensatory mitigation agreement is in place, federal and state governments can enforce the developer's commitments to create compensation funds. For example, before an OSW project developer can begin activities on their leased area, BOEM must approve their Construction and Operations Plan (COP), which describes the developer's proposed activities and planned facilities. So far, BOEM has conditioned its approval of each of the COPs it has approved for New England OSW projects on the developers establishing the fisheries compensation funds they committed to create. Furthermore, the Bureau of Safety and Environmental Enforcement, which is the lead federal regulator for the safe and environmentally responsible production of offshore renewable energy, can require that developers comply with the terms and conditions BOEM includes in its approval of a COP. States may be able to use contract law and the CZMA to accomplish the same end. For example, a state may be able to use the process established in the CZMA's implementing regulations to have the federal government require a developer to either establish the fisheries compensation funds it has agreed to or submit a new consistency determination. However, if the developer chooses to submit a new consistency determination that does not call for creating fisheries compensation funds,

the state would not be able to object simply because the developer failed to provide monetary compensation (Marine Affairs Institute 2024).[1]

With respect to California, the CCC developed the California Coastal Management Program (CCMP) pursuant to the requirements of the CZMA. The key policy component of the CCMP is the California Coastal Act of 1976. The Federal Consistency Unit of the CCC implements the CZMA as it applies to federal activities, development projects, permits and licenses, and support to state and local governments. For projects in federal waters, the Commission has two opportunities to weigh in on offshore wind energy projects through its federal consistency and state regulatory process. The first occurs prior to a BOEM lease sale. At this stage, the Commission assesses whether the leasing process, including any reasonably foreseeable development within a proposed lease area, is consistent with Chapter 3 policies of the California Coastal Act. The second opportunity occurs after specific projects are proposed. Here, the Commission reviews the specific development proposed and must issue both a coastal development permit for project components in the Commission's direct jurisdiction (i.e., state waters and some onshore areas) and a consistency certification for project components in federal waters (California Coastal Commission undated; California Coastal Commission 2019).

BOEM has designated two Wind Energy Areas (WEAs) in California, one off the coast of Humboldt Bay and another off the coast of Morro Bay, comprising a total of 582 square miles of ocean. The CCC conducted a federal consistency review of both areas. In April 2022, Commissioners conditionally concurred on the consistency determination for the Humboldt Bay area. In June 2022, Commissioners conditionally concurred on the consistency determination for Morro Bay. BOEM agreed to several conditions, including to ensure coordination on survey and monitoring plans, minimize impacts to marine habitats, and engage with Tribal, fishing, and environmental justice communities, to ensure consistency with the Coastal Act.

After several years of planning and preparation, BOEM held an auction in December 2022 to auction off the five lease areas that comprise the Morro Bay WEA and Humboldt WEA. The five BOEM auction winners now have the opportunity to begin information gathering and other preliminary activities. Lessees must submit site survey plans describing data collection efforts the lessees will undertake to characterize their lease area. Developers then have up to 5 years to conduct these surveys. Information collected is then used by lessees to draft a COP. Once a project receives all the necessary local, state, and federal authorizations, including a consistency certification and Coastal Development Permit (CDP) from the Commission, the project can begin construction. The Commission will also have the opportunity to weigh in on decommissioning as well.

[1] States also have the option of implementing specific legislation requiring the development of fishery compensation funds. For example, lawmakers in Connecticut have introduced a bill in the Connecticut General Assembly that would require developers of offshore wind projects that will supply Connecticut customers with electricity to establish funds that would provide compensation if the project damages fisheries or the environment or if the project creates fewer jobs than the developer promised (Marine Affairs Institute 2024).

Specific Communications Plans are required in the leases, and developers must submit Agency, Fisheries, and Native American Tribes Communications Plans to BOEM within 120 days of the lease execution date (June 1, 2023). The Fisheries Communication Plan (FCP) must set out the approaches the lessee will use to communicate with fishermen. The FCP must also include a process to file a complaint with the offshore wind operator to seek the replacement of, or compensation for, lost gear.

On Dec. 20, 2023, BOEM published a Notice of Intent to prepare a Programmatic Environmental Impact Statement (PEIS) for potential development activities on the five offshore wind lease areas off California's central and north coasts. A draft PEIS was released in November 2024 (BOEM 2024a). Among the prospective mitigation measures for commercial fisheries and for-hire recreational fishing listed in the draft PEIS are the following (BOEM 2024a):

- Lessees should consider establishing a compensation process if a project is likely to result in lost income to commercial and recreational fisheries.
- The compensation process should be equitable and fair across fisheries and fishing communities and consider best practices and consistency across other offshore wind energy projects.
- Financial compensation can include compensation for gear loss and damage and lost fishing income.

3 Compensation Methodologies—Guidance and Examples

3.1 Current Guidance on Compensation Agreements

3.1.1 Compensation

BOEM's Draft Fisheries Mitigation Guidance (BOEM 2022) describes a suite of best management practices and mitigation measures to reduce potential impacts to commercial and recreational fisheries (based on workshops with East Coast fisheries stakeholders described in Ecology and Environment Inc 2014).[2]

With respect to compensation, the draft guidance states that compensation processes should be established if a project is likely to result in lost income to commercial and recreational fisheries. The guidance does not speak to Tribal fisheries. It says that the general approach for the compensation process should consist of the following:

1) Be fair and equitable across fisheries and fishing communities;
2) Consider best practices and consistency across other offshore wind energy projects;
3) Be based on the impacts identified in the various environmental documents including the lessee's COP and BOEM's assessments.

At present, the BOEM draft guidance is the only available resource of best practices, though examples of compensation schemes are available in the US (reviewed in the next section).

BOEM specifically recommends minimum standards for damaged and loss gear as well as lost fishing income. It does not produce standards for determining resiliency funds or resiliency fund amounts, or promulgate specific standards for floating offshore wind projects. These standards are as follows:

Damaged or Lost Gear:

- Follow minimum standards for gear loss that exist for the Fisheries Contingency Fund (FCF) claims process.[3]
- Consider reimbursements for lost or damaged gear as a result of the lessee's actions, including survey work, and interactions with non-marked/non-charter obstructions.

[2] Between the time this review was drafted in December 2024 and finalized in February 2025, final mitigation guidance was released, which made several changes which are not fully captured in this document; more information here: https://www.boem.gov/newsroom/notes-stakeholders/boem-finalizes-fisheries-mitigation-guidance

[3] More information available here: https://www.fisheries.noaa.gov/national/funding-and-financial-services/fishermens-contingency-fund-program

- Consider compensating for the repair or replacement of damaged gear and 50% of gross income loss during the period from the discovery of the lost or damaged gear to when the gear is repaired or replaced.
- Consider compensating reasonable fees paid to an attorney, public accountant or other consultant for preparation of the claim.

Lost Fishing Income:

- Establish adequate reserve funds to compensate for lost income as a direct result of the lessee's actions

3.1.2 Guidance for determining an adequate reserve fund for compensation

3.1.2.1 Revenue exposure

BOEM recommends that lessees consider using fishing revenue exposure, or the amount of ex-vessel revenue generated from the project area of potential displacement, for the purposes of determining the value of reserve funds to set aside for compensation (BOEM 2022). BOEM expects that because gross revenue does not account for expenses this is an overestimation of income loss to participants and should as a result sufficiently cover shoreside income loss and potentially underreported landings, but in some places it may be sufficient to add a multiplier to cover shoreside losses. BOEM suggests that if revenue exposure data are not available, lessees should consider an additional multiplier. Finally, the guidance suggests that all revenues should be standardized to a common year using the GDP Implicit Price Deflator.

Additional factors that may be considered in developing revenue exposure estimates, as described in Appendix A to the guidance, "Developing a Methodology for Developing Revenue Exposure Estimates in the Northeast Atlantic" (summarized in the following subsection), include the following:

- Stock assessments
- Fisheries management actions
- Market conditions
- Other relevant factors including: trends in landings/revenue, and/or management actions that drive spatial effort

3.1.2.2 Duration of Compensatory Mitigation

BOEM recommends that different project stages should consider differential estimates of exposure, as summarized below.

Construction & Decommissioning:

Consider compensation for lost income for the duration of foundation and submarine cable installation/decommissioning. This area might be where vessels cannot safely operate or transit or where operations may disrupt target populations (e.g., elevated acoustic exposure).

Operations:

At a minimum, it should be assumed that there is an adjustment period for fisheries post-construction. The minimum recommended payment structure is 100% of revenue exposure for the first year, declining 10% per year for the first 5 years (to 50% in year 5). Compensatory mitigation 5 years post construction may be necessary and should be evaluated based on activities proposed in the COP.

3.1.2.3 Eligible Entities

BOEM recommends that lessees should consider permitting claims from entities other than vessel owners, operators, and crew including shoreside businesses that can demonstrate that their business experienced a loss of income due to unrecovered economic activity.

3.1.2.4 Basic Reserve Fund Formula Calculation:

The basic formula used by BOEM to determine the total reserve fund requirements is shown below using the minimum reserve fund guidelines (as reviewed above). This includes the annual revenue exposure estimate for commercial (*CFR*) and recreational fisheries (*RFR*) in the years of construction, the first 5 years of operation, and years of decommissioning. The assumed amounts required are at a minimum 100% of the inflation-adjusted revenue exposure and in each of the years of construction (k) and decommissioning (j) and a declining proportion of the revenue exposure in the first 5 years of operation, decreasing from 100% in year 1 to 50% in year 5 (a total of 3.6[4]). The Lessee should use the GDP Implicit Price Deflator to adjust the annual average revenue exposure estimates to the most recent complete year of the deflator[5] (n_i, while the GDP deflator for the year of the annual commercial fisheries revenue exposure estimate is given by n_{bf}, where the deflator for for-hire recreational fisheries is given by n_{br}). The purpose of these adjustments is to account for inflation between years. For example, if revenue exposure estimates used fishery data from 2022 and the current year is 2025, the 2022 revenue exposure estimates would be converted to 2024 (the most recent complete year of the deflator). To make this adjustment, the deflator for 2024 (n_i) is divided by the deflator for 2022 (n_{bf} or n_{br}), and then multiplied by the revenue exposure estimate (*CFR* or *RFR*). Impacts to shoreside businesses may be accounted for in the multiplier term, M (more information on sources of information for the multiplier provided in in the next section, 3.1.3.4).

[4] 3.6 is the sum of the proportion of revenue exposed in each year—i.e., 1+ 0.8+ 0.7 + 0.6 + 0.5= 3.6

[5] The most recent complete year of the deflator means the year for which a full year of information is available. For the GDP Implicit Price Deflator, deflator data are released quarterly (see https://fred.stlouisfed.org/series/GDPDEF); thus the most recent complete year is the most recent year for which all four quarters of data have been released.

$$k\left(CFR * \frac{n_i}{n_{bf}} + RFR * \frac{n_i}{n_{br}}\right)(1+M) + j\left(CFR * \frac{n_i}{n_{bf}} + RFR * \frac{n_i}{n_{br}}\right)(1+M) + \left((3.6 * CFR) * \frac{n_i}{n_{bf}} + (3.6 * RFR) * \frac{n_i}{n_{br}}\right)(1+M)$$

Source: Adapted from BOEM (2024b)

3.1.3 Guidance for Revenue Exposure Estimation in the Northeast Atlantic

As an appendix to the main document, BOEM created a guidance document for developing revenue exposure estimates in the Northeast Atlantic (BOEM 2022). The guidance document was specifically generated to support compensatory mitigation of lost income to fishermen and was developed from consultation with the National Marine Fisheries Service (NMFS). It describes methods for commercial fisheries, including data-limited stocks, recreational fisheries, and shoreside businesses. In addition, it also describes factors that may be taken into account when forecasting exposure in the future.

3.1.3.1 Commercial fisheries

In the guidance appendix for Greater Atlantic regional fisheries, BOEM explicitly identified fisheries for which it believes there is a high degree of confidence in the data and data tools for estimating revenue exposure in the Northeast Atlantic (Specifically, the fishery footprints data tool, based on DePiper 2014 and Benjamin et al. 2018, and the socioeconomic impacts of Atlantic Offshore Wind development reports[6]), though it notes that the lessee should work to ensure that the data tool accurately reflects the proposed action in the lessee's COP and to request an analysis specific to the proposed action. Specific components of the revenue exposure analysis include the following:

- Data from 2008 to the most recent year available
- VMS data to evaluate finer-scale vessel activity, interannual variation, and transit routes

The appendix notes that several limitations to using vessel monitoring system (VMS) data exist, including fisheries that do not require VMS, fisheries that cannot be assigned a specific target species without additional information, issues with linking VMS to other trip or landings datasets, and issues with distinguishing fishing from transiting behavior.

3.1.3.2 Data-limited commercial fisheries

The appendix identifies a set of species considered to be data-limited commercial fisheries. These fisheries are generally non-federally managed species, such as lobster, Jonah crab, and Atlantic menhaden, where spatial fishing and landing data reporting requirements may be determined

[6]https://www.fisheries.noaa.gov/resource/data/socioeconomic-impacts-atlantic-offshore-wind-development?utm_medium=email&utm_source=govdelivery

differently across states or may not be required at all. For each data-limited fishery, a snapshot of the data available (including estimated coverage) and major characteristics of the fishery are described.

3.1.3.3 Recreational fisheries

For recreational fisheries, the appendix describes the current recreational fishing industries in the Northeast Atlantic, including federally permitted party and charter fishing vessels, highly migratory species charter vessels, and private recreational angling. However, only the party and charter fisheries are included in NMFS' socioeconomic assessments. Economic exposure estimates are based on industry surveys and estimates of for-hire passenger fees per reported trip.

3.1.3.4 Shoreside seafood businesses

In the appendix, economic exposure estimates of upstream (e.g., bait, ice, and gear suppliers) and downstream (e.g., seafood processors, wholesalers, and markets) fishing industries are recommended to be analyzed using state-specific economic impact tables from the Seafood Industry Impacts Tool, a product of NMFS' Fisheries Economics of the U.S. report, and the IMPLAN regional economic impact modelling software. However, the guidance acknowledges that other sources and methods may be appropriate, depending on the affected fisheries, such as if fishery-specific models have been developed. It acknowledges the potential biases of using IMPLAN or other input-output (I-O) regional economic modeling software to estimate impacts since they do not account for substitution, which can lead to overestimation. The guidance notes how prior economic impact analyses used for compensation agreements have used I-O models to identify a multiplier to be used against the revenue exposure calculation for determining sufficient funds for claims of revenue loss for the shoreside sectors.

3.1.3.5 Forecasting Revenue Exposure

The guidance discusses that in order to use the past economic exposure to forecast losses in the future, it is necessary to consider how to adjust these estimates for future changes. The guidance notes that adjustments may be warranted, including if landings are on an increasing or declining trend, or if there are other management trends that may affect the distribution of fishing effort that could affect the exposure estimates.

3.1.4 Summary of Direct Compensation Methodological Approach

In summary, the BOEM guidance presents three primary steps for calculating direct compensation fund amounts for compensating for lost income in fisheries industries. These steps are as follows:

Step 1. Estimate baseline exposure

Estimate baseline revenue exposure in relevant fisheries, based on affected fisheries, industries, and data available for each. Different approaches may be suitable and/or necessary depending on the affected fisheries and/or industries and the information currently available for each.

Step 2. Forecast revenue exposure

Baseline revenue exposure estimates may be adjusted to account for various factors which may affect the likely exposure in the future, including landings or management trends.

Step 3. Calculate minimum reserve amount

The adequate funds to be held in reserve must be calculated consistent with BOEM's guidance and must meet several minimum standards including:

- Standardizing all values to the most recent year available using the GDP Implicit Price Deflator
- Calculating the minimum reserve fund amounts as follows:
    - 100% of revenue exposure during construction and during decommissioning years and first year of operations
    - At least 80% of revenue exposure during the second year of operations, 70% in year 3, 60% in year 4, and 50% in year 5.

However, it should be noted that BOEM's guidance for minimum reserve amounts has not applied to states where final mitigation agreements have been approved (see BOEM 2024b for example).

3.2 Examples of Existing Fisheries Compensation Agreements

This section draws from the history of compensation agreements in the US resulting from current OSW development activities as well as other offshore activities (e.g., offshore telecommunications cable construction). We summarize the approaches used for these agreements to understand their composition and the socioeconomic impact approaches used to inform negotiations between OSW developers and the fishing industry.

3.2.1 East Coast OSW Project Fisheries Compensation Agreements

3.2.1.1 Summary of Fisheries Compensation Funds

Drawing largely on information in CZMA federal consistency concurrence documents for specific East Coast OSW projects, Table 1 summarizes the fisheries compensation programs or funds that project developers have established or agreed to establish. A fisheries mitigation measure not shown in the table, but which BOEM has required of all OSW projects, is a separate claim procedure used to compensate fishing operations for gear loss and damage that may occur during project construction, operations, and decommissioning. It should be noted that the final compensation amounts are not equal to the output of the impact methodologies described in the following sections, since those figures are used as the starting point for negotiations between states and developers to determine final compensation amounts.

Table 1 Summary of East Coast OSW Fisheries Compensation Programs and Funds by Project

State	Compensation Program/Fund	Compensation Amount
Vineyard Wind		
MA	Direct Compensation	$19,185,016
MA	Fisheries Innovation Fund	$1,750,000
RI	Direct Compensation	$4,200,000
RI	Fisherman's Future Viability Trust	$12,500,000
CT, NY, NJ	Direct Compensation	$3,300,000
South Fork Wind		
MA	Direct Compensation - Construction & Operations Mitigation Fund	$1,900,000
MA	Direct Compensation - Decommissioning Fund	$200,000
MA	Coastal Community Fund	$200,000
MA	Navigation Enhancement and Training Program	$300,000
RI	Direct Compensation	$4,250,000
RI	Coastal Community Fund	$950,000
Revolution Wind		
MA	Direct Compensation	$6,425,000
MA	Coastal Community Fund	$400,000
MA	Navigation Enhancement and Training Program	$500,000
RI	Direct Compensation	$12,000,000
RI	Coastal Community Fund	$300,000
RI	Navigation Enhancement and Training Program	$333,333
RI	Impacts Study	$300,000
RI state waters	Direct Compensation	$3,050,000
RI state waters	Coastal Community Fund	$200,000
Sunrise Wind		
MA	Direct Compensation	$9,788,000
MA	Coastal Community Fund	$1,000,000
MA	Navigation Enhancement and Training Program	$500,000
RI	Direct Compensation, commercial vessels	$15,980,000
RI	Direct Compensation, for-hire vessels	$958,000
RI	Navigation Enhancement and Training Program	$333,333
RI	Coastal Community Fund	$300,000
RI	Impacts Study	$50,000
New England Wind		
MA	Direct Compensation	$5,859,471
MA	Fisheries Innovation Fund	$1,500,000
RI	Direct Compensation	$4,373,638
RI	Commercial and Charter Fishermen Fund	$500,000
South Coast Wind		
RI	Direct Compensation	$250,000

State	Compensation Program/Fund	Compensation Amount
RI	Commercial, Charter, and Recreational Fishermen Fund	$30,000
MA	Direct Compensation Fund	$2,100,000
MA	Coastal Community Fund	$200,000
MA	Navigation Enhancement and Training Program	$300,000

Source: Adapted from Marine Affairs Institute (2024)

As shown in Table 1, developers of OSW project on the East Coast usually have created multiple funds to serve different purposes (Marine Affairs Institute 2024). Generally, developers based these funds, together with the contribution amounts, on the findings of the CZMA consistency reviews conducted by the relevant state(s) and the resulting mitigation agreements. Direct compensation funds are intended to compensate commercial and for-hire recreational fishermen for loss of income due to unrecovered economic activity resulting from displacement from fishing grounds during project construction, operations and maintenance, and decommissioning. In addition, developers have committed to creating separate funds for a myriad of other purposes. There may be funds to compensate shoreside businesses for revenue losses indirectly related to an OSW project. Eligible shoreside businesses may include fishing gear suppliers and repair services; vessel fuel and maintenance services; ice and bait suppliers; seafood processors and dealers; and seafood wholesale distributors. The Coastal Community Funds listed in Table 1 are typically grant-making entities and open to a variety of fishing interests. For example, the Coastal Community Fund established by the developer of South Fork Wind in its agreement with Massachusetts offers grants that support activities like improving infrastructure that supports the commercial fishing industry, increasing training and apprenticeship opportunities in coastal industries, and providing marketing support for local sea food products (Marine Affairs Institute 2024). For some OSW projects, developers have also agreed to create funds that 1) provide support for fishermen to upgrade their navigational and safety equipment; pay increased insurance costs related to fishing near wind farms; and develop new gear or fishing methods; and 2) provide support for studies of OSW project impacts on fisheries as well as for fisheries research and education. Generally, the agreements provide some mechanism for transferring excess funds in the direct compensation fund to funds that support fishing or coastal communities in general (Marine Affairs Institute 2024).

The fisheries compensation funds that developers have agreed to establish are administered in a variety of ways. Typically, direct compensation funds are held in escrow and administered by a third-party selected by the developer in consultation with the relevant state agency. An advisory council determines how the funds are used (Marine Affairs Institute 2024).

To date, fisheries compensation funds established for East Coast OSW projects have been designed in a project-by-project manner. Both state and federal actors have shown interest in trying to standardize this process (Marine Affairs Institute 2024). Most notably, in 2021, several East Coast states formed a working group to, among other things, support developing "a common and robust framework, methodology, criteria, and process for compensatory mitigation for fishermen that are

consistent, equitable, and transparent" (Special Initiative on Offshore Wind 2024). The group initially included Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Virginia. Delaware and North Carolina joined the effort in 2023. In April 2023, the working group published a framework to establish a regional fisheries compensation administrator that would distribute compensation based on a common set of rules and procedures for the East Coast region rather than a project-by-project approach. The framework addresses the administrator's responsibilities, a governance structure for the administrator, and the claims and appeals processes, among other things. In November 2024, through a competitively bid RFP process, BrownGreer in partnership with the Carbon Trust were selected to be the third-party independent entity to design and develop this regional fund (Special Initiative on Offshore Wind 2024). If the states successfully establish a regional fund, it may shape how current and future funds are administered along the East Coast (Marine Affairs Institute 2024).

3.2.1.2 Approaches to Estimating Revenue Exposure

The contribution to each of the direct compensation funds set up by developers of East Coast OSW projects has been based on the revenue exposure for commercial and for-hire fisheries operating from selected ports. The following sections describe approaches used to estimate the potential revenue exposure due to development of Sunrise Wind and New England Wind. The former analysis was prepared by the Woods Hole Oceanographic Institution (WHOI), and the latter was prepared by King and Associates, LLC. These two projects represent recent samples of the methods used by the two main contractors hired to develop impact assessments used for compensation agreements on the East Coast.

Sunrise Wind—Woods Hole Oceanographic Institution

WHOI was hired by Sunrise Wind to conduct fishery revenue exposure analyses for Massachusetts and Rhode Island commercial and for-hire fisheries. In the analyses for Massachusetts and Rhode Island, respectively, Kite-Powell et al. (2023a) and Kite-Powell et al. (2023b) estimated the level of pre-development fishing operations intersecting with, and landings and landed value from, the Sunrise Wind Lease Area (WLA) and Export Cable Corridor (ECC) associated with landings and revenue generated in Massachusetts and Rhode Island ports, and the potential exposure of Massachusetts-based and Rhode Island-based commercial and for-hire fishing to Sunrise Wind Farm construction, operations, and decommissioning.

The assessment method used in the WHOI analyses was consistent with the general framework described in the reports by Kirkpatrick et al. (2017a and 2017b) on socioeconomic impact of offshore wind energy development on commercial fisheries, and builds on the approach described in Rhode Island Department of Environmental Management (2017, 2018, and 2019), which develops high-end estimates of fishery impacts by including in baseline estimates the entire trip revenues from all trips that overlap with a wind lease area, regardless of how much fishing occurred inside or outside the area. The analyses assume that landings from an area where access is constrained during

construction, operations, or decommissioning are simply forgone, and not compensated by landings from fishing elsewhere.

To assess the direct economic impacts to commercial fisheries, the WHOI analyses used NMFS estimates of annual landed weight and value of fish from the WLA and ECC that were based primarily on Vessel Trip Report (VTR) and observer data (based on methods described in DePiper (2014) and Benjamin et al (2018).[7] They then estimate the fraction of this annual value that may be exposed to wind farm development based on the nature and schedule of construction activities, operating plans, and decommissioning plans, and on information from the scientific literature on the effects of wind farm construction and operation on commercial fish stocks and landings.

Five categories of possible revenue exposure for commercial fishing from the Sunrise Wind project were considered:

- Transient effects on fish availability due to construction activities and noise
- Transient effects due to constrained access to certain areas during construction
- Changes in fishing in the WLA during operations
- Transient effects due to constrained access to certain areas during decommissioning
- Transient effects on fish availability due to decommissioning activities

The assumptions and effects on fish availability and fishing activity/landings are summarized in Table 2 for each project phase and project area.

Table 2 Assumptions for Estimating Revenue Exposure of Commercial Fisheries Due to Sunrise Wind Development by Category of Potential Exposure

Area	Assumptions/Effects	Duration
Availability effects due to construction		
WTGA+5km	100% of finfish leave area	1 year
WLA	Lobster/crab landings reduced 10%	1 year
WLA	Other shellfish landings reduced 10%	4 years
ECRA, 1.6km WA	All landings reduced 10%	1 year
ECRA, 180m ECC	Lobster/crab landings reduced 25%	1 year
ECRA, 180m ECC	Other shellfish landings reduced 25%	4 years
Construction constrained access		
WLA	No fishing in 50% of area	1 year
ECRA, 1.6km WA	No fishing in 5% of area	6 months
ECRA, 180m ECC	No fishing in 100% of area	2 months

[7] As noted by WHOI, the DePiper methodology is agreed upon as the best available approach for spatially distributing reported landings to fishing effort at sea on the US East Coast. Alternate methods using VMS data have been produced, but have been shown to lead to misrepresentations of fishing locations.

Area	Assumptions/Effects	Duration
Effects during operations		
WLA	Landings reduced by 5%	30 years
ECRA, 1.6km WA	None	N/A
ECRA, 180m ECC	None	N/A
Availability effects due to decommissioning		
WLA	None beyond constrained access	N/A
ECRA, 1.6km WA	All landings reduced 5%	1 year
ECRA, 180m ECC	Lobster/crab landings reduced 12.5%	1 year
ECRA, 180m ECC	Other shellfish landings reduced 12.5%	4 years
Decommissioning constrained access		
WLA	No fishing in 50% of area	1 year
ECRA, 1.6km WA	No fishing in 5% of area	2 months
ECRA, 180m ECC	No fishing in 100% of area	2 months

Notes: WTGA = Wind Turbine Generator Area; WLA = Wind Lease Area; ECRA = Export Cable Route Area; WA = Export Cable Corridor Working Area; ECC = Export Cable Corridor. Km=kilometer, m= meter

Source: Kite-Powell et al. (2023a) and Kite-Powell et al. (2023b)

Effects During Construction

For the purpose of estimating transient effects on fish availability due to construction activities and noise, a Wind Turbine Generator Area (WTGA) was defined as the subset of the WLA in which turbine generator towers are to be located.[8] As described in Table 2, as a result of the noise effects of pile driving in and around the WLA, 100% of finfish are assumed to leave the WTGA and a 7.5 km buffer zone around the WTGA for the duration of pile driving (up to nine months) and return after a further three months (total of one year); 10% of the lobster, crab, and other shellfish populations within the WLA are assumed to be adversely affected by pile driving noise, seabed disturbance around foundations, and cable installation during construction, and thus lost to fishing.

To estimate commercial fish landings along the ECC, a 10 km-wide Export Cable Route Area (ECRA) was defined (5km on either side of the cable route). Landings were assumed to be distributed uniformly across the fished sections of the ECRA. The greatest effects of burying the cable are likely to be due to habitat disruption along the immediate cable route. Only portions of the 180 meter wide ECC centered on the export cable would be disturbed in the process. The habitat disruptions that impact non-mobile benthic species are likely to extend on average no more than 5-10m on either side of the immediate cable route—at most 12% of the ECC and 2% of the 1.6km-wide Export Cable Corridor Working Area (WA). To be conservative, it was assumed that there would be a 25% reduction in landings of all shellfish for two years and all non-mobile shellfish over five years from the ECC, and a 10% reduction in landings for all species for one year from the WA.

[8] For the WTGA, WHOI used the indicative turbine layout from the COP (Figure 3.3.4-1, Sunrise Wind LLC 2022).

With respect to transient effects due to constrained access during construction, it was assumed that fishing would be constrained in half of the WLA for two years, and in 5% of the WA for 12 months. In addition, it was assumed that fishing would be constrained within all of the ECC area immediately around the export cable route for a period of nine months as the cable is buried.

Effects During Operations

Fishing activity constraints during wind farm operations apply only to the WLA; it was assumed that fishing along the ECC would not be constrained during operations. The footprint of the Sunrise Wind project area is 43,060 hectares, of which permanent structures occupy less than 10 hectares, or 0.03% of the total area. A 100 m radius area around each of the turbine towers and the converter station accounts for about 0.7% of the total WLA, suggesting that less than 1% of the WLA area may be lost to fishing. Mobile gear (dredge, trawl) fishing accounts for less than half of landed value from the WLA. It was conservatively estimated that 5% of total baseline landings from all stocks within the WLA would be lost to fishing during operations.

Effects During Decommissioning

Because cable removal is less disruptive than burial, the availability effect for decommissioning was assumed to be half that of cable installation. The fishing activity constraints along the export cable route are assumed to be similar to those during cable laying operations, but likely for a shorter duration—5% of the WA and 100% of the ECC for a total of two months.

Impacts on For-Hire Fisheries

The WHOI analyses also estimated the gross revenue associated with for-hire charter boat fishing activity originating in Massachusetts and Rhode Island, and the fraction of this revenue that may be exposed due to development of Sunrise Wind. To obtain data on for-hire charter fishing activity in the WLA and ECC, an online survey of Rhode Island- and Massachusetts-based charter vessel operators was conducted. The survey asked operators to identify their fishing locations on a chart, and report for each location:

1) the total number of annual for-hire fishing trips that vessel took in each of the years 2017–2021;

2) the average number of passengers onboard for-hire trips in each of the years 2017–2021;

3) the average amount of time spent targeting highly migratory species relative to bottom fishing or trolling for other species during for-hire trips.

The number of anglers per year was estimated by multiplying the vessel trip number in a year and the average number of anglers per trip in that year for each vessel. The results were then summed across vessels for fishing that occurred in three areas: WLA + 7.5km buffer; WTGA + 7.5km buffer; and ECRA.

Next, the annual revenue for each area was estimated by multiplying the number of anglers in the area by VTR-based average revenue per angler estimates from NMFS. The result was then adjusted using a scale factor. For a low-end estimate, the scale factor was the ratio of the number of vessels responding to the survey to the number of these vessels for which specific fishing locations were provided. For a high-end estimate, the scale factor was increased to reflect the estimated total of vessels operating in the survey areas versus the number of vessels for which survey responses were received.

The WHOI analyses assumed that the value of charter fishing in the WLA + 7.5km buffer and ECRA is foregone during construction and decommissioning due to noise effects on fish availability. Given that much of the charter fishing around the WLA takes place outside the WLA footprint and the 1 nautical mile spacing of the turbine towers, it was assumed that charter fishing boats would be able to operate in and near the WLA during the operations phase, and, therefore, charter fishing revenue would not be affected. Therefore, the calculation of revenue exposure was based on the WLA + 7.5km buffer and ECRA. As with the revenue exposure value for the commercial fishery, a 5% discount rate[9] was applied to convert future effects to a common basis. To estimate the overall economic impact associated with changes in charter fishing direct revenue, an economic impact multiplier was calculated using data collected in a nationwide survey of marine recreational anglers (Lovell et al. 2020).

Shoreside Impacts and Multipliers

To assess indirect and induced economic impacts to commercial fisheries, the WHOI analyses developed upstream and downstream multipliers for the commercial fishing industries in the two states. Upstream multipliers were based on regional economic models for Massachusetts and Rhode Island using the IMPLAN I-O modeling software. For the Massachusetts analysis, the downstream multiplier was based on one cited in BOEM (2021)[10]; for the Rhode Island analysis, the downstream multiplier was based on discussions with Rhode Island seafood industry representatives. The upstream and downstream multipliers were combined to provide a single output multiplier for the entire commercial fishing sector in a given state.

Discount Rate and Accounting for Inflation

The WHOI analyses used the Bureau of Labor Statistics' Producer Price Index for "unprocessed and prepared seafood" to convert the historical ex-vessel value of fish landings from nominal dollars to real dollars for a common year to account for the effects of inflation over time on the base revenue exposure estimate. To calculate the present value of revenue exposure across the entire timeline of the OSW project from construction to decommissioning, these future effects were converted to a

[9] A discount rate is applied to calculate the present value of future cash flows (and is distinct from economic adjustments made to account for inflation). 5% represents the average of 3% (cited as a typical rate used in natural resource valuation) and the rate used at the time by the US government for public investment and regulatory analyses (7%).

[10] Likely based on the analysis completed by King and Associates which used the Fisheries Economics of the US report's estimate of a commercial fisheries multiplier for Massachusetts.

common basis using a real discount rate of 5%. This rate is the average of the rate usually applied in natural resource valuation (3%) and the rate usually applied by the US government for public investment and regulatory analyses (7%).

WHOI Analyses Versus BOEM Guidance

The WHOI analyses include a description of how the revenue exposure estimates provided relate to the BOEM draft fisheries mitigation guidance (see Section 2.3.2). The authors emphasize that the BOEM guidance is to ensure that adequate reserve funds are in place for direct compensation of lost fishing income, not to estimate likely losses. The authors state that their analyses represent the latter, and take into account project-level considerations, such as turbine spacing, in the assumptions about the amount of space that will be precluded from fishing, especially during operations.

Negotiated Compensation Agreement and Analysis Criticisms

The CZMA federal consistency reviews of Sunrise Wind completed by Massachusetts (Massachusetts Office of Coastal Zone Management 2023a) and Rhode Island (Rhode Island Coastal Resources Management Council 2023) noted that the developer's compensatory mitigation offers were based in part on WHOI's revenue exposure assessments. However, after consulting with a "subject matter expert" hired to analyze the WHOI analysis, the Fisheries Advisory Board of the Rhode Island Coastal Resources Management Council expressed "considerable disagreement regarding the economic exposure valuation" (Rhode Island Coastal Resources Management Council 2023).[11] Among the WHOI assumptions criticized by the consultant was the estimated 5% reduction in landings during the wind farm's operation. According to the consultant, the loss would be greater since many fishing vessels will avoid the area entirely rather than risk safety hazards of gear entanglement (Lavin 2023). Other disagreements included the choice of discount rate. Additionally, others have disputed the accuracy and precision of the NMFS data and data products used to apportion fishing effort to space. Livermore and Guilfoos (2024) describe alternate methods and suggest that multiple data products should be considered when evaluating management alternatives.

New England Wind—King and Associates LLC

While WHOI was contracted by developers for revenue exposure analyses for Revolution Wind as well as Sunrise Wind, Dr. Dennis King, of King and Associates, LLC was similarly contracted by developers of other East Coast OSW projects, including Vineyard Wind I, New England Wind, and Vineyard Wind Northeast.

Here, we briefly summarize the main components of the approach used by King and Associates for New England Wind in order to facilitate comparisons to the approach in BOEM's draft fisheries mitigation guidance and the approach used by WHOI. Information in this section comes largely from the Massachusetts's CZM Consistency Review (dated November 9, 2023, Massachusetts Office of Coastal Zone Management 2023b) and relevant attachments, for information about the original

[11] The consultant was Kyle Antonelis, a fisheries analyst with Natural Resources Consultants, Inc, Seattle, WA.

revenue exposure methods used by Dr. King, as well as additional information used for the compensatory mitigation package (Avangrid 2023, provided in Massachusetts Office of Coastal Zone Management 2023b).

The revenue exposure calculations, similar to the WHOI approach, were based on data and analysis from NMFS, consistent with BOEM's draft fisheries mitigation guidance. Additional work was done to calculate exposure for two data limited fisheries, Jonah crab and lobster. The approach generally makes reference to the BOEM guidance and generally refers to the purpose of the revenue exposure as an indicator of potential economic impacts, not predicted or expected economic impacts. It states that likely economic impacts are likely lower than the full exposure estimate, since exposure does not take into account how much fishing vessels will move their fishing operations to areas outside the OSW energy areas (reducing the amount of revenue impacted by the development) or the extent that fishing will not occur at all (which reduces costs to fishermen that otherwise would have been incurred).

Specifically, the components of revenue exposure considered in the analysis consist of the following:

- The area of impact (lease area or offshore export cable corridor [OECC] including any buffer), and baseline revenue that are attributed to that area
- The duration of impact during each phase of construction, operations, and decommissioning
- Assumptions or effects that affect the proportion of baseline revenue that will be exposed in any given year or time period

For this analysis, all of these components are summarized in Table 3 below. Largely, information about the area of impact and duration of impact come directly from the COP. The methodology used to determine the baseline revenue estimate itself varies between the lease area and the OECC.

Table 3. NE Wind Economic Exposure Analysis Assumptions by Project Phase

Area	Assumption/Effects	Duration of Economic Exposure
Construction		
Lease Area	All (100%) commercial and for-hire charter revenue lost	3 years
OECC	All (100%) commercial revenue lost from 3.14km fishing preclusions area around cable installation activities	2 years
O&M		
Lease Area	Draft BOEM guidance 1-5 years (100%–50% reduction in revenue)	5 years
Lease Area	Commercial fisheries revenue reduced by 5%	25 years
OECC	None	n/a
Decommissioning		
Lease Area	All (100%) commercial and for-hire charter revenue lost	3 years
OECC	All (100%) commercial revenue lost from 3.14km fishing preclusions area around cable installation activities	2 years

Source: Avangrid 2023

Lease Area Revenue Exposure Estimation

For the Lease area, a 14-year average fishing revenue estimate was generated from NMFS as the amount of revenue attributable to the lease area; however, it only includes fisheries where federal VTRs are submitted, so excludes some information for the lobster and Jonah crab fisheries. As a result, adjustments were made to the estimate to account for these fisheries by estimating the proportion of effort (pots) that are covered by VTRs (since they may be fishing in other federally permitted fisheries) in the relevant management area. Unreported revenue was then estimated using NMFS estimate of what the average revenue per pot fished is coming from the Lease Area, plus an adjustment factor of 25% based on expert opinion from the Massachusetts Department of Marine Fisheries (MA DMF) that suggested that non-federally permitted fishermen were more likely to have higher per-pot revenue than federally-permitted fishermen.

For-Hire Charter Fisheries Revenue Exposure was also estimated (see New England Wind COP Appendix III-N: Appendix A as provided in Massachusetts Office of Coastal Zone Management 2023b). This was based on the approach described previously used by WHOI for Sunrise Wind, including using a 2022 survey of charter vessel operators and their fishing locations, and an estimate of revenue per angler and number of anglers per trip. Here, the estimate of revenue per angler was from Steinback and Brinson (2013) instead of the VTR estimate used by Kite-Powell et al. (i.e., WHOI, described above), based on feedback from MA DMF staff.

Table 4. New England Wind For-Hire Fisheries Exposure Calculations

State	For-hire Vessels Operating Annually in Survey Area	Average Annual Trips per Vessel	Total Annual Trips by For-hire Vessels in Survey Area	Total Annual Trips by For-hire Vessels in Lease Area	Average Number of Anglers per Trip	Average Revenue per Angler ($2021)	Total Annual For-hire Fishing Revenue in Lease Area
Massachusetts	60.5	47.3	2,862	106	5.41	$184.37	$105,729
Rhode Island	39.5	47.3	1,868	69	5.41	$184.37	$68,823
Total	**100**	**47.3**	**4,730**	**175**	**5.41**	**$184.37**	**$174,552**

Source: New England Wind COP. Appendix III-N, Appendix A as provided in Massachusetts Office of Coastal Zone Management 2023b

Offshore Export Cable Corridor Revenue Exposure Estimation

As stated previously, impacts for the OECC were only assumed to occur during OECC construction and decommissioning. Thus, exposure for the OECC was estimated as the product of the annual fishing revenues per unit area in the OECC, the area unavailable to fishing (the area of installation and 1 km buffer), and the duration of construction/decommissioning.

In order to provide a more conservative estimate, high and low economic exposure estimates were also provided to reflect seasonal variability, based on monthly average fishing revenue per square kilometer in the OECC, based on data from NMFS.

Shoreside Impacts and Multipliers

Ultimately, shoreside impacts were also accounted for in the assessment of economic impacts by applying multipliers to the total commercial and for-hire fisheries exposure estimates (Avangrid 2023). The multiplier for commercial fisheries was derived from the Fisheries Economics of the US report, produced by NMFS (in contrast to the method used in Sunrise Wind, described previously), while the for-hire multiplier was derived from Lovell et al. 2020 (consistent with approach used in the Sunrise Wind).

Discount Rate and Other Economic Adjustments

The final New England Wind economic exposure analysis used for their mitigation package (Avangrid 2023) calculates the present value of the economic exposure estimates for all stages of the project development (See Table 5). For this, it first adjusts the baseline estimate from nominal values (as described in Dr. King's analysis) to real terms, using the GDP Implicit Price Deflator (consistent with BOEM guidance). It then discounts the value of revenue exposed in all future time periods using a discount rate of 5% to generate a total economic exposure amount in terms of its present value. Shoreside impacts are included in the final economic exposure calculations (Table 6) using multipliers from NMFS' Fisheries Economics of the US report (for commercial fisheries) and Lovell et al. 2020 (for for-hire fisheries).

Table 5. NE Wind Fisheries Economic Exposure Analysis Assumptions

Project Phase	Project Area	Massachusetts Fisheries Revenue
Construction	Lease Area	$819,935
Construction	OECC	$8,177
O&M	Lease Area	$967,595
O&M	OECC	$0
Decommissioning	Lease Area	$163,882
Decommissioning	OECC	$1,634
Commercial Fisheries Economic Exposure	N/A	$1,961,223
For-hire Recreational Fisheries Economic Exposure	N/A	$379,546
Total Massachusetts Fisheries Economic Exposure	**N/A**	**$2,340,769**

Source: Avangrid 2023. Values discounted using 5% discount rate. All values in 2023 dollars adjusted using the GDP Implicit Price Deflator.

Table 6. Economic Impacts with Multipliers for Commercial and For-hire Fisheries

Fisheries	Massachusetts Economic Impacts with Shoreside Multipliers
Commercial Fisheries	$5,216,854
For-hire Fisheries	$617,521
Total Fisheries	**$5,834,374**

Source: Avangrid 2023. Represents discounted value over 36 years using a 5% discount rate. Note the multiplier for MA commercial fisheries is 2.66, which includes an upstream multiplier of 1.83 and a downstream multiplier of 0.83 (based on the Fisheries Economics of the US 2020 Report) and the for-hire multiplier is 1.627 from Lovell et al. 2020.

Indirect Sources of Economic Exposure

In addition to the analysis of the potential direct sources of income loss due to OSW development, evaluations of potential indirect sources of economic exposure were also included in the analysis by Dr. King. These specifically included potential congestion impacts in areas outside of the OSW due to displaced fishing effort as well as impacts on transit routes and associated increases in operating costs. Here we briefly summarize the analyses conducted for both.

Congestion Impacts

In order to evaluate potential crowding and congestion resulting from OSW development activities, Dr. King explored related data and analyses conducted for the project, specifically Baird and Associates' Navigation Safety Risk Assessment (Baird 2021). This relied on Automatic Identification System (AIS) data to evaluate seasonal vessel traffic patterns and estimate the number of vessels transiting through the development areas. Based on this, it was determined that the vessel traffic in the development areas were relatively low and that the proportion of time vessels spent within the OSW areas compared to total effort was also low, indicating that congestion outside the areas was not expected to occur.

Impacts on Transit Costs

To evaluate impacts on transit costs, Dr. King also relied on the Navigation Safety Risk Assessment data and analysis (Baird 2021). Because it states that it was not possible to predict how many annual transits through the lease area would be rerouted around it both during and after construction, the analysis assumes that all transits would be rerouted. It uses estimates of average steaming speed, minimum and maximum increases in transit times, assumed fuel consumption rate, and dockside fuel price to estimate total annual increases in fuel costs for all AIS-equipped vessels with a history of transiting through the lease area. The analysis notes that this methodology is sensitive to its assumptions, where variability in any factor may impact the estimate. It also notes that this estimate does not account for the opportunity cost of lost fishing time or other operating costs. Despite this, the analysis suggests that the estimate is still likely conservative based on the assumption that all transiting vessels will be rerouted, since it states that it is more likely that most vessels will be able to continue transiting through the lease area.

3.2.2 California Fisheries Compensation Agreements

3.2.2.1 Commercial Fishing Industry Improvement Fund of the Central California Joint Cable/Fisheries Liaison Committee

A study of stakeholder perceptions of offshore wind energy in Humboldt County, California reported that fishermen "overwhelmingly cited an interest in developing general fund for the fleet where compensation could be held and utilized in ways that benefit the fleet as whole" (Emery et al. 2020). Fishermen cited the Commercial Fishing Industry Improvement Fund (Fund) administered by the

Central California Joint Cable/Fisheries Liaison Committee (Committee) as a potential template for allocating compensation benefits.

The Fund was established in the late 1990s as part of a mitigation package for the development of undersea telecommunications cables in Morro Bay. At the time, fishermen expressed concern about losing fishing gear that became snagged on the cables (Starosielski 2012). The Committee is a 501(c)6 nonprofit mutual benefit corporation that was formed concurrently with the execution of the 1999 *Interim Agreement Between Cable Companies and Fishermen*. The purpose of this Agreement, which was finalized in 2002, was "to identify, establish, and confirm certain mitigation measures and monitoring programs which are intended to facilitate environmental review of the cable projects, reduce potential conflicts between the installation, continuation, and maintenance of the cable projects and commercial fishing activities along the California coast" (Central California Joint Cable/Fisheries Liaison Committee 2002). The Committee is governed by a Board of Directors comprised of local trawl fishing representatives, cable company representatives, and fishermen's association representatives (Central California Joint Cable/Fisheries Liaison Committee 2024a).

Each cable company must annually deposit $100,000 per undersea cable project in the Fund for enhancement of the commercial fishing industry in San Luis Obispo County (Central California Joint Cable/Fisheries Liaison Committee 2024b). Money in the Fund is doled out as project grants. At any regular meeting of the Board of Directors, the members may award a grant to an approved project. Projects that were awarded grants in 2024 include a fishing heritage scholarship program and projects intended to protect fleet access to commercial fisheries and to preserve the Dungeness crab fishery. In addition, the Committee uses the Fund to support its Commercial Fishing Vessel Safety Equipment Reimbursement Program, which provides grants to fishermen for items such as Emergency Position Indicating Radio Beacons, VH radios, and survival suits, and for activities such as repacking life rafts at the end of the fishing season (Central California Joint Cable/Fisheries Liaison Committee 2024b).

In addition to forming the Committee and Fund, the *Agreement Between Cable Companies and Fishermen* established a separate claim procedure used to compensate fishing operations for gear loss and damage. Each cable company must pay for the full costs of gear lost or damaged by a fishing vessel as a result of being snagged on a cable owned and/or operated by that cable company. The cable company must also pay a premium in the amount of 50% of the value of the sacrificed gear to settle claims for loss of business incurred by the vessel. The cable company is responsible for disbursing payments for the gear replacement costs and claims (Central California Joint Cable/Fisheries Liaison Committee 2002).

In reviewing the literature for information about the Commercial Fishing Improvement Fund, no direct information about specific methodologies used to estimate impacts or otherwise guide the compensation agreements were identified.

3.2.2.2 California OSW Community Benefit Agreements

A Community Benefit Agreement (CBA) is a legally binding, enforceable contract signed by community benefit groups and a developer, identifying the community benefits a developer agrees to deliver in return for community support of the project. Community benefit groups consist of coalitions of stakeholders who represent the interests of residents affected by proposed developments (US Department of Energy 2017).

CBAs are not a required part of the BOEM OSW development process, but developers can choose to pursue them in parallel with BOEM-permitted surveying and additional activities. As an incentive for developers to provide CBAs during the California OSW leasing process, BOEM offered bidding credits for workforce, supply chain manufacturing, and CBAs as voluntary elements in the Final Sale Notice and December 2022 auction. Each developer included initial plans and strategies for bidding credits to BOEM in their Bidder's Financial Form (submitted before the auction), which, if accepted, reduced the cost of a developer's winning bid. In return for those reductions in payment, lessees must deliver executed CBAs by the time they submit the first Facility Design Reports or pay the value of the bid credit to the US Treasury (UC Berkeley Center for Law, Energy & the Environment 2024).

In the Final Sale Notice, BOEM defined two types of CBAs. A Lease Area Use CBA is an agreement between a developer and "one or more communities, stakeholder groups, or Tribal entities whose use of the geographic space of the Lease Area, or whose use of resources harvested from that geographic space, is expected to be impacted by the Lessee's potential offshore wind development." The other type of CBA referred to in the Final Sale Notice is a General CBA, which is established with "one or more communities, Tribes, or stakeholder groups that are expected to be affected by the potential impacts on the marine, coastal, and/or human environment (such as impacts on visual or cultural resources) from activities resulting from lease development that are not otherwise addressed by the Lease Area Use CBA."

All the OSW wind developers that won leases in the Morro Bay WEA and Humboldt WEA agreed to provide Lease Area Use CBAs but not all agreed to provide General CBAs. Table 3 shows the monetary commitments in each CBA (amounts are delineated in each executed lease). The value ranges from $5 million to roughly $6.7 million among the different lessees, depending on the amount each lessee was awarded in bidding credits (UC Berkeley Center for Law, Energy & the Environment 2024).

Table 7. Community Benefit Agreements of OSW Wind Developers in Morro Bay WEA and Humboldt WEA

Developer	Monetary Commitment Lease Area Use CBA	Monetary Commitment General CBA
RWE Offshore Wind (Humboldt)	$6,065,385	$6,065,385
California North Floating (Humboldt)	$6,684,615	$6,684,615
Equinor Wind (Morro Bay)	$5,000,000	$5,000,000
Golden State Wind (Morro Bay)	$6,012,000	$0
Invenergy California Offshore (Morro Bay)	$5,558,462	$5,558,462

Source: UC Berkeley Center for Law, Energy & the Environment 2024)

As listed in UC Berkeley Center for Law, Energy & the Environment (2024), Lease Area Use CBA requirements in the executed leases are as follows:

- Benefits delivered can include financial as well as non-monetary benefits
- However, the developers cannot include benefits in the Lease Area Use CBA that overlap with a) other benefits the developers are required to provide under other statutes (except for the Outer Continental Shelf Lands Act), or b) the benefits provided under a lessee's other bidding credits.
- The CBA "may assist fishing and related industries (including Tribal fisheries) by supporting their resilience and ability to adapt to gear changes or any potential gear loss or damage, as well as any loss of income, or other similar potential impacts that may arise from the development of the Lease Area."
- The agreement can include payments to a special fund and can include financial support for new gear, navigation and/or safety upgrades, or monies "to compensate the fishing and related industries whose use of the geographic space of the Lease Area is impacted by the Lessee's potential offshore wind development."
- Importantly, the CBA "may apply within a reasonable distance onshore."

The requirements for General CBAs overlap significantly with the Lease Area Use CBAs (UC Berkeley Center for Law, Energy & the Environment 2024). Examples of benefits that could be included in the General CBAs include:

- Payments to a community fund, with the function of providing monies to mitigate the impacts of the developer's project.
- Support for engaging in the process of developing the CBA.
- Mitigation of impacts to cultural viewsheds or to species (land and water) that are culturally significant to Tribal Nations or impacted communities.

Castle Wind Fishermen's Agreement and CBA

The OSW developer Castle Wind LLC was one of 43 entities that qualified to bid for leases in the Morro Bay WEA and Humboldt WEA (UC Berkeley Center for Law, Energy & the Environment 2024). Prior to the 2022 auctions, Castle Wind negotiated and signed a CBA with the City of Morro Bay and two commercial fishermen's organizations (Morro Bay Commercial Fishermen's Organization and Port San Luis Commercial Fishermen's Association) after several years of collaboration and discussion. Although the company did not win a lease, the Castle Wind CBA and its current

incarnation, the Morro Bay Mutual Benefits Corporation, may provide a good model for a Lease Area Use CBA.[12]

In 2018, after engaging in extensive review of the potential economic and other impacts of the proposed OSW project on commercial fishing activities in the vicinity of the project, Castle Wind and the fishermen's organizations entered into the *Fishermen's Agreement* (Castle Wind LLC 2019a). Under the agreement, Castle Wind committed to minimize and mitigate the anticipated impacts to the commercial fishermen from Morro Bay and Port San Luis who operate within the Morro Bay WEA, underwater export cable corridor, and area proximate to the OSW project. The agreement would have, among other things, created a fund for infrastructure improvements to benefit the local commercial fishing industry. The fund would have been composed of annual contributions by the developer, equal to a percentage of the annual operating fees that Castle Wind will make to BOEM after the commercial operation date. The agreement specifies that the fund would be used for improvements to port infrastructure and fishing industry grants, which could include improvements to slips and docks, safety equipment, equipment purchases or repairs, improvements of repair of storage, fuel docks, cold storage facilities, etc. Other stated uses included low-cost loans, community outreach, college scholarships, and internships (Castle Wind LLC 2019a).

Additional components of the *Fishermen's Agreement* specify the following:

- Members of the Morro Bay Commercial Fishermen's Organization and Port San Luis Commercial Fishermen's Association would have the right of first offer to provide certain qualified services to Castle Wind during construction and operation of the OSW project
- Castle Wind would provide training opportunities to qualified members of the Morro Bay Commercial Fishermen's Organization and Port San Luis Commercial Fishermen's Association to apply their existing skills to the offshore wind industry
- Castle Wind would consult with the Morro Bay Commercial Fishermen's Organization and Port San Luis Commercial Fishermen's Association about the design of the offshore wind project and would also strive to minimize restrictions on commercial fishing in the project area.

An analysis of the economic and fiscal impacts of Castle Wind's proposed OSW project was included as an attachment to the Castle Wind CBA (Castle Wind LLC 2019b). Using IMPLAN I-O modelling software, the study largely focused on the potential direct, indirect, and induced impacts of the project on local economies. However, with respect to fisheries specifically, the study also summarized findings presented in Kirkpatrick et al. (2017a), which reported that the potential economic impacts to commercial fisheries as a result of OSW development on the East Coast ranged between a -2.2%

[12] Winning bidders can choose to sign onto the Morro Bay Mutual Benefits Corporation, or they may opt to design their own CBAs in coordination with the relevant communities. In addition, the organization is open to any fisher that can prove they have been fishing in the Morro Bay WEA even if they are not members of the above-mentioned fishermen's organizations (UC Berkeley Center for Law, Energy & the Environment 2024).

and 0.6% change in annual operating fishing revenue (revenue minus operating costs). The study notes that Kirkpatrick et al. concluded that these deviations were within interannual variations, resulting in generally neutral impacts.

4 Socioeconomic Impacts of OSW on Fisheries

4.1 Socioeconomic Impacts of OSW on Fisheries

There is a growing body of literature devoted to evaluating the socioeconomic impacts of OSW development on fisheries. Here, we focus on providing a high-level overview of recent studies which have synthesized information about what is known about economic impacts of OSW on fisheries (Chaji and Werner 2023), and indicators available for assessing socioeconomic impacts (Willis-Norton et al. 2024). These studies are highly relevant in terms of characterizing what is known about key impacts and available methods. We provide this review in order to facilitate comparison to the information and approaches used in extant compensation-related methodologies and the types of impacts that are covered by these methods.

4.1.1 Economic Impacts to Fisheries

Chaji and Werner (2023) provides an overview of industry perceptions, methods, results, and knowledge gaps with respect to economic impacts of OSW on the fishing industry. The paper focuses on four key areas of interest: fuel expenditures; insurance costs; fishing revenues, incomes, and livelihoods; and fishing support businesses. These areas of interest were informed by a group of fishing industry and offshore wind experts and built off of a series of workshops held in October of 2020. The paper reviewed both published works and relevant white papers relevant to both commercial and recreational fisheries; however, it notes that fewer resources were available to evaluate recreational fisheries, potentially due to more limited models on recreational demand and lack of spatial catch data. Here we summarize findings across the major areas of interest.

Fuel Expenditures

Chaji and Werner (2023) note that at the time of their review, few studies were available that explicitly estimated potential impacts on fuel expenditures, though some studies have evaluated impacts on net revenue, including changes to all operating costs and revenue (Kirkpatrick et al. 2017a), Despite this, the paper notes that increases in fuel usage have been observed (for example, in European contexts) or are expected to occur given disruptions in vessel navigation and changes in fishing location. Several mitigation measures have been proposed to offset increases in fuel expenditures spanning fuel subsidy programs, vessel engine replacement programs, and designated transit lanes. For the latter, it notes that several research projects are underway to better understand and map vessel navigation through East Coast wind energy areas. The paper underscores that to understand specific impacts to fuel expenditures, baseline data are needed, which on the East Coast are not collected systematically and fuel costs have not been estimated specifically. In addition, once baseline data are available, an understanding of how transiting and fishing location patterns would change would also be needed, necessitating the development of location choice models.

Fishing Industry Revenues, Income, and Livelihoods

Chaji and Werner discuss that while prior work on fishing industry perceptions have found that there are widely held expectations of negative impacts to commercial fishing revenue and income resulting from displacement, overcrowding, and property loss or damage, there are limited studies on the realized magnitudes of these impacts. Prior quantitative studies evaluating the impacts of OSW on revenue and income in the US have largely been based on revenue exposure calculations and have not explicitly captured impacts due to displacement, overcrowding, or property loss or damage. Chaji and Werner discuss how different methods have been used to determine revenue exposure on the East Coast that use different spatial fishery data spanning vessel trip reports, observer data, vessel monitoring system data, and combinations of data sources (primarily those used by Kirkpatrick et al 2017a; DePiper 2014; Benjamin et al. 2018; and RI DMF 2017). The authors note that a primary limitation of using revenue exposure for an indicator of potential impacts is that it does not consider changes in harvesters' participation or fishing behavior, including the ability to recoup losses from alternate fishing locations. Further, the authors note that understanding recreational demand and changes in response to OSW development is another knowledge gap with limited preexisting literature.

Cost of Insurance

Chaji and Werner discuss several concerns with respect to the cost of insurance when fishing in OSW development areas including:

- Premium increases due to increases in navigational hazards
- Liability for damage to subsea cables
- Validity of current insurance when fishing in OSW areas
- Avoidance of OSW development areas due to insurance concerns

However, despite these concerns, there has been limited evaluation of potential or realized insurance effects due to OSW development. The authors note that in prior compensation agreements, potential insurance-related effects have been included in direct compensation agreements, based on revenue exposure calculations. The authors suggest that both data on past insurance rates as well as an improved understanding of factors that determine rates are needed to estimate changes in insurance rates due to OSW development. However, the authors note that even then, considerable obstacles would remain in accurately estimating insurance effects.

Support Businesses

Chaji and Werner describe how to fully account for economic impacts to fisheries, both upstream and downstream impacts of offshore wind development activities must be considered on fisheries supply chains and associated businesses. However, like other types of impacts, the authors note that there

are considerable data and knowledge gaps about these related industries. Despite these limitations, recommended methodologies for evaluating these impacts have coalesced around using regional economic impact models (also called I-O models) to evaluate total economic impacts associated with fishing industries, which rely on assumptions about connections and relationships between industries in the regional economy based on information about expenditures in one sector (here, the fish harvesting sectors). Such methods evaluate direct, indirect and induced impacts with respect to employment, income, output, and tax revenue. The paper goes into greater detail about the variety of both general and specific models that have been applied in commercial and recreational fisheries contexts for OSW development and the general limitations of these models.

4.1.2 Indicators Available to Evaluate Socioeconomic Impacts of OSW Development

Willis-Norton et al. (2024) synthesized available information on data and indicators used to evaluate impacts of fishery displacement effects and shifts in fished species to inform OSW analyses, including the design of monitoring plans and impact analyses. Table 4 provides a high-level summary of the types of indicators reviewed and their availability to inform consideration of what indicators might be included in a socioeconomic impact methodology for California fisheries. An important consideration for the methodology will be how to adapt indicators for prospective use, or to understand impacts of OSW projects before construction begins, which may be different than how they may be used in retrospective analysis settings.

Table 8. Summary of Indicators for Assessing Socioeconomic Impacts of OSW on Fisheries

Indicator Category	Indicators	Availability and Analysis Summary and Notes
Changes in catch and revenue	Total catch, % of region wide landings from closed areas, total revenue, % of region wide revenue from closed area, catch quality (size of fish), catch composition and quality, catch per unit effort/area, value per unit effort, value per unit fuel	Public and confidential datasets exist for most indicators, data for assessing localized changes are likely confidential
Changes in time spent on the water and distance to port	Time at sea, steaming time/distance traveled, fishing effort, relative fishing effort, number of fishing trips, primary landing port	Public and confidential datasets exist for most indicators, though data for assessing localized changes are likely confidential
Competition and safety concerns	Competition (vessel density or crowding), collision and capsizing risk, trips during dangerous conditions	Public and confidential datasets exist for most indicators, though data for assessing localized changes are likely confidential
Shifts in fishing costs	Fixed costs (insurance, moorage), capital expenses (gear type changes, new licenses), variable costs (fuel, repair, maintenance, labor costs), average fleet cost (total cost divided by catch)	Some cost data do not have available datasets, for others generally confidential datasets exist. Exceptions include Value per Unit Effort (VPUE) and fuel price where there are publicly available datasets
Shifts in fishery profit	Profit, gross value added, resource rent	Some publicly available data, though data for assessing localized changes are likely confidential
Livelihood and economic well-being effects	Income, entrance and exit of vessels, access and ability to switch into other jobs, economic wellbeing	Availability varies across indicators from confidential to no available datasets (requires primary data collection)

Indicator Category	Indicators	Availability and Analysis Summary and Notes
Community-level impacts	Total income in county generated from fishing, fishing community infrastructure, tourism, food security,	Hackett et al. 2009 provide multipliers for fisheries in California, for other indicators primary data collection is required
Cultural and identity consequences	Place-based identity/place attachment, job satisfaction, traditional knowledge/cultural heritage, mental health	No publicly available or confidential datasets, primary data collection required
Highest Impacts or Vulnerability	Gear type/target species, vessel specifications (age, size), number of target species/fisheries/permits, vessel homeport, dependence on fishing, wealth reserves, underrepresented groups, years spent fishing, other/previous employment, ability to fish out of other ports/boats, member of fishing association/coop	Some datasets for some indicators have publicly available or confidential sources, while others would need to be filed by surveys or interviews

Source: Summary of information provided in tables 2 and 3 in Willis-Norton et al. 2024

4.1.3 Impact Analysis Approaches Used in Spatial Fisheries Management Actions

As a complement to the analyses, guidance, and papers on the impacts of OSW on fisheries, here we briefly summarize the methods used in an Environmental Impact Statement for a recent spatial fisheries management action on the West Coast.

4.1.3.1 Amendment 28 to the Pacific Coast Groundfish Fishery Management Plan

In 2019, the Pacific Fishery Management Council took final action on changes to closed areas to certain gear types to protect essential fish habitat (EFH), including changes to rockfish conservation areas (RCAs). These closed areas were specifically closed to bottom-contact gears, specifically bottom trawls (NMFS 2019).

The final Environmental Impact Statement (FEIS) describes the analysis used to evaluate socioeconomic impacts resulting from the EFH closure changes (NMFS 2019). The FEIS describes that socioeconomic impacts were generally evaluated qualitatively because of multiple factors, including the complexity of the action which included closing previously open areas and re-opening previously closed areas, as well as the lack of specific models and data which could predict the net economic impacts of these changes. Specifically, the action describes a lack of analytical ability to "predict how fishermen will redeploy, increase, or decrease their effort, or how the resultant catches will change" (page 4-8, NMFS 2019).

Specifically for areas proposed to be closed under the action, the FEIS describes that quantitative data were provided on all bottom trawl fishery activity for 5 years, the most recent data available since the implementation of a major management change (implementation of the West Coast groundfish trawl catch share program). These data were used to determine the potential importance of particular grounds retrospectively, as an indicator of future importance, but noted that future importance will depend on other factors. The FEIS describes that it is difficult to predict how fishing behavior would change in response to reconfiguring closed areas because of the many factors that

can influence trawl vessels' participation decisions, including their participation in other fisheries. It notes that in response to the loss of some fishing grounds, some operators may choose to increase effort in other fisheries or exit the fishery entirely.

In addition, the FEIS describes the use of social factor analysis to help identify social and cultural effects of the action. This cites NMFS' guidance for social impact analysis (SIA) and other work (such as Clay et al. 2014) to describe the five categories or social factors considered: size and demographic characteristics; attitudes, beliefs, and values; social structure and organization; non-economic social aspects; and historical dependence and participation. The FEIS notes that due to available data and indicators (landings, permit holdings, and vessel ownership), social impacts were primarily assessed in terms of historic dependence and participation in the fishery. The other four impact factors were evaluated qualitatively based on the economic analyses and available social science literature in terms of the likely magnitude and direction of effects.

4.2 Socioeconomics of California Fisheries in Relation to Offshore Wind

Recent work from NMFS and BOEM reviews West Coast data, fisheries, and analysis approaches relevant for consideration in OSW development processes. In this section, we provide a high-level summary of this work as well as additional resources specific to California.

Pfeiffer et al. (2024) describes West Coast commercial and recreational fisheries and fisheries information pertinent to consider in OSW development processes. Specifically, that report has three goals:

- Provide an overview of West Coast fisheries and fishing communities, including supportive industries (primary and secondary/ancillary markets), fishing-related infrastructure, fishing sector interconnections, and potential connections between fishing sectors and OWE development
- Summarize relevant sources of fisheries socioeconomic information available for West Coast fisheries
- Provide relevant examples of fisheries socioeconomic methods routinely used by NMFS in analyzing potential impacts to fisheries participants and communities of proposed fisheries management actions as well as to assess impacts from other drivers, such as changes in fish stock abundance, market forces, and climate variability, etc.

The report focused on commercial and recreational fisheries in federal waters where turbine infrastructure for OSW is expected and states that individual Tribes should be engaged directly about their Tribal fisheries and potential impacts from OSW. The report notes that BOEM has provided funding for some Tribal Nations to develop Tribal Cultural Landscape Assessments (as defined by Tribes) near West Coast offshore wind-energy planning areas, including the coast and offshore.

4.2.1 Summary of Fisheries Socioeconomic Data and Tools

4.2.1.1 Summary of Relevant Commercial and Recreational Data and Available Tools

Table 25 in the Pfeiffer et al. report summarizes the data owners, administrators, and coverage of different West Coast commercial fisheries datasets, while Table 26 summarizes the availability of different information across data sources. Most relevant to this work is that spatial fishing effort information is collected in multiple data sources, including fish tickets, logbooks, observer records, Electronic Monitoring, and VMS. The availability of logbook spatial fishery data, which may be most equivalent to the VTR data used by the East Coast methodologies, and observer data may be the most important for eventual tools and analyses that spatially apportion landings to fishing locations and offshore wind areas. However, similar to East Coast fisheries, Table 25 notes that logbook data coverage is variable across fisheries and spatial information in particular may be reported inconsistently. Observer data coverage is also dependent on the fishery, spanning from full coverage in the West Coast groundfish trawl catch share program and highly migratory species (HMS) fisheries to partial coverage in many others. Other relevant datasets include the fish ticket and permit databases, VMS and AIS spatial data, cost and earnings datasets, and the fishing participation social survey. It is worth noting that for West Coast groundfish trawl catch share program participants, more extensive cost and earnings datasets as well as social survey information is available.

For recreational fisheries, several datasets are described in the report that may be used to describe both private and for-hire recreational fisheries on the West Coast which may be helpful for characterizing effort, expenditures, and in the case of for-hire operators, earnings, across the state of California. However, as noted in Section 4.2.1.3 below (*Data and Analysis Needs)*, the location of recreational fishing effort offshore is noted as an outstanding need that would need to be filled to adopt similar for-hire revenue exposure estimates as suggested by the BOEM draft fisheries mitigation guidance and used in East Coast compensation agreements.

4.2.1.2 Summary of Available Tools and Indicators

Sections 5.1.2–5.1.4 in Pfeiffer et al. further describe the types of indicators and tools used to evaluate socioeconomic impacts on West Coast fisheries. This includes NMFS' Community Social Vulnerability Indicators[13] (Jepson and Colburn 2013), commercial fishery indices used in the California Current Integrated Ecosystem Assessment (CCIEA, NMFS 2022), and economic impact modeling tools. Each indicator, index, or tool is listed below. A full description of each is provided in the report.

Coastal Community Social Vulnerability Indicators

- Commercial fishing engagement: presence of commercial fishing
- Commercial fishing reliance: presence of commercial fishing relative to population size

[13] More information including online tools available here: https://www.fisheries.noaa.gov/national/socioeconomics/social-indicators-supporting-information

- Recreational fishing engagement: presence of recreational fishing
- Recreational fishing reliance: presence of recreational fishing relative to population size
- Environmental justice indicators: poverty, population composition, personal disruption
- Climate change indices: sea level rise risk, storm surge risk
- Workforce and housing indicators: labor force structure, housing characteristics
- Gentrification pressure indicators: housing disruption, retiree migration, urban sprawl

Commercial Fishery Indices

- Fishery participation networks: illustrations of cross-participation across fisheries
- Fishery fleet revenue diversification: effective Shannon Index
- Measures of revenue concentration: geographic concentration of fishery revenues

Economic Impact Modeling

- Fisheries Economics of the United States: national economic impact model
- Input-Output Model for Pacific Coast Fisheries (IOPAC): model developed specifically for West Coast

4.2.1.3 Data and Analysis Needs

While the report details the availability of a wealth of data and analytical tools available for assisting with the evaluation of fishery impacts analysis in relation to OSW development, it also notes that many data that may be needed to evaluate impacts either do not exist or are not currently publicly available. We summarize these data below.

Data that are available but not public

- Number and location (port) of commercial fishing vessels
- Commercial fishing vessel lengths
- Location of commercial fishing effort (offshore)
- Number and location of fish buyers
- Revenue of fish buyers

Data that are likely to be needed but new data collections need to be developed

- Number and location (port) of recreational fishing vessels
- Location of recreational fishing effort (offshore)
- Characteristics of recreational fishing vessels

- Number of land-based (shore/jetty) recreational fishing trips in Oregon and Washington
- Operating costs for non-groundfish fisheries
- Number, location and characteristics of fish processing facilities

The report notes that a publicly available tool is in development and will inform offshore wind development analyses. The Pacific Fishing Mapping Project (PacFEM) will integrate spatial fisheries data to support, among other purposes, offshore wind-related analyses for commercial fisheries. It notes that there is a need to integrate recreational fishing data into the tool but this component is currently unfunded. It also notes that current available input-output models such as IOPAC are unlikely to be sufficient to evaluate the impacts of offshore wind development.

4.2.2 Other Relevant Data Resources and Tools

The California Offshore Wind Energy Gateway[14] provides a compilation of resources, including datasets and tools, related to offshore wind development in California. Datasets and maps provided include data on essential fish habitat, CDFW and federal fisheries datasets, including VMS data, and community-based mapping efforts in each of the WEAs, including:

- Northern CA Commercial Fishermen's Associations Community-Mapped Fishing Grounds[15]
- Central Coast Fisheries Heritage Mapping Project[16]

In addition, the white paper produced by the California Fishermen's Resiliency Association (CFRA) "The Value of Fishing Grounds—California North Coast" provides additional information about local fisheries operations, such as gear types used and the spatial characteristics and requirements for operations by fishery as well as typical prices, landing volumes, and revenue (CFRA 2023).

4.3 Potential Socioeconomic Impacts in California

In 2024, the California Energy Commission (CEC) released its final strategic plan for offshore wind development in federal waters off the California coast, per the requirements of AB 525. Part of the plan identifies potential impacts to fisheries as well as potential mitigation measures (Jones et al. 2024). The impacts ultimately included reflect numerous Tribal consultations, weekly and biweekly meetings, working group calls, workshops, and in-person meetings to solicit input on potential impacts and strategies to address them.

This report underscored that defining potential impacts for a new floating offshore wind industry is challenging, as no commercially deployed floating offshore wind projects exist in the US and the technology is constantly evolving. Thus, potential impacts reflect those that are anticipated or those

[14]Available at: https://caoffshorewind.databasin.org/
[15] Accessible at: https://storymaps.arcgis.com/stories/ec90562aada545acb6bb1bf6f3c8f228
[16] Accessible at: https://caoffshorewind.databasin.org/datasets/7ea9f5e0e5c149ef9c5286b39c4753d2/

that have been observed for other major offshore infrastructure projects, including wind facilities, oil and gas platforms, pipelines, and sub-sea fiber optic cables that can serve as examples. It notes that more specific impacts may be identified and assessed once specific locations for projects are identified. Table 5 lists the potential sources of impacts by location, as described in the report.

Table 9. Potential Sources of Impacts of Offshore Wind Activities

Offshore and Nearshore	Ports and Harbors	Onshore
Construction and O&M of floating wind turbines, including mooring cables and anchors Construction and O&M of floating substations and cables to shore Construction and O&M of inter-array electric cables between turbines Marine vessel operation to support construction of turbines and associated facilities	Construction and O&M of new or expanded ports, coastal construction yards, and laydown areas, wet and dry storage areas, warehouses, parking areas, and service facilities New dredging projects to deepen existing channels to accommodate larger vessels Marine vessel and helicopter operation and services at port facilities	Construction and O&M of onshore transmission lines, substations, manufacturing facilities, and energy storage facilities, including vehicle, equipment, and helicopter use Horizontal drilling for bringing electrical cables onshore from turbines or offshore substations Development of housing and parking for long-term construction and permanent O&M workforce Construction of new or upgraded infrastructure, including roadways or railways providing access for equipment and project workforce

Adapted from Jones et al. 2024

4.3.1 Commercial and Recreational Fisheries Impacts

Jones et al. (2024) incorporates impacts identified for both the Humboldt WEA and Morro Bay WEA in the Coastal Commission's Consistency Determinations, which focused on effects of lease exploration activities but also described high-level foreseeable impacts associated with construction and operation. The strategic plan lists impacts identified by fishermen and the fishing industry including:

- Lost or reduced access to fishing areas
- Vessel safety concerns
- Gear loss or damage
- Uncertainty with survey work: including displacement of fish species and lack of access to fishing areas, as well as potential lethal impacts to fish species
- Food security: impacts stemming from a loss of fresh local seafood, disruption to markets
- Impacts from port activities: reduced dock space, increased vessel traffic, and competition for port space. In addition, dredging, filling or deepening of ports and harbors may affect fisheries.

- Disruption of fisheries data collection: impacts to NMFS scientific surveys and other long-term monitoring efforts.
- Cumulative effects

In addition, the strategic plan makes the following recommendation for determining impacts:

> The latest commercial, recreational, subsistence, and cultural fishing data should be used to conduct analyses assessing spatial and temporal trends in fishing effort and value metrics in the offshore and nearshore environments, in consultation with California Native American Tribes and fishing representatives, including those on the California Offshore Wind Fisheries Working Group. (page 88, Jones et al. 2024)

BOEM's Draft PEIS additionally describes the potential impacts of wind energy development in each leased area and potential mitigation measures that can be implemented to avoid or reduce various impacts (BOEM 2024a). Specific to commercial fisheries, the PEIS describes trends and average commercial fishery landings and revenues from port complexes near the WEAs, spatial commercial fishing effort in the groundfish trawl catch share program, and gear-types and target species in each WEA. For recreational for-hire fisheries, RecFIN data were used to characterize monthly patterns of for-hire fisheries in northern and southern sub-regions of California, which partially overlap with the WEAs, and finer-scale RecFIN catch data were used to characterize targeted species and species groups for each WEA. Impact issues and associated indicators included in the PEIS include the following:

- *Port Access*: congestion, reduced access to services, increased costs for services, displacement to other ports.
- *Fishing Access*: increased operating costs, lower revenue, increased conflict, area avoidance, loss of fishing, temporary displacement due to all phases (surveys, cable installation, maintenance, and decommissioning).
- *Loss of or Damage to Fishing Gear*: costs of repair/replacement, lost revenue while gear is being repaired/replaced.
- *Change in the Distribution of Target Species*: change in revenue.
- *Social and Cultural Impacts*: wellbeing, community dependence, increased stakeholder pressure, social stratification and change in ownership patterns, fisheries participation and employment structure, access to social capital, impacts on identity and livelihoods.
- *Shoreside Business Impacts*: impacts on shoreside support businesses.

The PEIS describes potential impacts of one representative project in each WEA as well as potential impacts of five representative projects and cumulative impacts. Here we summarize impacts described for one representative project:

- *Anchoring:* temporary navigational hazards and seafloor impacts.
- *Cable installation and maintenance*: temporary seafloor disturbance and fishery displacement for fixed and mobile gear types during installation. Permanent displacement to avoid gear interactions with cable protection fixtures on seafloor. Occasional spatial closures during maintenance and surveys.
- *Invasive species*: increased invasive species risks due to increased vessel traffic.
- *Noise*: Noise during surveys, construction, operations, and maintenance may induce temporary and localized changes in species distributions.
- *Port utilization:* additional vessels and vessel traffic in ports may reduce available dockage and reduce access to port services.
- *Presence of structures*: presence of structures may cause long term impacts on fish aggregation, habitat conversion, allisions, fishery displacement, gear loss/damage, navigational hazards, fisheries management mechanisms, space-use conflicts, and other safety issues. Positive impacts may result from fish aggregation and habitat conversion, particularly to for-hire fisheries, but negative impacts may result from all other impacts.
- *Vessel traffic*: Increased vessel traffic would occur most significantly during construction and decommissioning, causing displacement of fishing vessels from the cable corridor and WEA and potentially causing temporary increases in transit times.

In 2024, California Ocean Science Trust compiled the latest research to produce seven fact sheets on potential impacts of floating offshore wind in California's federal lease areas.[17] While impacts to fisheries and fishing industries were not one of the topic areas of focus, general impacts, impacts from electromagnetic fields and noise and impacts to seabirds, marine mammals and fish and seafloor habitats were included, all of which may indirectly affect fisheries. Their general conclusions included the following, which may be most relevant for determining impacts on fisheries:

- The complete scope of potential negative or positive impacts will be uncertain until the technology is deployed and effects have been studied in local marine ecosystems.
- Data and information from similar industries activities in the marine environment can be used to understand likely impacts, mitigation measures, and areas for additional research.

[17] All fact sheets are available at: https://www.oceansciencetrust.org/projects/windfactsheets/

- Potential stressors on marine life and habitats include electromagnetic fields, seafloor disturbances, noise, water quality, changes to wind and oceanographic patterns, and the risk of species' interactions with physical structures. In particular, Bay species and ecosystems may be affected by port redevelopment and related activities.
- Many potential impacts may be avoided, minimized, or mitigated based on research on similar ocean energy technologies.
- The combination of multiple stressors over time should be considered for determining impacts in addition to individual impacts by species or development phase (CA OST 2024)

The Pacific Northwest National Laboratory (PNNL) and the National Renewable Energy Laboratory are jointly leading an effort to facilitate knowledge transfer for offshore wind research around the world. Specifically, the U.S. Offshore Wind Synthesis of Environmental Effects Research (SEER) effort aims to synthesize key issues and disseminate existing knowledge about environmental effects, inform applicability to U.S. waters, and prioritize future research needs.[18] SEER maintains a Project Finder tool, which is a searchable database of planned, ongoing, and recently completed research projects relevant to better understanding the environmental effects of offshore wind development along the US Pacific Coast. The scope of projects includes both field and other non-field research activities related to wildlife, habitat, and ecosystem processes.

Emery et al. 2020 documented stakeholder concerns with respect to offshore wind development on the North Coast of California and grouped concerns into several general areas of impacts:

- *Loss of Ground and Potential Crowding*: uncertainty about ability to fish in the wind energy areas and interactions with subsea cables, including electromagnetic effects.
- *Safety and Displacement from Bay Resources*: navigational safety and access to port and harbor resources.
- *Fishing and Climate Change*: climate change impacts may pose a greater issue for fisheries than offshore wind.
- *Mobilization of the Fleet and Having a Voice*: challenges with advocating for fishing interests and being represented in the process.

4.3.2 Tribal Fisheries Impacts

Fisheries Impacts to Tribes are discussed in the California Offshore Wind Draft PEIS in the Tribal Values and Concerns section, and specifically detail the following impact indicator: "assessment of impacts on fisheries from offshore wind development (construction and operation); potential for conflict with one or more treaties between Tribes and the U.S. government" (BOEM 2024a). Specific

[18] Available at: https://tethys.pnnl.gov/us-offshore-wind-synthesis-environmental-effects-research-seer

impacts to fisheries are not described, but the following is provided to describe the determination of impacts on any particular resource of Tribal value and concern:

> The impact of any proposed measure on any particular resource of Tribal value and concern needs to be assessed when project-specific specific information (such as anticipated to be included in lessees' COPs) in tandem with engagement and consultation between BOEM and Tribal Nations. (BOEM 2024a, 3.4.5-15)

Other relevant Tribal concerns that were identified as part of a study of stakeholder concerns on the north coast of California included effects to Tribal resources, both biological and cultural, noise and vibration impacts, harbor development, and long-term impacts for future generations (Emery et al. 2020). In the section that reviewed Tribal concerns, no direct impacts to fisheries were described, though concerns about impacts to fisheries were raised elsewhere in the report.

Overall, a review of the literature including resources discussed earlier in this report indicates a general paucity of state or federal data for Tribal fisheries in general or specific to California that is similar to the types of data available for commercial and recreational fisheries that have been used in past impact analyses or methodologies for compensation. While Tribes along the West Coast have strong cultural and spiritual ties to fishery resources along the coast, a limited number have dedicated treaty and access rights to various species (PFMC 2024). The majority of these Tribes are located in Washington state, of which four have defined Usual and Accustomed fishing areas that extend into the offshore environment. In California, the Yurok and Hoopa Valley Tribes have a federally reserved right to harvest up to half of the harvestable surplus of Klamath River Fish (PFMC 2024). Both Tribes manage their harvests on their Tribal lands and associated waterways.

Beyond data limitations, it may not be consistent with expectations of procedures and individual concerns to try to generally describe how to quantify or qualify impacts to Tribes in California for the sake of compensation. AB 525 required the CEC to prepare a strategic plan that identified and proposed strategies for potential impacts to Native American and Indigenous people. Through that process, in 2022 and 2023 the CEC consulted with California Native American Tribes on the impacts of potential development of offshore wind. Overall, the strategic plan emphasizes that many Tribal comments expressed a need to work towards government-to-government decision-making, including early and consistent consultations with the relevant state and federal agencies and the opportunity to co-create strategies and recommendations specifically to "build their priorities into permit and mitigation requirements" (page 68, Jones et al. 2024).

5 Conclusions

Throughout this review, we find that multiple quantitative methodologies for direct compensation for commercial and for-hire fishery income loss as a result of OSW development have been employed for compensation agreements on the East Coast. In our review of recent applications, we find that methods generally align with BOEM's draft guidance on compensatory mitigation as well as the academic literature. However, differences do exist, primarily in terms of closing the gap between revenue exposure as a conservative indicator of income impacts and estimating these income impacts more explicitly. For the methods used in past East Coast compensation agreements, primary differences include determining exposure periods and the percentage of revenue exposed for various fisheries and at different development stages (e.g., construction and operations). BOEM's guidance suggests a conservative approach to include all revenue in the development areas during construction, decommissioning, and the first year of operations, and declining proportions of revenue in the first five years of operations. Evaluation of potential impacts specific to fuel costs and displacement related effects would be enabled by the development of fishing participation and location choice models. In addition, questions remain about how to best adapt revenue exposure methodologies for use in California including:

- Availability and form of NMFS spatial data tools to determine commercial fishing effort and revenue exposure
- Availability of spatial for-hire recreational fisheries data
- What impacts are and are not covered by revenue exposure (e.g., crowding, navigational hazards, insurance and other costs, etc.)
- Other methodological considerations pertaining to the configuration of OSW specifically in California and changes for floating OSW technology

In addition, methodologies for characterizing other impacts or information used to inform resiliency funds and other lump-sum compensation vehicles are not well documented in prior compensation agreements, so there is more uncertainty about if and what information was used in negotiations and how to characterize similar information in the methodology. However, throughout this review, we highlight previous work that explores the social and economic impacts of OSW on fisheries, data and methods available to qualitatively or quantitatively describe impacts, and current descriptions of potential impacts on California fisheries, which may be useful for the methodology to consider. Social, economic, and community-level indices available through NMFS or other indices suggested in the academic literature may be a good starting point for the methodology to consider and further informed by data availability and the set of impacts identified in the draft PEIS and other documents.

Finally, we did not identify preexisting information about if or how to compensate for Tribal fisheries impacts. Prior work on understanding Tribal impacts as a result of offshore wind development in California suggests that overarching concerns with respect to offshore wind may vary across Tribes, and separate processes may be preferable for Tribes to work independently to find solutions that meet their individual needs and preferences for Tribal consultation.

5.1 Preliminary Set of Knowledge Gaps and Questions

Lessons Learned and Approaches from Prior Compensation Agreements

- What social and economic information were used to inform negotiations on resiliency funds and/or safety/navigation funds
- How shoreside impacts as considered in revenue exposure and reserve fund calculations connect with eligibility (i.e., when shoreside businesses aren't eligible to submit)

Data and Information Availability for the Methodology

- How NMFS West Coast Fisheries Data and Offshore Wind Effort and Revenue Exposure Methods will differ from East Coast methods (i.e., PacFEM)
- What types of impacts can be included/covered by revenue exposure (including pre-construction activities)
- How IOPAC or other I-O models may be used/referenced by the methodology
- California-specific resources for filling data gaps to determining spatial revenue exposure for commercial or for-hire fisheries

Other

- Differences between floating offshore wind turbines and export cable configurations that would affect exposure calculations
- If/how to include Tribal fisheries in this work

6 References

Avangrid, 2023. New England Wind (Lease Area OCS-A 0534) MA Fisheries Mitigation Proposal. Presentation dated September 8, 2023. As provided in the MA CZM Conditional Concurrence dated November 9, 2023.

Baird and Associates Ltd. 2021. New England Wind Navigation Safety Risk Assessment.

Benjamin, S., M. Y. Lee, and G. DePiper. 2018. Visualizing fishing data as rasters. Northeast Fisheries Science Center, Reference Document 18-12, Woods Hole, Massachusetts.

BOEM (Bureau of Ocean Energy Management), US Department of the Interior. 2021. Vineyard Wind 1 Offshore Wind Energy Project Final Environmental Impact Statement, Vol. IV.https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/Vineyard-Wind-1-FEIS-Volume-4.pdf

BOEM. 2022. Guidelines for Mitigating Impacts to Commercial and Recreational Fisheries on the Outer Continental Shelf Pursuant to 30 CFR Part 585. June 23, 2022.

BOEM. 2024a. California Offshore Wind Draft Programmatic Environmental Impact Statement. https://www.boem.gov/renewable-energy/state-activities/california-offshore-wind-programmatic-environmental-impact

BOEM 2024b. Conditions of Construction and Operations Plan Approval Lease Number OCS-0487. June 21, 2024.

California Coastal Commission. Undated. https://documents.coastal.ca.gov/assets/upcoming-projects/offshore-wind/CCC-Offshore%20Wind-FAQ.pdf

California Coastal Commission. Federal Consistency. https://www.coastal.ca.gov/fedcd/fedcndx.html

CRFA (California Fishermen's Resiliency Association). 2023. Value of Fishing Grounds California North Coast. https://www.californiafishermensresiliencyassociation.com/resources

CA OST (California Ocean Science Trust). 2024. Potential Environmental Impacts of Floating Offshore Wind in California's Federal Lease Areas: Understanding Potential Environmental Impacts with Existing Research. June 2024. Available at: https://www.oceansciencetrust.org/wp-content/uploads/2024/07/OST-Science-Factsheet-1-General-Takeways-Final.pdf

Castle Wind, LLC. 2019a. Commercial Leasing for Wind Power Development on the Outer Continental Shelf Offshore California Call for Information and Nominations. Exhibit C: Summary of

Fishermen's Agreement. https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/CA/CastleWInd-Nomination.pdf

Central California Joint Cable/Fisheries Liaison Committee. 2002. Agreement Between Cable Companies and Fishermen. https://climate.law.columbia.edu/sites/default/files/content/CBAs/Cable%20Companies%20Agreement.pdf

Central California Joint Cable/Fisheries Liaison Committee. 2024a. Introduction to the Committee. http://www.cencalcablefishery.com/

Central California Joint Cable/Fisheries Liaison Committee. 2024b. Commercial Fishing Industry Improvement Fund Grant Program Overview. http://www.cencalcablefishery.com/commercial-fishing-industry-improvement-fund.html

Chaji, M. and S. Werner. 2023. Economic Impacts of Offshore Wind Farms on Fishing Industries: perspectives, methods, and knowledge gaps. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science.

Clay, P. M., Kitts, A., & da Silva, P. P. 2014. Measuring the social and economic performance of catch share programs: Definition of metrics and application to the US Northeast Region groundfish fishery. Marine Policy, 44, 27-36.

PFMC (Pacific Fishery Management Council). 2024. Tribes. Accessed 12/20/2024 at https://www.pcouncil.org/fishing-communities/tribes/

Emery, C., Richmond, L., Casali, L., Severy, M. and Jacobson, A. 2020. Stakeholder Benefits and Concerns. In M. Severy, Z. Alva, G. Chapman, M.Cheli, T. Garcia, C. Ortega, N. Salas, A. Younes, J. Zoellick, & A. Jacobson (eds.) California North Coast Offshore Wind Studies. Schatz Energy Research Center. Humboldt, CA. https://schatzcenter.org/pubs/2020-OSW-R21.pdf

DePiper, G. S. 2014. Statistically assessing the precision of self-reported VTR fishing locations. NOAA Technical Memorandum NMFS-NE-229.

Ecology and Environment, Inc. 2014. Development of Mitigation Measures to Address Potential Use Conflicts between Commercial Wind Energy Lessees/Grantees and Commercial Fishermen on the Atlantic Outer Continental Shelf Report on Best Management Practices and Mitigation Measures. A final report for the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewal Energy Programs, Herndon, VA. OCS Study BOEM 2014-654. 98 pp.

Jepson, M. and L.L. Colburn. 2013. . Development of Social Indicators of Fishing Community Vulnerability and Resilience in the U.S. Southeast and Northeast Regions. U.S. Dept. of

Commerce, NOAA Tech. Memo. NMFS-F/SPO-129, 64 p. https://spo.nmfs.noaa.gov/sites/default/files/TM129.pdf

Jones, Melissa, Jim Bartridge, and Lorelei Walker. 2024. Assembly Bill 525 Offshore Wind Energy Strategic Plan. California Energy Commission. Publication Number: CEC-700-2023-009-V2-CMF.

Kirkpatrick, A.J., S. Benjamin, G.S. DePiper, T. Murphy, S. Steinback, and C. Demarest. 2017a. Socioeconomic impact of Outer Continental Shelf wind energy development on fisheries in the U.S. Atlantic. Volume I – Report Narrative. U.S Dept. of the Interior, Bureau of Ocean Energy Management, Atlantic OCS Region. Washington, D.C. https://espis.boem.gov/final%20reports/5580.pdf

Kirkpatrick, A.J., S. Benjamin, G.S. DePiper, T. Murphy, S. Steinback, and C. Demarest. 2017b. Socioeconomic impact of Outer Continental Shelf wind energy development on fisheries in the U.S. Atlantic. Volume II – Appendices. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Atlantic OCS Region. Washington, D.C. https://espis.boem.gov/final%20reports/5581.pdf

Kite-Powell , H., Di Jin, and M. Weir. 2023a. Fisheries Exposure in Massachusetts from the Sunrise Wind Lease Area and the Sunrise Export Cable Route. Marine Policy Center, Woods Hole Oceanographic Institution. Woods Hole, MA.

Kite-Powell , H., Di Jin, and M. Weir. 2023b. Rhode Island Fisheries Exposure from the Sunrise Wind Lease Area and the Sunrise Export Cable Route. Marine Policy Center, Woods Hole Oceanographic Institution. Woods Hole, MA. http://www.crmc.ri.gov/meetings/2023_0822semipacket/SW_FisheriesExposure_2023-08-10.pdf

Lavin, N. 2023. RI coastal regulators affirm NY wind farm project. *Rhode Island Current*. https://rhodeislandcurrent.com/2023/08/23/ri-coastal-regulators-affirm-ny-wind-farm-project/

Livermore, J. and T. Guilfoos. 2024. Scallop fishing activity characterization in Southern New England: Offshore wind demands and fisheries-dependent methods. November 11, 2024. https://doi.org/10.1371/journal.pone.0313197

Lovell, S.J., Hilger, J., Rollins, E., Olsen, N.A. and Steinback, S., 2020. The Economic Contribution of Marine Angler Expenditures on Fishing Trips in the United States, 2017. National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Silver Spring, MD. https://spo.nmfs.noaa.gov/sites/default/files/TM201.pdf

Marine Affairs Institute. 2024. Fisheries Compensation Agreements & Offshore Wind. https://marineaffairsinstitute.org/wp-content/uploads/2024/04/NY-Fisheries-Compensation-Agreements-2024.pdf

Massachusetts Office of Coastal Zone Management. 2023a.CZM Federal Consistency Review of the Sunrise Wind Farm and Sunrise Wind Export Cable. Boston, MA. https://www.mass.gov/doc/offshore-wind-sunrise-wind-federal-consistency-determination-with-attachments-10-6-23/download

Massachusetts Office of Coastal Zone Management. 2023b .CZM Federal Consistency Review of Park City Wind, LLC's New England Wind Project (Phase 1 and 2) - Subpart E – Consistency for Outer Continental Shelf (OCS) Exploration, Development and Production Activities and Subpart D – Consistency for Activities Requiring a Federal License or Permit Action; Massachusetts.. Boston, MA.

NMFS (National Marine Fisheries Service). 2019. Changes to Pacific Coast Groundfish Essential Fish Habitat Conservation Areas and Boundaries of the Trawl Gear Rockfish Conservation Area Final Environmental Impact Statement, Magnuson Stevens Act Analysis, Regulatory Impact Review, and Regulatory Flexibility Analysis. accessed 12/19/2024. https://media.fisheries.noaa.gov/dam-migration/feis-groundfish-am28-7-19.pdf

NMFS. 2022. 2021–2022 California Current Ecosystem Status Report. NOAA. https://www.pcouncil.org/documents/2022/02/h-2-a-cciea-team-report-1-2021-2022-california-current-ecosystem-status-report-and-appendices.pdf/

Pfeiffer, L., Alkire, C., and Ise, J.L. 2024. Socioeconomic Characterization of West Coast Fisheries in Relation to Offshore Wind Energy Development. BOEM 2024-054. August 2024.

Rhode Island Department of Environmental Management. 2017. Spatiotemporal and economic analysis of Vessel Monitoring System data within wind energy areas in the greater North Atlantic, Addendum I. Rhode Island Department of Environmental Management Division of Marine Fisheries. Providence, RI. http://www.crmc.ri.gov/windenergy/vineyardwind/RIDEM_VWFishValue_20190114.pdf

Rhode Island Department of Environmental Management. 2018. Spatiotemporal and economic analysis of Vessel Monitoring System data within the New York Bight call areas. Rhode Island Department of Environmental Management Division of Marine Fisheries. Providence, RI. https://dem.ri.gov/sites/g/files/xkgbur861/files/programs/bnatres/fishwild/pdf/RIDEM_VMS_Report_2018.pdf

Rhode Island Department of Environmental Management. 2019. Rhode Island fishing value in the Vineyard Wind Construction and Operations Plan area. Rhode Island Department of

Environmental Management Division of Marine Fisheries. Providence, RI. http://www.crmc.ri.gov/windenergy/vineyardwind/RIDEM_VWFishValue_20190114.pdf

Rhode Island Coastal Resources Management Council. 2023. RI CRMC Federal Consistency Review of the Sunrise Wind Project. Wakefield, RI. http://www.crmc.ri.gov/windenergy/sunrisewind/SW_FedConDecision_20230906.pdf

Starosielski, N., 2012. Warning: do not dig: Negotiating the visibility of critical infrastructures. *Journal of Visual Culture* 11(1): 38-57. https://journals.sagepub.com/doi/full/10.1177/1470412911430465

Special Initiative on Offshore Wind. 2023. Nine Atlantic Coast States Final Scoping Document: Framework for Establishing a Regional Fisheries Compensation Fund Administrator for Potential Impacts to the Fishing Community from Offshore Wind Energy Development. Revised and Released on April 13, 2023. https://offshorewindpower.org/wp-content/uploads/2023/04/RFA_RevisedScopingDoc_FINAL.pdf

Steinback S, Brinson A. 2013. The economics of the recreational for-hire fishing industry in the Northeast United States. Northeast Fisheries Science Center reference document; 13-03. https://repository.library.noaa.gov/view/noaa/4373

UC Berkeley Center for Law, Energy & the Environment. 2024. Offshore Wind & Community Benefits Agreements in California. Berkely, CA. https://www.law.berkeley.edu/wp-content/uploads/2024/04/Offshore-Wind-CBAs-in-CA-1.pdf

US Department of Energy. 2017. Guide to Advancing Opportunities for Community Benefits through Energy Project Development. https://www.energy.gov/justice/articles/community-benefit-agreement-cba-resource-guide

Willis-Norton, E., T. Mangin, D.M Schroeder, R.B. Cabral and S.D Gaines. 2024. A synthesis of socioeconomic and sociocultural indicators for assessing the impacts of offshore renewable energy on fishery participants and fishing communities. Marine Policy. Vol 161, 106013

Summary of Interviews

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Introduction

On December 31, 2024, Northern Economics provided a review of relevant literature to members of the project team[1] and on January 7, Northern Economics staff presented a summary of that review to members of the California Offshore Wind Energy Fisheries Working Group. At that meeting, a preliminary set of knowledge gaps and questions that were identified from the literature review were presented alongside a set of contacts who may be able to help fill knowledge gaps through interviews.

Between January 8 and February 21, Northern Economics conducted a series of semi-structured interviews with fishery stakeholders, Tribal representatives on the working group, offshore wind (OSW) energy developers, scientists engaged in research projects on OSW, and state and federal agency representatives. In total, 18 total interviews were conducted with 24 distinct people (some interviews were group calls with multiple participants). Honoraria were offered to support the participation of fishery stakeholders/representatives and Tribal fisheries representatives and knowledge holders. Interview questions depended on the knowledge gap to be filled, and therefore there was no standardized interview protocol.

[1] The project team includes members of the California Coastal Commission, grant managers from California Ocean Protection Council, and the chair of subgroup 5.

Summary of Knowledge Gaps

Knowledge gaps that interviews sought to fill are summarized below.

Lessons Learned and Approaches from Prior Compensation Agreements

- What social and economic information was used to inform negotiations on resiliency funds and/or safety/navigation funds?
- How shoreside impacts as considered in revenue exposure and reserve fund calculations connect with eligibility (i.e., when shoreside businesses aren't eligible to submit)

Data and Information Availability for the Methodology

- How National Marine Fisheries Service (NMFS) West Coast Fisheries Data and Offshore Wind Effort and Revenue Exposure Methods will differ from East Coast methods (i.e., the Pacific Fishing Mapping Project (PacFEM))
- What types of impacts can be included/covered by revenue exposure (including pre-construction activities)
- How IOPAC or other IO models may be used/referenced by the methodology
- California-specific resources for filling data gaps to determining spatial revenue exposure for commercial or for-hire fisheries

Other

- Differences between floating offshore wind turbines and export cable configurations that would affect exposure calculations
- Whether and/or how to include Tribal fisheries in the currently defined scope of work (see literature review for more information.)[2]

[2] As noted in the literature review: "We did not identify preexisting information about if or how to compensate for Tribal fisheries impacts. Prior work on understanding Tribal impacts as a result of offshore wind development in California suggests that overarching concerns with respect to offshore wind may vary across Tribes, and separate processes may be preferable for Tribes to work independently to find solutions that meet their individual needs and preferences for Tribal consultation" (page 42)

Summary of Interviews

The following subsections provide a summary of insights and information gathered from interviews.

Lessons Learned from Past Compensation Agreements

Key Takeaways:

- Some quantitative information on costs of additional safety equipment and training programs have informed past safety and navigation fund amounts.
- Across East Coast OSW compensation agreements and California compensation agreements, little to no documented information on impacts has been used to determine resiliency/innovation fund amounts.
- Supplemental analyses on potential congestion impacts and re-routing may be helpful as a qualitative source of information.

In interviews with representatives from offshore wind developers and those familiar with past compensation methodologies, we sought to better understand if and what information has been used to inform safety and navigation funds as well as other funds that have been provided, such as resiliency or innovation funds. In general, safety and navigation fund amounts have been informed by the amounts/precedence of past agreements and information on the cost of safety equipment, such as Automatic Identification Systems (AIS), doppler, Emergency Position Indicating Radio Beacons (EPIRBs), and immersion (also called "gumby") suits, as well as the cost of providing safety training programs. Any calculations were described as relatively rough and high-level, and no specific formulas or approaches were disclosed.

While some quantitative information has been used to inform safety and navigation fund amounts, it does not appear that this has been the case for community, resilience and/or any innovation funds. Across interviews, no methods or specific data were indicated as being the foundation for negotiated amounts for these purposes. In interviews with those knowledgeable about past compensation agreements in California, interviewees noted that past agreements have not relied on impacts information to determine funds. While each of the four past cable agreements includes an annual payment schedule (generally per cable) that is deposited into a fund, the final agreed-upon amounts were determined through individual discussion and negotiations. No interviewee was aware of any specific analysis or information used to justify the negotiations.

In interviews we also sought to understand how negotiated funds for direct income impacts connected with eligibility, especially for shoreside businesses that in past agreements may have been included in the impacts analysis (as multipliers) but later were not eligible to submit claims for impacts. Specifically, Massachusetts and Rhode Island commercial vessel owners and onshore

dealers were eligible to submit claims for direct compensation for the Vineyard Wind project, but for the South Fork Wind Farm, only commercial vessel owners and party/charter vessel owners were eligible to submit for its direct compensation program. [3] In both cases, shoreside impacts were evaluated in the underlying methodology using similar methods. During interviews, interviewees discussed that there has been variability to whom and when funds are provided, and different processes for determining who is eligible, which in part is the rationale for the ongoing process to establish a regional fund administrator on the East Coast.[4]

We also interviewed those with experience with past compensation methodologies about the utility of analyses that explored potential congestion and vessel transit re-routing impacts. Congestion impacts refer to impacts associated with displacement from the OSW project areas—increasing potential gear entanglements or safety hazards—while impacts to vessel transit routes include increased fuel costs associated with needing to transit around OSW project areas to access fishing grounds. For some East Coast projects, supplemental analyses developed by other contractors were used to explore the potential for these types of impacts. These analyses were not directly combined with the revenue exposure analyses because they conflict with the assumptions of the revenue exposure calculations. Specifically, the revenue exposure approach assumes all revenue associated with trips in the development area will not occur, while for fuel impacts to occur, some proportion of trips must still take place in areas outside of the offshore wind development area. Because of this, we conclude that such analyses are better to provide qualitative information when combined with revenue exposure approaches.

Data and Information Available for the Methodology

Key Takeaways:

- PacFEM is distinct in its approach compared to East Coast methods.
- Not all California commercial fisheries are or will be represented in PacFEM.
- For fisheries not in PacFEM, a variety of different approaches may be needed.
- Fishing block location information is available for all commercial and for-hire recreational fisheries in California and may be used to inform revenue exposure estimates for data-limited species.

[3] Example where shoreside businesses have not been eligible for direct compensation: *https://www.fisheriescompensationprogram.com/rhode-island-fisheries-direct-compensation-program*; example where shoreside businesses have been eligible: *https://vw1fisheriescomp.com/*

[4] More information here: *https://offshorewindpower.org/fisheries-mitigation-project*.

- Ongoing and recently completed projects in California may have additional value and utility for the methodology.

Our main questions for interviewees revolved around how data and tools available for methodology to consider may be similar or different from the approaches used on the East Coast. The majority of interviews for these questions revolved around federal and state data sources, starting with better understanding PacFEM, which is being developed by NMFS and Pacific States Marine Fisheries Commission (PSMFC) in partnership with the Bureau of Ocean Energy Management (BOEM), Oregon Department of Fish and Wildlife (ODFW), Washington Department of Fish and Wildlife (WDFW), California Department of Fish and Wildlife (CDFW) and other NMFS line offices.

While a publication fully describing PacFEM's methodological approach is currently being developed, we were able to review a presentation[5] during interviews that described PacFEM's approach and ask questions about its similarities and differences to the methods used on the East Coast. We learned that while PacFEM is similar in that it is a tool that can spatially apportion fishing effort, landings, and revenue to space in the ocean, it is distinct primarily because of the differences in the underlying fisheries data. Specifically, PacFEM primarily leverages logbook (or observer) data on where trips start and end, where sets/hauls occur, VMS data, and fish ticket data on total landings and revenue, to create fused "fishing tracks" combining multiple data sources' information. Information from trips is combined and gridded on an online dashboard to allow for different confidential (for internal uses) and nonconfidential (for public use) purposes. In addition, nonconfidential data summaries can be generated to describe patterns for specific landing ports of interest.

From these conversations, we learned that some California fisheries are not included in PacFEM due to data availability. In the case of recreational fisheries, there is also no funding currently available to include them in PacFEM. During interviews, we worked to better understand which fisheries may not be represented at all in PacFEM, have some limited representation, or be fully represented, since data availability varies by state and fishery (primarily for logbooks).

In some cases, data will be more available in the future than in the past. For some fisheries, logbooks were not required prior to certain years. For example, in the California limited entry and open access sablefish fisheries, logbooks were not required prior to 2023, so only comprehensive data from 2023 forward are available in PacFEM, though some limited data from observed trips will be available in previous years. Dungeness crab also will have data after 2024 for California, when a mandatory electronic logbook program was implemented. We also learned that at least one recreational fishery, Pacific albacore, is not currently included in PacFEM but does have enough spatial data that could facilitate its inclusion later. It is our understanding that most of the California fisheries that are not included in PacFEM are excluded because of a lack of logbook data. Such fisheries include Pacific sardine and other coastal pelagic species, spot prawn, rock crab, the salmon troll fishery, and hagfish.

[5] *https://geo.psmfc.org/portal/apps/storymaps/stories/7bc1a025e2fd43e49efb011cd15e1d4e*

One fishery, Pacific halibut, is not limited by data, but by lack of data-sharing between the International Pacific Halibut Commission (IPHC) and PacFEM-affiliated agencies.

For California fisheries that are partially represented in PacFEM (currently only identified as the limited entry and open access sablefish fisheries), it may be possible to apply the PacFEM estimate to the proportion of trips that are not included in the tool, similar to the approaches used on the East Coast to adjust for data-limited species like Jonah crab and lobster. However, for all other California fisheries that are not represented at all, an alternative method to PacFEM would be needed to identify trips and associated revenue associated with offshore wind development areas.

For fisheries not represented at all in PacFEM, CDFW data may be used to develop estimates. Specifically, for all California commercial and for-hire fisheries, some spatial fishery information is available stemming from the fishing block (10 nautical mile squares) reported on fish tickets or in the case of for-hire fisheries, on monthly logbooks. It may be possible to develop estimates of fishing revenue per unit area of block areas that overlap OSW project areas; however, interviewees noted that the fishing block identifier reported on fish tickets is not validated, which limits the robustness of the data. For for-hire fisheries, additional spatial data (by the micro block, or 1 square nautical mile) are collected by the California recreational fisheries survey (CRFS), but there are additional questions about if and how to merge this information with the trip-level information that is needed to estimate revenue impacts, since CRFS data do not contain estimates of the number of recreational fishing trips. For revenue exposure calculations, information is needed about both the spatial fishing location on for-hire fishing trips and the number of trips in those areas, from which revenue derived from those trips can be calculated using survey data (specifically Lovell et al. 2020).[6] Additional information that could be used includes data from California's Seafloor Mapping Program,[7] which could be combined with information about the suitability of habitat for various species and fisheries, such as the community mapping projects and documents estimating the value of fishing grounds.[8]

Interviews also discussed ongoing projects in California that may inform the methodology or could inform future applications of the work. An ongoing BOEM-funded study led by researchers at the University of California, Santa Barbara (UCSB) looks at displacement effects from OSW and includes two scenarios—one where fishing trips in the OSW lease areas do not occur and one where trips are displaced to other areas—and estimates impacts on profitability in both scenarios.[9] Another part of the project will incorporate impacts due to climate change on species distributions. The results of

[6] Lovell, S.J., Hilger, J., Rollins, E., Olsen, N.A. and Steinback, S., 2020. The Economic Contribution of Marine Angler Expenditures on Fishing Trips in the United States, 2017. National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Silver Spring, MD. *https://spo.nmfs.noaa.gov/sites/default/files/TM201.pdf*

[7] *California Seafloor Mapping Program | U.S. Geological Survey*

[8] North Cost: *https://storymaps.arcgis.com/stories/ec90562aada545acb6bb1bf6f3c8f228* and Central Coast: *https://caoffshorewind.databasin.org/datasets/7ea9f5e0e5c149ef9c5286b39c4753d2/* , Value of Fishing Grounds California North Coast: *https://www.californiafishermensresiliencyassociation.com/resources*

[9] *https://emlab.ucsb.edu/projects/facilitating-resilience-and-adaptation-commercial-fisheries-response-offshore-renewable*

this study and its methods are both informative for the methodology to consider, especially if tools are produced that can be applied in the future. Additionally, researchers at the University of California, Santa Cruz (UCSC) have been working on a project to understand fishing community resilience, social cohesion, and offshore wind energy development in California. During interviews we were informed that a manuscript of this work is nearing completion and once accepted for publication, it may also be a potential resource for the methodology to include.

Finally, multiple interviews touched on how it may be important to consider a diversity of information in the methodology and allow flexibility to consider the best information available. One interviewee suggested that approaches used in fishery management that consider a broad range of quantitative and qualitative information to characterize fishery and fishing community impacts may be helpful to adapt for the methodology. One interviewee cautioned that federal fishery management indicators and approaches may not fully be able to capture impacts in California, due to the importance of state-managed fisheries. Another interviewee expanded on potential data limitations and noted that data confidentiality restrictions can reduce the ability to identify or describe impacts stemming from less than three individuals.

Tribal Fisheries Impacts

Key Takeaways:

- Developing an analogous methodology as is being considered for commercial and recreational fisheries in California is likely not culturally appropriate or practically feasible.
- Excluding Tribal fisheries from the methodology is not desirable, but inclusion should be sensitive in its treatment to allow for Tribal preferences to take precedent.
- The methodology may want to highlight the need for consultation and to work directly with Tribes to determine any compensation and methods to determine compensation amounts.
- The methodology may be able to provide sources of information that may be helpful for understanding potential impacts on Tribal fisheries.

Interviewees knowledgeable about offshore wind development and Tribal fisheries in California discussed if and how the socioeconomic impact methodology could and should consider Tribal fisheries. Across interviews, interviewees described both practical and cultural difficulties of determining a similar quantitative approach for determining compensation amounts as are being explored for commercial and recreational fisheries. Practically, data on Tribal fisheries are sparse, especially for Tribes without explicit rights to fish, which is the majority of California Tribes. As discussed in the literature review, only two California tribes have explicit rights to fish, the Yurok and Hoopa Tribes.

Culturally, interviewees described challenges with conflating use with monetary value for species collected for subsistence and traditional purposes. However, despite the challenges with such an approach, interviewees described a desire to not leave Tribal fisheries out of the methodology and described potential information or data sources that may be helpful to provide as background resources, as communicated and supported by individual Tribes. Some of those information sources included:

- Tribal fishery management plans (Yurok and Hoopa Tribes specifically)
- Recent federal salmon fishery management decisions
- Environmental Impact Statements from dam removal projects
- Tribal Cultural Landscape Assessments (TCLA)[10]
- Tribes with MOUs with the state of California for expanded take and who submit scientific collections reports
- Federal Fishery Disaster Declarations and Funding for California Tribes

Interviewees noted that there are advantages and disadvantages to the approaches and information contained in any of the above resources. For TCLAs specifically, it was noted that each is different and some have fisheries information and some do not, since they are guided by the types of information and data that Tribes want to share. Recent federal fishery disasters may also provide some information, since both federally recognized and non-federally recognized Tribes in California have received compensation for recent salmon fishery disasters specifically for subsistence and cultural uses. Specifically, the Pulikla Tribe of Yurok People requested disaster relief in 2023 for Klamath River and ocean salmon stemming from a complete closure of the fishery in 2023. As a result, their request for a determination of a subsistence and ceremonial fishery resource disaster was approved in 2024.[11]

Interviewees generally underscored the importance of early, often, flexible, and individual engagement with Tribes. Interviewees also highlighted that fisheries are just one component of the impacts that Tribes may experience, and the cumulative impacts of development alongside other pressures that Tribes face (e.g., climate change) should be taken into consideration. One interviewee suggested that the methodology for Tribal fisheries be considered a living document and be able to be flexible and adaptable over time.

[10] *https://www.boem.gov/PC-21-01*

[11] Determination letter can be found here: *https://www.fisheries.noaa.gov/s3/2024-09/CA-Pulikla-Tribe-Salmon-Determination-2023.pdf*

In addition, because another subgroup (Subgroup 4) is focused on Tribal fisheries, we are exploring having additional opportunities to collaborate and work with this subgroup to align our work with its activities, including roundtable discussions planned for later this year. This was identified as a pathway to help ensure the methodology benefits from the subgroup's expertise as well as a broader group of Tribal fisheries representatives.

Floating Offshore Wind Implications for Methodology

Interviewees generally underscored that floating offshore wind technology is still very nascent as is any information about potential impacts, which is a challenge for the methodology to prospectively consider. In particular, the final BOEM fisheries mitigation guidance document is explicitly limited to fixed-bottom offshore wind structures and focuses on the Northeast Atlantic.

One interviewee discussed how currents and gear deployment/retrieval considerations may affect fishing decisions around OSW project areas. Because of the risk of entanglements or collisions with structures, the area of impacts may extend beyond the footprint of the project. Additionally, because of this additional area of impact, the likelihood or degree of congestion/compaction outside of the OSW development areas could also increase.

Others discussed how the design parameters and specifics of individual floating offshore wind projects will have a large bearing on if and what mitigation measures are considered and the ultimate impacts to fisheries. Because the design may have different effects for different types of fishing gear (based on depth), interviewees indicated that it is hard to generalize across fisheries about areas of exclusion or whether additional buffers outside of development areas are needed. One interviewee indicated that the eventual Construction and Operations Plan (COP) documents should provide the necessary information for the methodology to consider design parameters.

Conclusions

Interviews were helpful to answer initial questions coming out of the literature review and identify additional areas where more research, work, and conversations will be needed to advance the methodology. To prepare the skeleton methodology and workshop, the project team will continue to explore the following areas:

- Back-up revenue exposure methods for California fisheries not included or partially included in PacFEM
- Best ways to quantify and/or qualify shoreside impacts
- How ongoing research projects in California (and elsewhere) can inform the methodology
- The most socioculturally appropriate way to advance work on Tribal fisheries, including working more directly with Subgroup 4
- Additional lessons learned from the East Coast

Over the coming months, the project team will continue working to fill knowledge gaps and collect necessary information to inform the methodology from available sources, including potentially conducting additional informal follow-up interviews or meetings with contacts relevant to this work.

Socioeconomic Impact Methodology Expert Workshop Report

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Abbreviations

CCC	California Coastal Commission
OSW	Offshore Wind
SB	Senate Bill

Introduction

This report summarizes the results of a virtual expert panel workshop held on May 1, 2025, organized and facilitated by Northern Economics, Inc. The goal of the workshop was to review and provide feedback on a high-level outline of a socioeconomic impact methodology (referred to as the 'skeleton methodology'), pursuant to a broader project Northern Economics is conducting with the California Coastal Commission (CCC) and the Offshore Wind Energy Fisheries Working Group to develop such a methodology. The recommendations summarized here will be reviewed and considered by the CCC and the Offshore Wind Energy Fisheries Working Group in their development of the socioeconomic methodology.

How this Report is Organized

This report is organized into 6 main sections. The first section summarizes relevant background information for the project, followed by a description of the workshop goals and structure. The bulk of the report summarizes each discussion session of the workshop, including participants' recommendations for changes to the methodology. There were four main discussion sessions:

1. Icebreaker: Biggest challenges for the development of a socioeconomic impact methodology
2. Big picture reactions to the skeleton methodology as a whole
3. Key questions and recommendations for Step 3 (direct income impacts)
4. Key questions and recommendations for Steps 4 and 5 (dependence and vulnerability and supplementary analyses)

The final sections provide a summary of conclusions from the workshop as well a list of additional resources shared by participants. Also included as appendices are the workshop agenda, draft socioeconomic impact methodology, and the workshop goals and key questions, which were all provided to the participants a week prior to the workshop.

The full report outline is as follows:

- Background
- Workshop Goals and Structure
- Workshop Discussion Summaries
    - Biggest challenges
    - Big Picture Reactions
    - Income Impacts and Data Considerations
    - Dependence & Vulnerability and Supplementary Analyses
- Conclusions
- Additional Resources
- Appendices

Background

Background

Under a grant from the California Ocean Protection Council, Northern Economics, Inc. is working to develop a socioeconomic impact methodology for fisheries and offshore wind (OSW) projects in California. This project is pursuant to the requirements of California Senate Bill (SB) 286, which directs the CCC and the Offshore Wind Energy Fisheries Working Group to develop such a methodology.

Project Objective and Purpose

The objective for this project is to produce a socioeconomic impact methodology (henceforth referenced as the methodology) that will enable consistent, thorough, and objective evaluations of OSW impacts on fisheries in California. The methodology will be used to inform guidance and determinations for compensatory mitigation agreements resulting from unavoidable OSW impacts in California. Specifically, the methodology will describe steps and approaches that can be used to inform the development of direct compensation and resiliency funds, considering possible data and information limitations and project-specific considerations. The methodology is anticipated to be generalizable and flexible to apply to various OSW projects across the state but detailed enough to allow for ease of use and consistent application.

Workshop Goals and Structure

Workshop Goal

The overarching goal of the workshop was to gather experts from various fields who have worked with or adjacent to OSW projects previously and solicit their feedback on a draft high level outline of the methodology, the skeleton methodology, (*Appendix 2: Draft Socioeconomic Impact Skeleton Methodology*) for evaluating socioeconomic impacts of proposed OSW projects. The specific goal was to come away with suggestions and modifications to the skeleton methodology that would ensure it is thorough, objective, able to guide compensatory agreements, and able to be used consistently across different projects. Recommendations and suggestions provided by the workshop participants will be considered and integrated, as appropriate, based on review from the project team, CCC, and Offshore Wind Energy and Fisheries Working Group. As a result, not all recommendations and suggestions may be integrated, depending on determinations about scope, definitions, or consistency with other parts of the statewide strategy or the California Coastal Act.

Workshop Objectives

We had three main objectives to achieve during the workshop that were shared with the experts:

- Review the skeleton methodology
    - Identify strengths, gaps, suggest improvements
- Identify additional analyses, resources, or indicators that may be utilized or referenced
- Document expert recommendations for improvements to the methodology to ensure it meets its goals

Workshop Participation

In total, nine experts attended the workshop (Table 1). Experts were affiliated with west coast public and private universities, state and federal government agencies, and private research institutions. Experts were invited to attend the workshop based on their knowledge and expertise in economics, anthropology, sociology, regulatory analysis, and fisheries science. Experts were prioritized for invitation based on relevant subject matter expertise—specifically, analyses or methods that have informed prior compensation agreements, or experience with studying the socioeconomic impacts of OSW on fisheries. Experts with familiarity and experience with these topics in the state of California were also prioritized. The expertise sought for this workshop was on methodological

development. The subgroup and full working group will serve as an important source of expertise to advance the draft methodology in later stages of methodology development.

Cumulatively, the workshop participants had developed frameworks for evaluating impacts, contributed to analyses in support of previous OSW compensation agreements, and studied the impacts of OSW including economic, community, and fisheries impacts.

Table 1. Number of Workshop Participants by Affiliation Type

Affiliation	Number of Participants
Public and Private Universities	4
State and Federal Government	4
Private Research Institutions	1

Workshop Structure and Discussion Framework

At the workshop, participants received a presentation on the skeleton methodology and were led through several targeted discussions to gather feedback in key areas of interest. The agenda for the workshop can be found in *Appendix 1: Workshop Agenda*. In total, four main workshop topic discussions were held with participants to gather feedback and recommendations for the methodology. These discussions were as follows:

- An icebreaker discussion on the biggest challenges for developing and OSW socioeconomic impact methodology
- A discussion on 'big picture' reactions to the skeleton methodology as a whole
- A targeted discussion on key questions and challenges for Step 3, "Estimate Direct Income Impacts"
- A targeted discussion on key questions and challenges for Steps 4 and 5, "Assess Dependence and Vulnerability" and "Other Supplemental Analysis"

Each discussion is summarized in the following section.

Workshop Discussion Summaries

Biggest Challenges

The first discussion of the day focused on what workshop participants perceive to be the biggest challenge for developing a socioeconomic impact methodology for OSW and fisheries. This was used as an icebreaker to warm workshop participants up and to identify what might be key discussion themes throughout the workshop but not used to solicit specific recommendations for the methodology.

Discussion Structure

For this discussion, workshop participants were asked "What do you think is the biggest challenge for developing an OSW socioeconomic impact methodology for fisheries in California?" Participants were given 5 minutes to write down their thoughts on an interactive PowerPoint slide. They then were provided with an additional 5 minutes to review the collective set of challenges and place dots on challenges that resonated with them as being most important (Table 2, note dots were replaced for readability and noted as the frequency of concurrence).

Table 2. Biggest Challenges for Developing a Methodology Discussion

Challenge	Frequency of Concurrence
Lack of Accurate spatial fisheries data and estimating non-catch related impacts from shoreside and transit effects	5
Identify the appropriate data sources and accurately evaluating impacts to commercial and for-hire recreational fishers	5
Data limited fisheries	4
Limited attention & understanding regarding social organization of fisheries/fishing communities; social information and assessment needed	4
Incorporating all/sufficient number of potential impacts	4
Availability and quality of appropriate datasets	4
High resolution mapping of fishing revenues	0
Focus on mitigate and compensate instead of avoid	0
Cause other problems to solve energy security problem	0

Note: Dots were used by participants to indicate notes that workshop participants thought were important beyond what they had chosen to write. The number of dots were counted, and the value was placed in the right column as the frequency of concurrence.

Discussion Summary

As shown in Table 2, nine main challenges were identified by workshop participants, however, some were identified as being more important than others (as shown by the frequency of concurrence). With five concurrences apiece, limitations of spatial fisheries data and ability to evaluate shoreside and transit effects and identifying appropriate data sets for analysis were identified as the most important challenges. Other top challenges included the limited attention and understanding of

fisheries social information and ensuring all impacts or potential impacts are addressed. Some of the participants were careful to distinguish quantitative data from qualitative data, and the different challenges associated with considering each. Multiple participants agreed that both types of data were critical in understanding the entire picture and integrating it into the methodology. Additionally, participants discussed how the data used should be evaluated at different levels including region, community, fishery, and gear type. Participants supported the use of local fisheries and ecological knowledge to ensure methods used are appropriate and results are valid. Part of the discussion also acknowledged that previous compensation agreements benefitted from stakeholder review and feedback.

Big Picture Reactions

After a presentation of relevant background and an overview of the skeleton methodology, the participants were led through a discussion to gather their thoughts on the methodology as a whole and to solicit their feedback and recommendations for improvement generally.

Discussion Structure

Participants were prompted with a few questions about whether the methodology seemed practical, what they thought was missing, what challenges they envisioned, and what they liked about the methodology. This worked to ensure that the draft was not missing any key steps or information. Experts had time to write their individual reactions and answers to the questions below, review all reactions, and identify which resonated with them before discussing as a group. The group generally discussed challenges for the methodology and potential things that might be missing.

- Does this approach provide a generalizable way to analyze and describe socioeconomic impacts of OSW projects in California?
- Are these steps able to capture the key impacts of OSW projects needed to inform compensation agreements?
- What do you think should be added or clarified?
- What challenges do you foresee?

Table 3. Big Picture Reactions to the Skeleton Methodology Discussion

Reaction	Frequency of Concurrence
Complexities and dynamics of fisheries hard to capture and interpret with quantitative data identified	4
The CDFW fishing block data is notoriously terrible. Ecotrust did an evaluation of it for MPA process and found that it is so inaccurate to not be useable	3
Fishing communities (especially fixed gear) have expressed concern around further exclusion from additional transit lanes related to OSW activities	3
Revenue exposure focuses people on money from get-go when understanding spatial dimensions dynamics, and connectedness if key to understanding and addressing individual and collective impacts	3
Marine space use conflict following displacement	3
Loss of markets to shorewide businesses also impact at sea businesses and can often last for decades	2
Considering equity implications of direct one time payments to individual fishers vs. resiliency funds that support current and future fishermen and the community as a whole include future generation of fishers in the compensation model	2
Fishery and place substitution complexities. Fishermen can't hop from one fishery to another	2
Effects of schedule changes in construction, operation, and maintenance	1
Equity and justice (cost and benefit for all)	1
Viability goes beyond money when it comes to people	1
Balancing mitigation with ratepayer effects	1
Habitat changes resulting from construction (boulder relocation)	0

Note: Dots were used by participants to indicate notes that workshop participants thought were important beyond what they had chosen to write. The number of dots were counted, and the value was placed in the right column as the frequency of concurrence.

Discussion Summary

The discussion about the overall methodology ranged from defining what a "fishery" is and who it includes to ensuring that both quantitative and qualitative data are considered as part of the methodology. Initial reactions were positive in that the methodology, as presented, should be replicable across projects in terms of location and time. Some of the specific suggestions can be found in Table 3. Participants discussed the challenge of bringing together quantitative and qualitative data in a cohesive manner that supported calculations while also including community impacts beyond those who own vessels, quota, or shoreside businesses. Additionally, participants discussed uncertainty around some traditionally public datasets (e.g., fishing block location) and how changes to data and tools over time will affect what analyses can be constructed.

There were a few general themes of recommendations that were discussed during this session. One suggestion was to incorporate an adaptive element to the methodology, including potential follow-up studies, and/or monitoring. Several participants noted that including an explicit retrospective element into the methodology would ensure that it could be more easily applied over time.

Another theme was to consider impacts that may occur outside of the lease and cable areas that may not be captured by an impact analysis that focuses on revenue exposure within development areas. Some of those impacts may include congestion within the harbor, changes to species distributions, and higher competition for space on the waterfront (e.g., storage, business, and other opportunities).

Recommendations

Recommendations were summarized after the discussion and presented to participants at the end of the workshop for review and refinement. Participants discussed the recommendations and requested edits and additions. Below are the revised recommendations for the methodology overall:

- Allow for integration of qualitative and quantitative data.
    - Describe perceived impacts of concern identified by stakeholders (e.g., Emery et al. 2020).
- Outline an iterative process for identifying and evaluating social and economic impacts of the OSW project.
    - Work with state agencies to identify impacts, methods, information, and tools.
    - Provide opportunities for stakeholders to review and provide feedback on impact analyses.
- Clarify terms. The term fisheries should be clarified as one that reflects three interwoven components: the fish (resources and habitat), the people (individuals and businesses), and the place (communities, including those of place and of interest).
- Recognize impacts outside of the lease and construction areas (e.g., port congestion impacts, species distributional shifts, impacts on transit pathways, etc.)
- Ensure the methodology can consider the past, present, and future, incorporating reflection and validation.

Other Reactions, Thoughts, and Questions

Other parts of the discussion that were not part of the final set of recommendations from this discussion are summarized below as other reactions, thoughts, and questions.

- Does the methodology include aquaculture or mariculture under the scope and definition of 'fisheries'?
- It is difficult to create a process that is generalizable and can be applied to specific scenarios with imperfect data.
- It would be good to acknowledge the trade-offs and lessons learned of how various compensation vehicles affect outcomes for individuals and communities (e.g., one-time individual payments versus community-focused funds).
- Other situations may have important lessons learned for the methodology, such as disasters (including fisheries but other disasters too), area closures, COVID-19 pandemic, tariffs, etc.
- Equity in the ultimate compensation agreements should be a criterion.

Income Impacts and Data Considerations

A key part of the methodology is the evaluation of potential income impacts (Step 3); however, it is also one of the most complicated due to data limitations and uncertainty about floating OSW impacts on the ability for fishermen to fish in and around the OSW development areas. Because of this, a specific session at the workshop was held to ask participants for their recommendations to ensure this step of the methodology is as robust as possible.

Discussion Structure

Experts were asked to provide insight into potential analyses, data sets, and activities that could be used and considered as part of the assessment. Participants were asked to respond to a specific set of questions and they discussed important considerations for the income impact analyses, including the scale and scope of impacts, changes in data over time, the need for conservative assumptions under uncertainty, and consideration of indirect effects.

The session on Income Impacts and Data Considerations aimed to gather information from participants with regards to how they had or had not seen income impacts calculated previously from other OSW projects. The discussion started with the questions below:

- What additional information can be used to inform revenue exposure analyses to account for future management changes or distributional impacts?
- What recommendations do you have for the area/duration of impacts for floating offshore wind given uncertainty?
- What are the best sources of information/approach for estimating revenue exposure for data-limited fisheries?
- What is the best way to estimate impacts on shoreside businesses? If available multipliers (Specifically, Lovell 2020 and NOAA Fisheries FEUS) are used, what guidance should be provided for their interpretation?

Discussion Summary

The discussion and resulting recommendations focused initially on data availability, particularly for long-term monitoring projects and the implications for the analysis of changes in these datasets, as well as other potential examples of impact analyses. Participants shared some specific suggestions for considerations in Table 4. Some of the initial suggestions for other methods/approaches to examine income impacts methods included the whale entanglements with crab traps and the associated impacts, impacts from harmful algal blooms and the Dungeness crab fishery, groundfish closures, and impacts from marine protected areas. These types of projects occurred in California and had restrictions on fishing in both timing and/or space due to certain management decisions,

which would be similar to certain phases of OSW projects. One participant also suggested examining methods used to examine impacts of other shocks, like the COVID-19 pandemic and tariffs.

Additionally, due to the nature of floating OSW compared to fixed bottom OSW, the impacts of projects in California will likely be different when compared to those in the Atlantic, which are the primary source of previous projects in the United States. Participants discussed how conservative assumptions are likely necessary given major sources of uncertainty about displacement from OSW development areas for floating OSW.

The discussion included other concerns about capturing all impacts to income, including shoreside businesses and ecological changes that may also affect fishing opportunities. Participants described the challenges of compensating crew for impacts due to more limited data about crew and their participation and earnings. There was also acknowledgement that additional OSW development factors other than displacement can affect fishing income, such as oceanographic changes and changes to species distribution and habitat.

Table 4. Considerations for the Methodology Income Impacts Discussion

Data or information sources to adjust revenue exposure for management or distributional changes?	Recommendation for the area or duration of impacts for floating OSW?	Other information sources for estimating revenue exposure for data-limited stock in CA?	How to best estimate impacts on shoreside businesses?
Fisherman & fishery support business including port manager	The level and duration of impacts will be dependent. Some fisheries may be able to adapt to utilize the developed area and some probably won't	Data-limited "fisheries" (stocks & people & activities)	Start with conversations with fishing community to identify impacts and then
Maybe look at other fisheries closures and processes like CA crab for whale entanglements	Including ports/estuaries in area of impacts	Account for existing space uses and coordination (e.g. crabber-towboat agreement)	How far along the impact chain should shoreside services be eligible for compensation in fisheries management
Note that fishery data originate with CDFW (from fishermen & 1st receivers/buyers). Engage CDFW staff as well as fishing community members)	Considerations for duration: potential biological spillover effects could occur slowly. Aggregation effects quickly.		Could possibly look at impacts of COVID and tariffs (some data is being pulled together on this)
Future changes/improvements in fisheries data collection (e.g. D. Crab electronic logbook program starting in 2024)	Climate change may exacerbate/lessen specific fishing-related impacts over time		Look at what happened with markets with the groundfish closures (lasting market changes, consolidation of the fleet, etc.)
Recent work by NMFS (Kelly Andrews) to model future changes in fish stock distribution in response to climate change in the lease areas	The duration of impacts can be informed by fisheries monitoring post construction. Maybe the methodology could allow for flexibility in the duration of impact based on monitoring		Note that NMFS community vulnerability indicators are not commensurate w fishing community

Recommendations

Draft recommendations for Step 3 (direct income impacts analysis) were summarized after the discussion and presented to participants at the end of the workshop for review and refinement. Participants discussed the recommendations and requested edits and additions. Below are the revised recommendations as part of the income impacts session:

- Consider conservative assumptions about area and duration of impacts if there is uncertainty about impacts concerning floating offshore wind.
    - Specifically, it may be warranted to assume complete displacement of fishing operations during construction and/or operations from the OSW development areas (including any buffers).
- Plan for long-term changes in data availability.
    - Data requirements are constantly changing across fisheries, and tools that are available now may not exist or may look different in the future. In addition, new information, data, and/or tools may become available.
- Include impacts on ports and estuaries.
    - Estuarine fishery activities may be disrupted.
    - Port congestion may displace homeported vessels, and vessels who use ports during storms or periodically throughout the year and thereby impact fishery support businesses and the seafood supply system.
- Consider making the methodology adaptive to allow for revising or updating impacts based on post-construction monitoring.
- Consider looking at whale entanglement, Dungeness crab closures, MPAs, the fisheries disaster relief program, as additional methodological examples of social and socioeconomic impact assessments.
- Consider potential indirect economic impacts deriving from any ecological impacts of OSW.
    - If OSW affects fisheries, habitats, listed species, oceanographic conditions, or processes, how will that affect regional fisheries overall?

Other Reactions, Thoughts, and Questions

- The whole is greater than the sum of parts. Sum of income impacts is not equal to community impacts. Impacts are felt throughout the community and not just by the person who owns the vessel, quota, etc.
- Fishing block information on fish tickets is an unreliable indicator of where fishing effort occurred, but it can be groundtruthed and supplemented by knowledgeable fishery participants.

- Unit of analysis (vessel owner) may be important for compensation considerations. How to ensure other affected groups are not left out (e.g., crew)?
- If and how to include potential beneficial impacts of OSW in the analysis?
- Analyses should be inclusive with results reported in ways that are consistent with confidentiality rules.

Dependence & Vulnerability and Supplementary Analysis

The last session of the workshop focused on Steps 4 and 5 of the skeleton methodology and focused on other possible social and community impact analyses and other supplementary analyses that may qualitatively inform compensation agreements (i.e., do not produce quantitative estimates of impacts). The skeleton methodology includes indicators of dependence and vulnerability, specifically citing Community Social Vulnerability Index (CSVI) indicators developed by researchers at NOAA Fisheries (Jepson and Colburn 2013) that may help identify which fisheries and fishing communities may be most dependent and/or vulnerable on OSW development areas, which may be helpful information for the development of community resilience funds. For supplemental analyses, the skeleton methodology suggests a vessel traffic and re-routing analysis be included which may help identify potential congestion or fuel cost impacts.

Discussion Structure

The discussion was framed with the following questions about additional methods and indicators that could be considered by the methodology:

- What important impacts are not covered by analyses/indicators so far?
- Other information to use other than NMFS/federal-level indicators?
- Is there any way to connect analyses to determine amounts for compensation?
- Are there any issues or challenges you see with the recommended analyses?

Discussion Summary

During this discussion, participants generally re-iterated similar concerns as raised in previous discussions. Workshop participants also discussed some of the common dependence and vulnerability indicators and associated tradeoffs. Participants made thoughtful suggestions to broaden and deepen analyses to better account for community impacts and posed questions about how the analysis may support the development of community-focused compensation agreements. One participant discussed how the suggested indicators for this analysis (Jepson and Colburn 2013) rely on information from the US census bureau in a given community and therefore these indicators cannot specifically evaluate the vulnerability specific to members of the community who directly

compose the fishing community. There was a short discussion on how to define a fishing community as a result. However, recommendations were not made for alternate indicators or specific information sources to be used instead.

Participants also discussed how the design of compensation agreements themselves impact the effectiveness of compensation, particularly for community impacts (Table 5). Workshop participants discussed pitfalls from previous agreements to account for broader community impacts and provide effective compensation. Participants discussed how many compensation agreements, inside and outside of fisheries, have prioritized individual compensation over community compensation. The choice to compensate an individual versus a community, intended or not, may not correctly compensate those who worked for those individuals and the importance of accounting for that in compensation calculations. Some of the other considerations for compensation were navigation training for vessel captains and search and rescue training to understand impacts from the OSW project on operations, impacts on infrastructure such as utilities, and cumulative impacts on the community for the length of the project or additional projects.

Table 5. Qualitative and Supplemental Analyses Discussion

Suggestions for additional impacts/analysis?	Suggestions for additional information for analysis to use?	How to use analysis to determine compensation?	Challenges or issues with proposed approaches
Ecological impacts to fisheries/marine mammals and how those lead to impacts to fisheries	NMFS eng & deo measures use "permits" as metric for participants. Need to account for fishermen *licenses* (to fish in general) and permits (for selected fisheries) and vessel (owner) permits (again, for selected fisheries), etc.	Weigh direct compensation of individuals against providing support for community as a whole and future generations	Account for dockside sales?
There was a recent study at the MMI of OSU looking at the impact of OSW and whale entanglement	Highly recommend you look at the socioeconomic section of this report	Don't fall into the hole of just highliners or just boat owners	How to deal with unanticipated impacts (will compensation be constrained by a scope?)
Link fishery impacts to fishing communities (interest, place; at sea, shoreside) port communities, associated coastal communities	Grey and ref'd lit on CA fisheries, fishing communities, etc.		Cumulative impacts noted in doc; important to fully define and account for – e.g. multiple leases, other sources of changes in access, activity, over time and space
Impacts on transiting and loss of waterfront space will be important	There is a lot of published material about social or community vulnerability related to coastal communities		Different impacts for mobile and fixed fishing gears
	Maybe consider looking to NOAA's Voices from the Fisheries database and search for spatial conflicts		How to consider predicted/computed impacts (e.g. expected revenue exposure) vs. observed impacts once implemented

Recommendations

The recommendations for Steps 4 and 5 of the methodology (Vulnerability and Dependence and Supplemental Analyses) were summarized after the discussion and presented to participants at the end of the workshop for review and refinement. Participants discussed the recommendations and requested edits and additions. Below are the final recommendations as part of the dependence and vulnerability and supplemental analyses session:

- Link fishery impacts to fishing communities (interest, place; at sea, shoreside), port communities, and associated coastal communities.
- Consider impacts to fishery participants and communities not at/adjacent to project areas that also "use" or support "use" of those areas—e.g., Trinidad (and other ports, e.g., San Francisco to Crescent City, as well as Eureka).
- Consider how analysis can direct compensation for fishing communities (as opposed to direct compensation for individual harvesters or businesses)
- Consider adding cumulative impacts analysis to address how other projects and reasonably foreseeable actions may affect outcomes.

Other Reactions, Thoughts, and Questions

- Any impact analysis may be limited in its ability to prospectively assess impacts over the long term. How can a methodology or compensation framework be adaptive as possible to adjust over time to the type of impacts and who may incur impacts?
- Consider that longer-term compensation for a community may differ in the first few years compared to 20 or more years in the future. Goals for end compensatory agreements may need to evolve over time.
- Suggest making funds available for specific purposes that were identified by the community.
- NMFS social community vulnerability indicators rely on US Census Bureau data and information at the community level, which is not the same as data at the fishing community level.

Conclusions

Overall, workshop participants provided a wealth of information and feedback for consideration in the methodology, but recommendations for improvement consisted of relatively minor adjustments to individual steps, as opposed to large structural changes to the methodology overall. The biggest recommended changes were to consider adding an evaluation of cumulative impacts to the 'other supplementary analysis' section and to describe the process in which the methodology will be applied (How will stakeholders be allowed to review and how will past impact evaluations be reviewed and validated?)

In addition, throughout the workshop, there were several common themes across participants' recommendations and feedback. The first theme surrounded the challenges with limited data and uncertainty of impacts and the desire of workshop participants to ensure that the methodology could be both iterative and adaptive. This was emphasized in the recommendation to allow for iterative development of analyses with experts and stakeholders, the recommendation to validate analyses (retrospective evaluation of impact analyses), and to plan for long-term changes in data availability.

Another key theme was the scope of the impact assessment and the definition of fisheries being used in the methodology. Participants were concerned about how the methodology captured both at-sea and shoreside impacts that occur outside of the construction areas (lease and cable corridor) as well as indirect effects of ecological changes on fishery activities. Participants were furthermore concerned that impacts on mariculture or aquaculture operations in estuaries and bays would not be considered nor would disruptions in and around port areas due to congestion and competition in port. This discussion highlights broader needs for a definition of the scope and scale of impacts considered by the methodology for where impacts occur, consideration of ecological impacts, and impacts to aquaculture activities.

A third theme centered on elevating and refining social impact analyses considered by the methodology. Participants recommended allowing for the integration of qualitative data into the methodology, noting that the current framework was very focused on quantitative data. Participants also thought the definition of fishing community should span communities of interest, as well as at-sea and shoreside and that impacts to communities not adjacent to the development areas should also be considered.

Lastly, participants consistently discussed how the methodology should ideally set up compensation for the community as well as impacted individuals. For participants, this was reflected in the sentiment that the whole is greater than the sum of its parts. Participants expressed concern that if the analysis focuses on summing individual impacts to determine total impacts, important community impacts may be missed. Furthermore, participants feared that an individual-focused methodology would also lend itself to a compensation framework that favored individuals at the expense of communities. Overall, participants recognized the challenges of developing this methodology and were thoughtful about suggesting additions to make it more thorough.

Additional Resources

Below are sources of information shared by participants at the workshop as resources for the methodology to consider.

Hogan, F., B. Hooker, B. Jensen, L. Johnston, A. Lipsky, E. Methratta, A. Silva & A. Hawkins. 2023. Fisheries and Offshore Wind Interactions: Synthesis of Science. *NOAA Technical Memorandum* Northeast Fisheries Science Center. NOAA NMFS. *https://repository.library.noaa.gov/view/noaa/49151*

Industrial Economics Inc. 2012. Identification of Outer Continental Shelf Renewable Energy Space-Use Conflicts and Analysis of Potential Mitigation Measures. 414 pp. Herndon, VA: U.S. Department of the Interior, Bureau of Ocean Energy Management. *https://espis.boem.gov/final%20reports/5203.pdf*

Socioeconomics of offshore wind website: *https://www.fisheries.noaa.gov/resource/data/socioeconomic-impacts-atlantic-offshore-wind-development*

BOEM's site for funded research on offshore wind: *https://www.boem.gov/environment/environmental-studies/renewable-energy-research*

BOEM-funded larval hydrodynamics studies:

- *https://espis.boem.gov/final%20reports/BOEM_2021-049.pdf*
- DHI Report: *https://espis.boem.gov/final%20reports/BOEM_2025-015.pdf*
- Technical Summary: *https://espis.boem.gov/technical%20summaries/BOEM_2025-015.pdf*
- RPS Report: *https://espis.boem.gov/final%20reports/BOEM_2025-016.pdf*
- Appendices: *https://espis.boem.gov/final%20reports/BOEM_2025-016A.pdf*
- Technical Summary: *https://espis.boem.gov/technical%20summaries/BOEM_2025-016.pdf*

California Joint Fisheries Liaison Office (JOFLO): *https://caseagrant.ucsd.edu/news/sharing-sea*

Emery, C., Richmond, L., Casali, L., Severy, M. and Jacobson, A. (2020). Stakeholder Benefits and Concerns. In M. Severy, Z. Alva, G. Chapman, M. Cheli, T. Garcia, C. Ortega, N. Salas, A. Younes, J. Zoellick, & A. Jacobson (Eds.) California North Coast Offshore Wind Studies. Humboldt, CA: Schatz Energy Research Center. schatzcenter.org/pubs/2020-OSW-R21.pdf.

Pomeroy, Carrie, Debbie Aseltine-Neilson, Nicole Georgilas, and Ryan Bartling. "Socioeconomic Guidance for Implementing the California Marine Life Management Act." (2018).

“Cumulative Effects.” NEPA | National Environmental Policy Act - Cumulative Effects. Accessed May 15, 2025. https://ceq.doe.gov/publications/cumulative_effects.html.

Pomeroy, C. & C. McCaw. 2025. Fishing Community Resilience, Social Cohesion and Offshore Wind Energy Development in California. White Paper prepared under contract to the Alliance of Communities for Sustainable Fisheries. 25 p. Santa Cruz, CA: University of California, Santa Cruz.

Clay, P. & L. Colburn. 2020. A Practitioner's Handbook for Fisheries Social Impact Assessment. In *NOAA Technical Memorandum*, 89 p.: U.S. Department of Commerce; National Oceanic and Atmospheric Administration; National Marine Fisheries Service.

Appendices

Appendix 1: Workshop Agenda

8:00 am—Welcome, Introductions

- Plan for the day
- Introductions
- Icebreaker

8:15 am—Project Background/Orientation

- Overview of SB 286
- Background of CA OSW and Fisheries WG
- Northern Economics' Scope of work
- Project objectives and constraints

8:30 am—Workshop Goals and Objectives

8:35 am—Presentation: Foundations of the Methodology and Overview

- Brief review of foundational documents from literature review and interviews
- Overview of high-level methodology steps
- Q&A

9:00 am—Discussion Part 1: Big Picture Reactions

9:30 am—Discussion Part 2: Step 3- Income Analysis and Data Considerations

10:30 am—Break

10:45—Discussion Part 3: Steps 4 & 5- Qualitative and Supplementary Analysis

11:45 am—Synthesis & Recommendations

12:30 pm—Next Steps and Closeout

12:45 pm—END

Appendix 2: Draft Socioeconomic Impact Skeleton Methodology

Below is a high-level outline of what is currently envisioned to be the core components of the eventual socioeconomic impact methodology—referred to as the 'skeleton methodology'.

Once these high-level steps have been reviewed and refined, the eventual methodology will flesh each step and sub-step out with more information, resources, caveats, and other information needed for eventual users to apply the methodology to evaluate unavoidable impacts of offshore wind development on fisheries.

Please refer to the *Literature Review* and *Interview Summary* documents for more information on key concepts and resources (**blue bold text**), if needed.

Outline

1. Survey Available Data and Tools
2. Summarize Project, Affected Fisheries, and Communities
    a. Describe project, determine areas and duration of impacts, including any buffers, by fishery or gear type
        i. Lease area
        ii. Cable corridor
        iii. Onshore locations
    b. Using available information, summarize affected fisheries and fishing communities
        i. Commercial participation, effort, and landings trends
        ii. For-hire effort, targeted species
    c. Describe management context, recent trends
3. Estimate Direct Income Impacts (commercial and recreational)
    a. Select tools and data for use
        i. If methods to predict income impacts are not available, use **revenue exposure**[1]

[1] Quantitative impacts of OSW on fisheries have previously primarily been based on calculations of revenue generated in the areas that may be affected or "exposed" to OSW activity. Chaji and Werner (2023) examines the various methods of calculating revenue exposure and its limitations.

ii. If using revenue exposure, potential data sources and tools

1. NOAA Fisheries **PacFEM**[2]**—**available for most commercial fisheries
2. Logbook data—for fisheries that are not available on PacFEM and have logbook data
3. Fish Tickets—landings and revenue, **fishing block location**[3]
4. **Community fishery mapping projects**[4]
5. Revenue estimates per trip for hire trips and **shoreside multipliers**[5] for for-hire fisheries: **Lovell et al. 2020**[6]
6. Commercial fishery shoreside multipliers for California—**NMFS FEUS**[7] **(Seafood Industry Impacts Tool)**[8]**, IOPAC**[9]**, or IMPLAN**[10]

b. Make adjustments to allow for revenue exposure calculations

i. Data-limited fisheries (estimate revenue exposure using best information available)

ii. Adjust for inflation, convert to common base year

[2] Pacific Fishing Effort Mapping Project. PacFEM incorporates institutional knowledge and expertise from state departments of fish and wildlife, NMFS, PSMFC, and the Pacific Fishery Management Council.

[3] In California, a fishing block is a 10 square nautical mile location that is reported as the fishing location on fish tickets for landings in commercial fisheries and in the monthly logbooks in for-hire fisheries.

[4] Two specific community mapping projects and their data products exit through the California Offshore Wind Energy Gateway (*https://caoffshorewind.databasin.org/datasets/7ea9f5e0e5c149ef9c5286b39c4753d2/*): the Northern CA Commercial Fishermen's Associations Community-Mapped Fishing Grounds (*https://storymaps.arcgis.com/stories/ec90562aada545acb6bb1bf6f3c8f228*) and Central Coast Fisheries Heritage Mapping Project (*https://caoffshorewind.databasin.org/datasets/7ea9f5e0e5c149ef9c5286b39c4753d2/*).

[5] Multipliers can be developed for shoreside impacts using NMFS' Fisheries Economics of the US report for commercial fisheries and Lovell et al. 2020 for for-hire fisheries.

[6] Lovell, S.J., Hilger, J., Rollins, E., Olsen, N.A. and Steinback, S., 2020. *The Economic Contribution of Marine Angler Expenditures on Fishing Trips in the United States, 2017*. National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Silver Spring, MD. *https://spo.nmfs.noaa.gov/sites/default/files/TM201.pdf*

[7] All of the past Fisheries Economics of the United State Reports can be found at: *https://www.fisheries.noaa.gov/national/sustainable-fisheries/fisheries-economics-united-states*

[8] Fisheries economics data and visualizations can be found at: *https://www.fisheries.noaa.gov/data-tools/fisheries-economics-united-states-data-and-visualizations*

[9]The Input-Output Model for Pacific Coast Fisheries (IOPAC) model was developed specifically for West Coast fisheries and a full description of the model can be found at *https://www.fisheries.noaa.gov/data-tools/fisheries-economics-united-states-data-and-visualizations*.

[10] IMPLAN (IMpact analysis for PLANning) is an input-output model that is used by NMFS to better understand regional economic impacts of potential management decisions.

c. Apply multipliers to estimate shoreside impacts

i. Commercial

ii. For-Hire

d. Develop baseline estimate

e. Consider accounting for future trends including management and climate change

f. Estimate total at-sea and shoreside impacts over lifetime of project

4. Assess Dependence and Vulnerability

a. Dependence of individual fisheries on OSW area (percent of landings, revenue, trips)

b. Dependence of individual fishing communities on OSW area

i. Total and by species/fishery and community

c. Vulnerability of affected fishing communities

i. Community Social Vulnerability Index[11]

5. Other Supplemental Analysis

a. If using revenue exposure—**Vessel traffic and re-routing analysis**[12]

Appendix 3: Workshop Goals and Key Questions

Project Objective

Produce a socioeconomic impact methodology which will enable **consistent**, **thorough**, and **objective** evaluations of offshore wind (OSW) impacts on fisheries to **guide compensatory agreements** in California (see Northern Economics' *Scope of Work* for more information). The methodology will be used to inform guidance and determinations for compensatory mitigation resulting from unavoidable OSW impacts in California. Specifically, the methodology will describe steps and approaches that can be used to inform the development of direct compensation and

[11] Described in Jepson and Coburn 2013 and expanded for offshore wind projects on the west coast by Pfeiffer et al. 2024. (Jepson, M., and L.L. Colburn. 2013. *Development of Social Indicators of Fishing Community Vulnerability and Resilience in the U.S. Southeast and Northeast Regions*. U.S. Dept. of Commerce, NOAA Tech. Memo. NMFS-F/SPO-129, 64 p. *https://spo.nmfs.noaa.gov/sites/default/files/TM129.pdf* and Pfeiffer, L., Alkire, C., and Ise, J.L. 2024. *Socioeconomic Characterization of West Coast Fisheries in Relation to Offshore Wind Energy Development*. BOEM 2024-054. August 2024.)

[12] Impacts on vessel traffic and routing are anticipated with OSW development activities, called re-routing analysis. This analysis has typically been done using Automatic Identification System (AIS) data to evaluate the number and patterns of vessel traffic in the area.

resiliency funds, considering possible data and information limitations and project-specific considerations. The methodology is anticipated to be generalizable and flexible to apply to various OSW projects across the state but detailed enough to allow for east of use and consistent application.

Skeleton Methodology

The 'skeleton methodology' is a high-level outline of the major steps and components of the socioeconomic impact methodology as it is currently envisioned. It is informed by current practices on the US East Coast, similar methodologies including BOEM's draft fisheries mitigation guidance, and adapted to the data and methods specific to California fisheries and with consideration of knowledge gaps and sources of uncertainty with respect to floating offshore wind technology. In addition, information gathered in interviews has also informed the skeleton methodology (see the *Literature Review* and *Interview Summary* for more information).

Workshop Goal

Review and suggest modifications to the skeleton methodology to ensure the final methodology is:

- Thorough
- Objective
- Able to guide compensatory agreements
- Able to be used consistently

Workshop Objectives

- Review the skeleton methodology: identify strengths, gaps, suggest improvements
- Identify additional analyses, resources, or indicators that may be utilized or referenced
- Document expert recommendations for improvements to the methodology to ensure it meets its goals

Key Issues and Questions for Discussion

- Does this approach provide a generalizable way to analyze and describe impacts of any potential OSW projects in California into the future?
- Are these steps able to capture the key impacts of OSW projects that directly connect to and inform compensation agreements (design, negotiated amounts)?
- What (if anything) is missing from the methodology?
- What additional information can be used to inform revenue exposure analyses to account for future management changes or distributional impacts?

- What advice or challenges exist for using revenue exposure as basis for compensation agreements?
- What are the best sources of information/approach for estimating revenue exposure for data-limited fisheries?
- What is the best approach to estimate impacts on shoreside businesses? If available multipliers (Specifically, Lovell et al. 2020 and NOAA Fisheries FEUS) are used, what guidance should be provided for their interpretation?
- What supplementary or qualitative analysis should be provided to inform negotiations? Are there any changes or additions to suggested approaches?

Appendix C: Agreement Templates for the Statewide Strategy

Senate Bill 286 (SB 286) calls for the Statewide Strategy to include "a template for a fishing agreement that includes all relevant elements of the statewide strategy." The Commission determined that multiple agreements, rather than a single agreement, are likely to be required to implement the framework for compensatory mitigation. Accordingly, rather than providing a single template, this appendix provides three templates in outline form. All relevant elements of the Statewide Strategy will be memorialized and enforceable through the Commission's consistency certification review and CDP (see Chapter 1 for more detail on regulatory authorities).

These three templates, in outline form, are intended to guide the content and structure of agreements as they are developed. They do not include detailed provisions, as those will need to be tailored to individual offshore wind projects. Individual agreements may modify these templates, but specific elements should be incorporated into those agreements to ensure that they achieve their intended purpose. The strategy does not preclude other forms of cooperation between developers and the fishing community.

The three templates in this appendix are presented in chronological order (Figure B.1).

- **Fisheries compensation agreement:** The first template would be used to inform an agreement between the developer and the Commission on mutually agreed compensatory mitigation. It will incorporate relevant findings from the consistency certification review and outline the foundational elements of a compensatory mitigation commitment. The Statewide Strategy includes guidance on design principles for compensatory mitigation (Chapter 6), which should be referenced when drafting this agreement.
- **Resiliency fund agreement:** The second template would inform the agreement between the Commission and the Resiliency Administrative Entity (RAE) once the RAE is selected. It would build upon a consistency certification to define the rules for administering the Resiliency Fund Program.
- **Regional resiliency committee charter:** The third template is a charter that would inform the relationship between the RAE and the Regional Resiliency Committee (RRC). The RRC charter would also set forth the committee's operating procedures and the process for selecting projects to receive resiliency funds. The charter would reflect both the framework established in the consistency certification and the administrative rules defined in the Resiliency Fund Agreement.

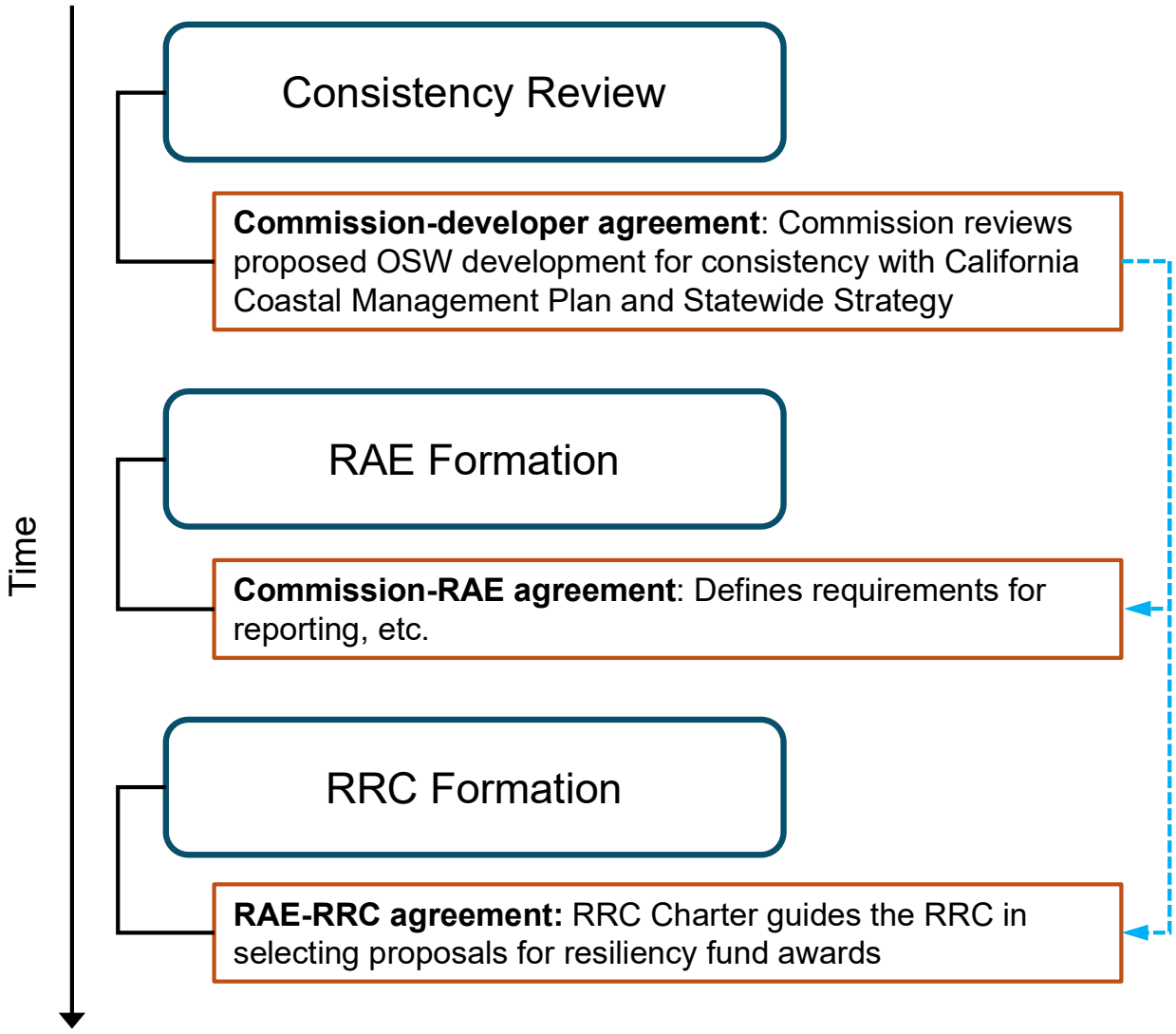

Figure B.2 Agreements that Support Implementing the Statewide Strategy. The three templates in this appendix would be developed in chronological order and are coincident with stages of the implementation of compensatory mitigation programs, as shown in the figure. The agreement between the Commission and developer will stem from the consistency review, the selection of an RAE will initiate an agreement between the Commission and the RAE, and the formation of the RRC will initiate a charter. The dotted blue arrows show how the information from previous stages will feed into subsequent agreements.

Acronyms OSW = offshore wind; RRC = Regional Resiliency Committee; RAE = Regional Administrative Entity.

FISHERIES COMPENSATION AGREEMENT

The fisheries compensation agreement would be between the developer and the Commission. Elements of the Statewide Strategy that are relevant to an offshore wind energy project will primarily be memorialized through federal consistency review. The Commission and the developer may additionally enter into an agreement that reflects the commitments related to compensatory mitigation and other relevant aspects of the Statewide Strategy. The agreement template outlined below lays out potential elements of the Statewide Strategy related to compensatory mitigation that could be included in such an agreement:

1. Purpose and Background
    a. Establish mutual understanding and commitments
    b. Memorialize mitigation commitments, conditions, and funding contributions in relation to fisheries and fishing as a coastal resource under the California Coastal Act and other applicable laws
2. Compensatory mitigation program framework
    a. Direct Compensation
        i. Funding Contributions
            1. amount, payment schedule, and funding triggers (e.g., construction start)
        ii. Funding Terms
            1. Use restrictions, interest accrual
        iii. Implementation terms
            1. Eligibility requirements
            2. Program design consultation
            3. Fiscal review
            4. Reporting
    b. Resiliency Funds
        i. Funding Contributions
            1. Amount, timing, and structure (e.g., lump sum or annual payments)
        ii. Funding Terms
            1. Use restrictions, interest accrual
        iii. Implementation terms
            1. Developer obligations in participation

        a. Review and comment on nominations for the Resiliency Administrative Entity (RAE)
        b. Ex officio seat on Regional Resiliency Committee (RRC)
        c. Review and comment on program design and RRC Charter
        d. Review and feedback to Executive Director on RRC nominations
        e. Participation in program reviews
    2. Opportunity for the RAE, the developer, and government agencies such as CDFW and NMFS to review nominations, provide feedback, or make recommendations to the Executive Director on the composition of the RRC.
    3. Fiscal review
    4. Reporting
3. Indemnification
4. Term and Termination
5. Successor Obligations
6. Integration
7. Severability
8. General Provisions
    a. Amendments
    b. Dispute resolution
    c. Governing law
    d. Signatures; Authority

RESILIENCY FUND AGREEMENT

The resiliency fund agreement would be between Commission and the Resiliency Administrative Entity (RAE), once the RAE is selected. Following the consistency review process but prior to construction of an offshore wind energy project there will be a public and transparent solicitation and selection of a Resiliency Administrative Entity (RAE). The RAE will facilitate the implementation of the resiliency fund program (see Chapter 6 for further explanation on the Resiliency Fund Program). The rules for administering the resiliency fund program will be memorialized in an agreement between the RAE and Coastal Commission. Developers contributing funds to the resiliency fund program may also enter into an agreement with the RAE specific to the management of the resiliency funds for a particular offshore wind project.

The agreement between the RAE and Coastal Commission is expected to include:

1. Parties to the Agreement
    a. Coastal Commission
    b. Resiliency Fund Administrative Entity
2. Recitals
3. Purpose
    a. Administration of resiliency funds
    b. Reference to regulatory context that triggered the funds
4. Definitions
5. Resiliency Program Generally
    a. Geographic region
    b. Composition of Regional Resiliency Committee (RRC)
        i. Number of representatives
        ii. Sectors/locations/gear types that need representation
        iii. Selection process including nomination and appointment procedures
        iv. Term lengths and limits
    c. Funding Schedule
    d. Operations funding
        i. Administrative overhead
        ii. Project overhead
        iii. Venue-meetings spaces must be easily accessible to RRC
    e. Eligible and Ineligible Uses

f. Performance Standards
    i. Key performance indicators
    ii. Compliance requirements

6. Resiliency Administrative Entity (RAE) obligations
    a. Fiscal responsibility
        i. Fund management
        ii. Fiscal agents
        iii. Fiscal review
        iv. Fund Distribution
    b. Administrative
        i. Secretarial duties
        ii. Facilitating community engagement
        iii. Ex officio membership on RRC
    c. Facilitating nominations for Regional Resiliency Committee (RRC)
        i. Criteria for membership
        ii. Roles of CCC and RAE in selection
        iii. Roles of CDFW, NMFS, and Developers
        iv. Timelines
        v. Term lengths and limits
    d. Draft RRC Charter
    e. Reporting and transparency
        i. Reporting Requirements
        ii. Annual reports
        iii. Financial audits
        iv. Impact assessments
        v. Maintain public records and respond to information requests
    f. Project oversight
        i. Monitor and evaluate projects for consistency with resiliency fund program design
    g. Maintenance of legal existence; good standing
7. Coastal Commission obligations
    a. Review and concurrence of Regional Resiliency Committee members
    b. Oversight, monitoring, and auditing

        i. Oversight
        ii. Corrective actions
8. Additional Terms
    a. Confidentiality
9. Legal and risk provisions
    a. Indemnification
    b. Insurance requirements
    c. Dispute resolution
    d. Conflict of Interest
    e. Force majeure-how to handle unforeseen events
    f. Governing law and venue
    g. Attorney Fees
    h. Notice
    i. Severability; waivers
10. Term; Termination
    a. Effective date and duration
    b. Termination clause
11. Modification
    a. Procedures
    b. Requirement for mutual written consent
12. Signatures

REGIONAL RESILIENCY COMMITTEE CHARTER

The Regional Resiliency Committee (RRC) Charter would detail the relationship between the RAE and the Regional Resiliency Committee (RRC). As described in Chapter 6 of the Statewide Strategy, the RAE will receive resiliency funds, establish accounts, and disburse funds as stipulated in its agreement with the Coastal Commission and as directed by the RRC. A charter will be necessary to govern the activities and decision-making processes of the Regional Resiliency Committee. Below is an outline of what the Charter is expected to include:

1. Purpose and Mission
    a. Statement of Purpose: Define the committee's role in administering funds to support resilient fishing communities.
    b. Mission Statement: e.g., Promote sustainable fisheries, economic stability, and community well-being through strategic use of resiliency funds.
2. Authority and Scope
    a. Legal and Organizational Authority: Describe the source of the committee's authority
    b. Scope
        i. Geographic area
        ii. Types of fisheries
        iii. Communities served
3. Committee Structure
    a. Membership Composition
        i. Number of members
        ii. Representation (consistent with the RAE's agreement with the Commission)
        iii. Term lengths and limits
    b. Roles and Responsibilities (e.g., chairperson, vice chair…etc.)
4. Decision-Making Procedures
    a. Meeting Schedule and Format
        i. Frequency (e.g., monthly, quarterly)
        ii. In-person, virtual, or hybrid
    b. Quorum Requirements
        i. Minimum number of members needed to conduct business
    c. Voting Procedures

        i. Majority or consensus-based
        ii. Conflict of interest disclosures and recusals
5. Fund Management
    a. Fund Allocation Principles
        i. Equity, transparency, sustainability, and community impact
    b. Eligible and Ineligible Uses of Funds:
    c. Application and Review Process
        i. Proposal submission guidelines
        ii. Evaluation criteria
        iii. Approval timelines
6. Transparency and Accountability
    a. Public Engagement
        i. Community input sessions
        ii. Public comment periods
    b. Reporting Requirements
        i. Annual reports
        ii. Financial audits
        iii. Assessment of fund impacts
7. Conflict Resolution
    a. Grievance Procedures
    b. Code of Conduct
        i. Expectations for respectful and ethical behavior
8. Amendments and Review
    a. Charter Review Cycle
        i. Frequency of review (e.g., every 2 years)
    b. Amendment Procedures
        i. How changes to the charter are proposed and approved