BEST PRACTICES FOR EQUITABLE, JUST AND CLIMATE-RESILIENT FISHERIES

Environmental Defense Fund

Best Practices for Equitable, Just and Climate-Resilient Fisheries

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EXECUTIVE SUMMARY

Climate change is driving profound shifts in ocean and coastal ecosystems, and the impacts on U.S. fisheries vary significantly by region and community. Often, underserved fishing communities — those that have been systematically denied a full opportunity to participate in and benefit from aspects of economic, social and civic life — experience and are the least able to withstand severe impacts on their livelihoods, infrastructure and well-being. Under the current U.S. fishery management system, fishery managers have significant influence over how fishermen and communities adapt to the challenges and opportunities posed by climate change. Efforts are underway at the national and regional levels to advance equity and environmental justice (EEJ) and climate resilience within fisheries. However, the intersections of these two priorities require further attention to ensure that policies and practices foster equitable, just and climate-resilient fisheries.

EDF organized a workshop in April 2024 for fishery practitioners (i.e., non-fishermen individuals or organizations engaged in the fishery management process) to explore the intersections between EEJ and climate change impacts on fisheries. The goal of the workshop was to identify best practices for achieving equitable, just and climate-resilient fisheries. The workshop explored key topics including the challenges of meeting community needs amid climate impacts, EEJ-related gaps within existing management processes and the need for improved coordination and communication with historically underserved communities. The following best practices were drafted during the workshop and refined based on review of workshop discussion, context from pre-workshop surveys and feedback collected from post-workshop interviews.

1. **Establish Clear Goals and Metrics**: Define specific goals and metrics to ensure that equity and climate resilience efforts are effective, accountable and transparent.
2. **Enhance Workforce Capabilities**: Provide current personnel with the necessary knowledge, skills and tools to better engage with and support diverse communities as they adapt to climate change.
3. **Redesign Internal Processes**: Adjust internal workflows and, where feasible, strengthen the workforce to prioritize community engagement and relationship-building efforts.
4. **Foster Community Leadership**: Create and support opportunities for community leaders to play an active role in fisheries management and climate resilience efforts.
5. **Value Multiple Forms of Knowledge**: Develop and refine methods to elevate diverse forms of knowledge into decision-making processes to ensure that all relevant perspectives are considered.

These best practices are intended to guide fishery practitioners when developing equitable and just climate-resilient fisheries policies.

1. INTRODUCTION

Climate change impacts, such as rising water temperatures and shifting ocean conditions, increasingly disrupt the intricate balance that supports marine life. This disruption generates ecological, social and economic challenges and opportunities for coastal communities dependent on sustainable fisheries.[1, 2, 3, 4] For example, as species distributions shift, some communities may lose access to their target fisheries, while others may have opportunities to enter a new fishery, pending the availability of new permits.[5] In some instances, the effects of climate change can lead to more frequent severe weather events, which can damage infrastructure and restrict access to fisheries.[6] Importantly, the impacts of climate change on fisheries will not be uniform across regions and communities. In many cases, underserved communities experience and are least able to withstand the worst effects of climate disruption on their livelihoods, infrastructure and well-being.[7] Under the current U.S. fishery management system, fishery managers are in a position of power that influences how fishermen and communities are able to adapt to the challenges and opportunities presented by climate change. How managers respond in these instances will be critical to ensure U.S. fisheries remain sustainable — as well as equitable and just. Box 1 includes definitions of common terms used throughout this report.

BOX 1. Key definitions of terms used in this report.

Key Definitions
Environmental Justice: The fair treatment and meaningful involvement of all people, regardless of race, color, gender, sexual orientation, national origin, tribal affiliation, religion, disability or income during the development, implementation and enforcement of environmental laws, regulations and policies (NOAA Fisheries EEJ National Strategy).
Equity: The consistent and systematic fair, just and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment (NOAA Fisheries EEJ National Strategy).
Fishery Practitioner: Non-fishermen individuals or organizations engaged in fishery management.
Fishing Community: 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 (Magnuson-Stevens Fishery Conservation and Management Act).
Management Process: The stages involved in generating, reviewing, and revising fishery specifications, measures, and regulations by the regional fishery management councils and NOAA fisheries with input from stakeholders.
Resilience (in fisheries systems): The ability to prepare for, resist, cope with, recover from or adapt to a given stressor to ensure the sustainability of marine ecosystems, fishery resources and human benefits (Eurich et al. 2023).
Stakeholder: Fishermen, community members and those whose livelihoods and well-being are affected by fisheries management.
Underserved Communities: Communities that have been systematically denied a full opportunity to participate in and benefit from aspects of economic, social and civic life, which include geographic communities as well as populations sharing a particular characteristic, history or identity (NOAA Fisheries EEJ National Strategy).

There is growing recognition among fishery managers and fishing communities that climate change creates unique challenges for equity and environmental justice (EEJ). Eight regional fishery management councils, consisting of members appointed by the Secretary of Commerce including fishermen, researchers, conservationists and other stakeholders, work to develop fair and equitable science-based fishery management plans and other measures under the oversight of NOAA Fisheries in the face of climate change. NOAA Fisheries, the conduit between climate-informed fisheries science and the management decisions that drive stock status and community well-being, is ultimately responsible for implementing all management measures consistent with federal law. In a May 2022 meeting of the Council Coordination Committee's EEJ subgroup, fishery managers from all eight council regions noted a need to better understand and prepare for the ways that climate change will generate unique obstacles to equitable and just management outcomes and processes. Specifically, they noted the need for heightened awareness of EEJ in the development of adaptive fisheries policies, which will require nuanced understanding and collaboration across disciplines.[8] Policymakers increasingly recognize that integrating social equity considerations in conservation interventions is both a moral imperative and a key condition for making such interventions effective. Conservation and fisheries management initiatives that are developed in partnership with communities, that recognize local leadership, knowledge and needs and that uphold Indigenous rights and tenure have been demonstrated to be more likely to generate buy-in and therefore long-term support, stewardship and sustainability.[9, 10, 11, 12, 13, 14, 15]

There are ongoing efforts to address climate change and EEJ in federal fisheries management. For example, NOAA's Climate, Ecosystems and Fisheries Initiative (CEFI), funded in part by the Inflation Reduction Act, was developed to build the operational ocean modeling and decision support system needed to reduce impacts, increase resilience and help marine resources and resource users adapt to changing ocean conditions.[16] In 2023, NOAA Fisheries published its first Equity and Environmental Justice Strategy to guide the agency as it focuses on serving all communities more equitably and effectively.[17] This Strategy includes three goals: prioritize identification, equitable treatment and meaningful involvement of underserved communities; provide equitable delivery of services; and prioritize EEJ in mission work with demonstrable progress. NOAA plans to achieve these goals by operationalizing regional implementation plans that meet the needs of specific communities.[18] Following publication of the EEJ Strategy, at the request of NOAA, the National Academies of Sciences, Engineering, and Medicine (NASEM) published a 2024 report, "Assessing Equity in the Distribution of Fisheries Management Benefits," that described the challenges for assessing EEJ consequences in fisheries management.[19] NASEM recommended that NOAA Fisheries "develop and implement a contextual, place-based, and participatory approach to identify and value multi-dimensional equity considerations into decision-making processes in ways that balance previous and more recent mandates."[20]

Given the significant range of equity impacts on human communities due to climate change, the intersections between EEJ- and climate-focused management efforts warrant further exploration to ensure U.S. fisheries are equitable, just and resilient. In light of this, Environmental Defense Fund (EDF) convened a two-day, remote workshop in April 2024 titled, "Best Practices for Equitable, Just and Climate-Resilient Fisheries." A working group composed of staff from EDF, Northern Economics, Co-Creative Labs, NOAA's Northeast Fisheries Science Center, NOAA Fisheries Office of Policy, New England Fishery Management Council, and North Pacific Fishery Management Council collaboratively designed the workshop from November 2023 to April 2024 (Box 2). The

workshop brought together 45 fishery practitioners from across the U.S. to self-reflect on and examine opportunities and challenges within the existing management structure and to identify best practices for advancing equitable, just and climate-resilient fisheries. The following objectives were key points of discussion at the workshop:

- Define the intersections of EEJ and climate-resilient fishery initiatives
- Identify the challenges around addressing community needs within ongoing and future climate-related fishery initiatives
- Evaluate existing climate-related management processes to identify EEJ-related gaps and limitations (e.g., socioeconomic data needs) for climate-resilient fisheries management
- Identify how to improve coordination and communication with historically underserved communities during development of future climate-resilient fishery initiatives

Appendix I details additional context on the workshop and development of best practices, including information about pre-workshop surveys, workshop structure and post-workshop interviews.

BOX 2. Workshop planning process to generate and refine best practices.

Scoping calls	Scoping calls were conducted with fishery practitioners to identify potential workshop participants and solicit priority topics for workshop discussion. Over 20 calls were conducted across the eight regional fishery management council regions.
Pre-workshop survey	An eight-question online survey was distributed to over 100 stakeholders in multiple languages to solicit and elevate topics for workshop discussion. Respondents identified key challenges, priorities and examples of how EEJ considerations should be incorporated into climate-resilient fishery policies and initiatives in various communities. The survey was not used to draw conclusions about stakeholder perceptions of climate and equity based on sector, region or other criteria. Anonymous quotes from the survey were provided to workshop participants.
Workshop structure	The workshop was held virtually over two days and included a mix of presentations and group discussions. 1. **Keynote presentations**: Roger Griffis (NOAA Fisheries) – On the Road to Climate Ready Fisheries and Fishing Communities; Danika Kleiber (Pacific Islands Fishery Science Center) – EEJ in U.S. Federal Fisheries 2. **Spark talks and Q&A:** Three 10-minute presentations discussed climate-resilient fisheries initiatives while highlighting challenges and successes associated with bolstering equity and environmental justice. 3. **Breakout discussion:** What are challenges and opportunities when it comes to ensuring climate-resilient fisheries initiatives are equitable and environmentally just? What are the most essential pieces of advice you would offer to other practitioners? 4. **Spark talks and Q&A:** Three 10-minute presentations discussed EEJ within fisheries initiatives that are directly affected by the impacts of climate change. 5. **Breakout discussion:** How can our EEJ efforts account for the challenges and opportunities of climate change? What are the most essential pieces of advice you would offer to other practitioners? 6. **Plenary discussion:** Interactive exercise to develop draft best practices 7. **Breakout exercise:** Workshop participants discussed and addressed trigger questions based on the following topics: (1) applying best practices, (2) identifying support and resources and (3) addressing obstacles to implementing best practices 8. **Plenary discussion:** Finalize draft best practices
Post-workshop interviews	Post-workshop stakeholder interviews were used to validate the best practices developed at the workshop and identify opportunities to refine and clarify the best practices as well as identify potential gaps. Sixteen stakeholder interviews were conducted across 6 regional fishery management council regions.
Refinement of best practices	The draft best practices developed at the workshop were further refined based on workshop notes, post-workshop interviews and literature. The refinement process included edits to highlight the key aspects of each best practice, identification of tactics to support implementation, suggestions on when and where to implement the tactics and identification of available examples and resources.

As the impacts of climate change increasingly threaten marine ecosystems and the livelihoods of people who depend on them, it is crucial for managers to prioritize climate-resilient fishery initiatives.[21] Ensuring these strategies are effective, however, requires more than just technical and scientific solutions; they must also be rooted in principles of equity and environmental justice and consider the needs of underserved communities. Policies that are fair and just can significantly influence stakeholder buy-in and consequently the success of climate adaptation efforts. The following best practices are intended to inform how fishery practitioners gather and incorporate EEJ considerations into fishery policies and initiatives in support of a more equitable, just and climate-resilient fishery management system — one that addresses environmental challenges of climate change, ensures that the benefits and costs are shared more broadly and supports a healthy marine environment and economy.

2. BEST PRACTICES

The five best practices presented below were developed during EDF's two-day, remote workshop and further refined by the working group based on follow-up research, review of workshop discussion, context from pre-workshop surveys and input gathered from the post-workshop validation interviews. Each best practice includes actionable tactics, recommendations for where in the management process or system practitioners can utilize each tactic and examples and resources for reference (Tables 1–5). The tactics described in each table are not comprehensive but important steps identified through this process, and the examples and resources are not intended to indicate that the tactics have been completed but rather for fishery practitioner to use for inspiration in their regions.

During the workshop, participants discussed various knowledge forms, including fishermen's on-the-water observations and Indigenous knowledge developed over generations. Participants highlighted the significance of elevating such knowledge sources as well as social science and qualitative data in fisheries management, which are often overlooked. We recognize these knowledge systems are diverse and require different approaches for effective management, therefore we use plain language to encompass multiple knowledge frameworks outside "western fisheries science," which dominates U.S. fisheries management. We refer more generally to "valuing" multiple forms of knowledge and adopt specific terminology as used by specific initiatives or by workshop participants.

Best Practice 1: Establish Clear Goals and Metrics

Define specific goals and metrics to ensure that equity and climate resilience efforts are effective, accountable and transparent.

Description of Best Practice 1

Fishery practitioners should establish clear goals and metrics for equitable and just climate-resilient fisheries management. Specific, measurable goals and metrics can help practitioners tailor policies and initiatives to the unique equity and climate-related challenges of each fishery as well as monitor and evaluate progress.

Workshop participants and post-workshop interviewees discussed the importance of identifying concrete metrics that are aligned with equity goals to ensure progress is being made. When metrics that support the goals and objectives are defined early in the management process, practitioners are in a better position to center communities' needs and objectives in decision making. They may also be better positioned to anticipate and quantify impacts of unintended consequences, such as economic hardships or disruptions to local communities, and adjust management to mitigate adverse effects as necessary. Monitoring and evaluation can be employed through regular self-assessment or through review by an outside organization. Through this process, practitioners can evaluate how effectively their decisions support the livelihoods of stakeholders, including historically underserved communities (Table 1).

What influences success and what challenges might practitioners face?

One challenge associated with Best Practice 1 is that practitioners will need to ensure that goals are realistic and measurable. Goals that are open-ended, too ambitious or not measurable may be hard to achieve. Therefore, fishery practitioners must approach goal setting with a clear understanding of the problems, the affected stakeholders and communities, and the data available to measure success.

Fishery practitioners can overcome the challenges of goal setting by adopting a multifaceted approach that values multidisciplinary research, stakeholder engagement and adaptive management. For example, data collected through improved fishery-dependent and socioeconomic surveys can supplement fishery-independent data sources to support more accurate and comprehensive insights into stock health and to the communities that prosecute certain fisheries. Additionally, engaging diverse stakeholders, including local communities, fishermen and non-governmental organizations, can help ensure that goals reflect a range of interests and promote cooperative solutions. By combining these strategies, practitioners can better navigate the complexities of fisheries management and work towards more climate-resilient, equitable and sustainable fishery management systems.[22]

Additional topics for consideration

Goals can differ significantly across regions and communities, so it is essential to utilize an open and transparent approach that facilitates broad stakeholder engagement and incorporates diverse perspectives and knowledge, including from tribes and Indigenous communities. Furthermore, practitioner and community goals may not always align, but practitioners can better tailor goals to reflect the unique needs and contexts of communities where possible through close collaboration with stakeholders and communities. Importantly, fishery practitioners should also ensure goals do not further burden underserved communities. Through an inclusive approach to goal setting, practitioners can enhance the relevance and effectiveness of the goals as well as foster a more equitable and sustainable path forward in fisheries management.

TABLE 1. Tactics supporting Best Practice 1.

Best Practice 1: Establish Clear Goals and Metrics Define specific goals and develop metrics for monitoring progress to ensure that equity and climate resilience efforts are effective and transparent.		
Tactic	**When and Where Tactic May be Implemented**	**Examples/Resources**
When possible, develop measurable goals that center equity in management actions and can be achieved under realistic timelines. Include more holistic metrics in fishery management goals such as equity, well-being and socioeconomic community outcomes.	Goal and metric setting is a vital component of all steps in the fishery management process, however, goals and metrics must be developed during initiation of a fishery action or initiative.	NOAA Fisheries released its first-ever national Equity and Environmental Justice Strategy and subsequent regional implementation plans (Alaska, New England/Mid-Atlantic, Pacific Islands, Southeast [Southeast – Spanish], and West Coast) to guide the agency as it focuses on serving all communities more equitably and effectively. Each regional plan includes specific goals, resources needed, actions, metrics and accountability measures.[23] The NASEM report on Assessing Equity in the Distribution of Fisheries Management Benefits: Data and Information Availability (2024) warns against a limited focus on readily-measurable indicators, as equity outcomes are complex and not easily quantified.[24] It points to emerging efforts to develop more holistic and multidimensional equity metrics in the Marine Protected Area space.[25] NOAA Fisheries' Diversity & Inclusion Strategic Plan 2022-2025[26] includes objectives that each have specific metrics for success (e.g., number of hires in underrepresented groups, number of diversity-related trainings). An American Fisheries Society (AFS) podcast on Diversity, Equity and Inclusion (DEI) developed by the AFS Executive Committee and additional groups presents stories on systemic barriers that help practitioners identify important themes to address their own equity goals.[27]
Develop goals and metrics through an open and transparent process in collaboration with stakeholders, tribes and Indigenous communities.	Initiation of a fishery action or initiative, as well as during public scoping sessions.	The North Pacific Council formed a Local Knowledge, Traditional Knowledge, and Subsistence (LKTKS) Task Force for its Bering Sea Fisheries Ecosystem Plan. The Task Force was formed to develop transparent protocols that include goals and metrics for using LK and TK in management and to understand the impacts of Council decisions on subsistence resources, users and practices.[28]
Build partnerships with other agencies and stakeholders to strengthen common goals.	Fishery practitioners should always remain open and willing to build partnerships throughout the fishery management process.	The East Coast Climate Change Scenario Planning effort brought together three regional fishery management councils, the Atlantic States Marine Fisheries Commission, NOAA Fisheries and stakeholders to collectively explore jurisdictional and governance issues related to climate change and shifting fishery stocks.[29] Collaborative efforts to address the impacts of climate change are still ongoing as a direct result of this work.
Develop multidisciplinary goals by integrating diverse expertise and engaging stakeholders to develop comprehensive fishery management	Barriers for implementation can happen at any point throughout the fishery management process, so fishery practitioners should	Free et al. 2020 present realistic fisheries management reforms that could mitigate the impacts of climate change in most countries. They highlight four guiding principles for climate-adaptive fisheries management that address challenges surrounding ecology, economics and conservation, among others.[30]

strategies that enhance adaptability and reduce implementation barriers.	anticipate potential barriers at the initiation of a fishery action or initiative.	Gómez and Maynou 2021 – a case study on demersal species in the Western Mediterranean – detail the benefits of balancing ecology, economy and culture in fisheries policy.[31] NOAA Fisheries' handbook, A Practitioner's Handbook for Fisheries Social Impact Assessment [32] provides guidance to practitioners on core components of social impact assessments (SIA) and what types of data are available to help produce an SIA in compliance with "best scientific information available" requirements. It is also a resource for social scientists who have never conducted an SIA or need a refresher.
Define and use common terms to support clear communication during goal setting and implementation.	Define common terms during the initiation of a fishery action and during all public comment periods and use common terms throughout the process.	NOAA Fisheries' Equity and Environmental Justice Strategy includes definitions of terms including environmental justice, equity, underserved communities, etc.[33] The North Pacific Fishery Management Council's LKTKS Task Force effectively defines common terms and regionally focused language when developing goals and metrics.

Best Practice 2: Enhance Workforce Capabilities

Provide current personnel with the necessary knowledge, skills and tools to better engage with and support diverse communities as they adapt to climate change.

Description of Best Practice 2

To respond to the impacts of climate change in an equitable and just manner, fishery practitioners must first understand the limitations and inequities inherent to the management system. Best Practice 2 aims to identify how fishery practitioners can bolster their internal capacity to appropriately tackle EEJ issues exacerbated by climate change (Table 2).

Communities have first-hand knowledge and experience of how climate change is impacting their environments, businesses and resource use; and it is necessary that fishery practitioners improve engagement with communities to support their needs and interests. To do so effectively and appropriately, fishery practitioners first must educate themselves on the systemic barriers in the current management system and the potential harm that certain management measures may have caused communities. The onus should be on practitioners to come to the table ready to engage and facilitate community feedback and involvement in decision making. This is a critical first step towards building accountability and trust.

What influences success and what challenges might practitioners face?

Key challenges that fishery practitioners may face in accomplishing Best Practice 2 include limited funding and staff time, as well as an outsider view that addressing EEJ is additive rather than a part of ongoing work. As a result, many fishery practitioners are often forced to train “on the job,” which can place the onus on communities themselves to ensure proper engagement with fishery practitioners. Furthermore, there may be people working in the fishery space, as with all spaces, who resist a paradigm shift. Support and clear direction from leadership helps center EEJ as a priority and begin to shift perspectives on how equity and justice can and should be incorporated into daily work.

Another challenge is the lack of knowledge about the communities that fishery practitioners need to support and/or engage with. This results from multiple factors including that underserved communities tend to be the most data poor and that staff may not reflect the diversity of communities they serve and, therefore, lack the cultural knowledge needed to engage. Additional work needs to be done to identify underserved communities in each region so that fishery practitioners can best equip themselves to engage. It is important to understand communities, including tribes and Indigenous communities, as unique, each with their own identities and place-based knowledge and challenges specific to climate change.

Additional topics for consideration

Fishery practitioners must recognize that EEJ work requires sustained, collaborative commitment. This recognition will be particularly important in places where there is staff turnover and a need for periodic training. Organizations and institutions will need to provide the space and time for staff to learn, grow and have difficult conversations that may help them become more open to shifting

norms. Ideally, all staff receive EEJ training, but in a limited resource environment, it may be necessary to think critically about who gets trained and to prioritize participation by key decision-makers. Ensuring that those in influential positions, such as lead practitioners and policymakers, are included in these programs will help facilitate meaningful change. Also, it is important to be aware that conversations about equity can sometimes be uncomfortable or polarizing, and some individuals will inevitably resist engagement in equity conversations. Such resistance creates a barrier to equity work that will require long-term shifts in knowledge, perceptions and attitudes. In the meantime, conversations about identified shared values that form the foundation of equity — such as inclusion, trust and fairness — can sometimes come more naturally and serve as a pathway to deeper engagement on the topic.

TABLE 2. Tactics supporting Best Practice 2.

Best Practice 2: Enhance Workforce Capabilities Provide current personnel with the necessary knowledge, skills and tools to better engage with and support diverse communities as they adapt to climate change.		
Tactic	**When and Where Tactic May be Implemented**	**Examples/Resources**
Provide equity training to staff on the history of white-dominant conservation and natural resource management practices and the associated impacts on underserved or disenfranchised communities. Use training to develop an understanding of the unique communities affected by fisheries management and the approaches that may need to be tailored to each community.	Upon hiring new staff and at regular intervals for all staff.	Decolonizing Conservation: A Reading List (2019) is a resource developed by Sarah Cannon (University of British Columbia) to help non-Indigenous people educate themselves on how colonialism, imperialism and white supremacy have influenced and shaped biodiversity conservation practices.[34] Diversity, Equity and Inclusion: Current Conditions and Best Practices Across the National Sea Grant Network explores DEI topic areas across 15 case studies that outline best practices for applying DEI principles across the Sea Grant Network.[35]
Develop and train fishery practitioners on protocols for engagement and facilitation with tribes and Indigenous communities as rightsholders.	Upon hiring new staff and at regular intervals for all staff.	The University of British Columbia's Center for Indigenous Fisheries offers a course, FISH506i: Co-Creating Aquatic Science, that was co-developed with members of the Haida Nation and teaches graduate-level students how to co-create science with Indigenous communities.[36] Indian Country 101 is an online tribal engagement training series built with natural resource practitioners in mind to help outline the long and complicated history of tribes and tribal governments.[37] The NOAA Policy on Government-to-Government Consultation with Federally Recognized Indian Tribal Governments[38] provide guidance for sovereign tribal consultation processes, including stipulations for annual online training for all NOAA personnel involved in consultations. The U.S. Geological Survey webinar series, *Incorporating Indigenous Knowledges into Federal Research and Management,* details what it means to ethically engage with Indigenous Knowledge on resource management and conservation.[39]
Invest in social science capacity, including interdisciplinary scientists who can bridge the gap between social and natural sciences (including Indigenous fisheries, social and physical scientists).	Throughout the fishery management process.	NOAA Fisheries highlights plans to invest in social science capacity within the Equity and Environmental Justice Strategy and subsequent regional implementation plans (Alaska, New England/Mid-Atlantic, Pacific Islands, Southeast [Southeast – Spanish], and West Coast).[40]

Best Practice 3: Redesign Internal Processes

Adjust internal workflows and, where feasible, strengthen the workforce to prioritize community engagement and relationship-building efforts.

Description of Best Practice 3

Significant and strategic investments must be made to redesign internal organizational processes and bolster the workforce where it is possible to improve how fishery practitioners engage with underserved communities. While federal fisheries management strives to be an open public process, stakeholders with valuable knowledge to contribute can often feel alienated or disenfranchised.[41] By diversifying staff to be more inclusive and participatory, practitioners can be better positioned to understand and address local challenges, leading to more effective and equitable policies.

This best practice is intended to complement Best Practice 2 and examines where and how fishery practitioners can promote reciprocity through mutual engagement with communities, knowledge exchange and relationship building. Importantly, fishery practitioners will need to work to build, and in some cases repair, relationships with communities, which will take time and follow through. Workshop participants noted that hiring community liaisons can help to build trust, increase cultural sensitivity, foster inclusive dialogue and address systemic inequities (Table 3). By supporting community engagement and relationship building, fishery practitioners are beginning to address a significant gap that helps integrate social science theory on community outreach and engagement into management to support equitable and responsive decision making in the face of environmental change. Redesigning internal processes is not just about improving efficiency; it also fosters a collaborative environment that addresses both the technical and social dimensions of fisheries management, which helps ensure that policies are both scientifically sound and socially accepted.

What influences success and what challenges might practitioners face?

Challenges associated with Best Practice 3 are similar to those identified for Best Practice 2, including the constraints of limited funding, resources and staff time, as well as lack of data on underserved communities. Stakeholders may also speak different languages, which necessitates translation of documents or interpreters to ensure information can be accessed. Moreover, building trust with communities, especially with those that have been harmed by management practices, is a gradual process that cannot be rushed. Limited data on underserved communities exacerbates this difficulty, as fishery practitioners may be compelled to make decisions based on insufficient information, particularly given the urgency of climate change. Adequate staff time and resources for engaging with fishing communities may be the most fundamental factor to successfully address these issues. It is crucial to develop pathways that bridge the gap between the management system and underserved communities to foster an environment where community input is genuinely valued and streamlined into decision-making processes.

Additional topics for consideration

While redesigning internal processes, fishery practitioners should be careful not to inadvertently exacerbate inequities or create barriers to decision makers. For example, it is critical to integrate community input and traditional knowledge into management, but doing so might slow down

decision-making processes and potentially delay responses to urgent climate change impacts. This delay could result in inequitable outcomes, where communities most vulnerable to climate-related shifts suffer the consequences of protracted decision making. Additionally, if engagement processes are not carefully designed, they may favor more vocal or resource-rich communities and sideline those with fewer means to participate effectively. Thus, while striving for inclusivity, it is crucial to balance engagement with efficiency and ensure that all voices, particularly from underserved groups, are heard. This requires a thoughtful approach that fosters collaboration, safeguards against widening disparities and maintains the agility needed to respond to the pressing challenges posed by climate change.

TABLE 3. Tactics supporting Best Practice 3.

Best Practice 3: Redesign Internal Processes Adjust internal workflows and, where feasible, strengthen the workforce to prioritize community engagement and relationship-building efforts.		
Tactic	**When and Where Tactic May be Implemented**	**Examples/Resources**
Diversify leadership and regional fishery management council representation.	Throughout the fishery management process.	The North Pacific Fishery Management Council's LKTKS Task Force had diverse membership/representation based on experience and historical knowledge. NOAA Fisheries' EEJ Strategy includes an action related to increasing representation of underserved communities in leadership bodies such as regional fishery management councils, advisory bodies, and the Marine Fisheries Advisory Committee.
Hire community liaisons or engagement teams to build stronger connections between communities and the fishery management process.	Throughout the fishery management process.	NOAA Fisheries regularly engages and consults with tribes and Indigenous groups to meet its federal trust responsibility,[42] and in doing so, continues to build and strengthen relationships with tribes, Alaska Natives, Native Hawaiian and Pacific Islanders, and Caribbeans. The NOAA Procedures for Government-to-Government Consultation with Federally Recognized Indian Tribal Governments[43] require that each line office, staff office and regional team establish a "headquarters tribal liaison" to guide NOAA programs in conducting proper consultations and inform tribal governments of consultation results. The Pacific Islands Regional Office supports fisheries liaisons that act as conduits between fisheries management and their local island communities.[44]
Tailor approaches, tools and resources for specific communities, recognizing that every community has unique context and needs.	Throughout the fishery management process.	Naturally Resilient Communities offers solutions and case studies from around the world that highlight how communities addressed local challenges.[45] In each localized example, fishery practitioners can review tools and tactics implemented by other managers/researchers that lead to more climate resilient ecosystems. In the Pacific Islands Region (PIR), more than 5 languages are commonly spoken by community stakeholders. In recognition, the PIR EEJ Implementation Plan indicates NOAA Fisheries' plans to continuously provide information in accessible language.[46]
Invest in and develop participatory processes for community engagement outside of the action-based regional fishery management council process to gather information on climate impacts and other concerns with clear feedback loops to council decision making.	Throughout the fishery management process.	The NOAA Climate, Ecosystems, and Fisheries Initiative (CEFI) is a nationwide effort to develop support systems for climate-informed decision making that take into account community resilience. The Northeast Region CEFI team includes social scientists who are developing "climate histories," which are oral history interviews with fishery participants about their perceptions of and adaptations to change in their fisheries. The Pacific Fishery Management Council's Climate and Communities Initiative conducted a scenario planning process, including meetings/workshops with community members in 4 different areas on the West Coast (WA, OR, northern and southern CA).[47] The results of these workshops were synthesized into various follow-on actions for the Council.

Subsidize participation for underserved populations and their representatives.	Throughout the fishery management process.	Fishery practitioners should consider offering honorariums to support underserved community engagement in the fishery management process whenever possible. The Environmental Protection Agency issued guidance for Federal grant recipients on compensating community members for participation in meetings, research projects, and similar activities as participant support costs under 2 CFR 200.1 and 2 CFR 200.456.

Best Practice 4: Foster Community Leadership

Create and support opportunities for community leaders to play an active role in fisheries management and climate resilience efforts.

Description of Best Practice 4

Climate disruption creates an opportunity to consider new, more equitable governance frameworks that not only promote community participation but put communities in the lead. This best practice explores how fishery practitioners can facilitate opportunities for community leadership within the current management system and support broader systemic change for communities. It recognizes that for climate-resilient fisheries initiatives to be equitable and just, communities must be fully engaged and informed throughout the fishery management process, from the collection of information and data, to signaling about potential fishery management issues, to scoping and developing new policies (Table 4). Many workshop participants did not feel the current fishery management system is fully able to engage with and empower communities, especially underserved communities, which further hampers the system's ability to work reflexively and proactively to adjust fishery management measures and processes in the face of environmental change.

What influences success and what challenges might practitioners face?

A key challenge associated with Best Practice 4 is the need to overcome the inertia of the current U.S. fishery management system, which is shaped by inequitable power dynamics and the difficulty of making structural changes in a highly polarized political environment. Another key challenge is the uncertainty associated with where and who will be impacted by climate change, which can limit the ability to start the long-run processes of relationship-building, learning and empowerment. Additionally, many of the supporting tactics for this best practice require funding (grants, cooperative research programs, fellowships, etc.). While modifying current programs to achieve the best practice is ideal, if additional programs are needed, this may be difficult to achieve without tradeoffs to other programs, or without additional congressional funding. Factors that will affect how successfully communities can be empowered within the fishery management system include the degree to which strong, trusting relationships can be effectively built, if adequate resources can be identified and maintained to support this effort, how well climate impacts on various groups can be assessed and understood and the overall institutional willingness to invest in these efforts.

Additional topics for consideration

Workshop participants emphasized that efforts to broaden engagement should be made intentionally, especially those developed for the region and communities of interest. Specifically, fishery practitioners should be respectful and show up in good faith, allow Sovereign Tribal Nations (and other rightsholders) to self-identify, facilitate information sharing in a way that still allows for regional differences and learn from local communities that have experienced comparable climate challenges and impacts. Further, if efforts are not made with intentionality, there could be risks that participants are not representative, which could reinforce the status quo.

TABLE 4. Tactics supporting Best Practice 4.

Best Practice 4: Foster Community Leadership Create and support opportunities for community leaders to play an active role in fisheries management and climate resilience efforts.		
Tactic	**When and Where Tactic May be Implemented**	**Examples/Resources**
Communicate the importance of engaging in fishery management and how to participate.	During outreach and specifically, prior to the initiation of a new action or fishery initiative.	Outreach activities led by academic, non-governmental, or government agencies may be ideal, such as the Woods Hole Science Stroll.[48] Robison et al. 2024 aim to expand fishery managers' understanding of how the science of communication can facilitate effective fisheries management.[49]
Increase and subsidize participation in fisheries management training programs.	Throughout the fishery management process.	The Marine Resource Education Program (MREP) is an example of a training program led by fishermen which offers regionally focused training on fishery management.[50] The program offers funds for travel/hotel for all participants to remain engaged. Additional training programs are available through the American Fisheries Society, EDF's Virtual Fisheries Academy and Conservation Training.[51, 52, 53]
Increase funding opportunities for co-developed, community and Indigenous-led projects and programs.	During the design of grants and grant priorities.	Recently announced Lenfest projects via a request for proposals emphasized qualifications that supported "Indigenous led organizations/institutions as well as Indigenous team members" and co-production approaches.[54]
Provide technical support for applying for grants and during grants.	During the design of grants and open application periods.	The Bureau of Indian Affairs provides technical support for grant applicants (such as Tribal Climate Resilience Grants), including webinars, grant writing seminars, virtual office hours and Climate Resilience Liaisons, who can assist with developing proposals.[55, 56] Writing for Green provides grant writing training, tools and coaching to support underserved communities in securing funding for their environmental justice work.[57] In 2024, Writing for Green partnered with the Frontline Resource Institute and EDF to provide training and grant writing support to ten fishing community organizations.
Increase the number of paid internship and fellowship opportunities in fisheries science and management for members of underserved communities, ideally with direct-hire authorities.	Increasing capacity to engage underserved communities for internship and fellowship opportunities should occur year-round at local, state and federal levels, as well as through the many environmental non-governmental organizations.	The RAY Conservation Fellowship is a two-year, full-time paid position designed to support black, indigenous, and people of color early professionals who are beginning their career paths in conservation. Fellows are placed with member organizations and provided with additional resources to support their growth.[58] Sea Grant institutions offer a variety of internships for undergraduates, graduate students, and recent graduates working in marine science and management with the goal of increasing diversity from coastal communities. Oregon Sea Grant offers eight

		internship and fellowship programs, many of which offer placements in local, state and federal agencies and legislative offices.[59]
Support community-led research, monitoring programs, and partnerships with various institutes.	Community-led programs could occur in the form of research set asides, cooperative research programs or other programs. Support the design and administration of federal programs, during grant-making, during spatial planning in fishing communities.	In the Greater Atlantic Region, Research Set-Aside (RSA) programs generate funds for applied research, including community and industry-led projects, through the sale of "set-aside" allocations for a few fisheries. Research topics vary, but a focus in the past has been on industry-based surveys for access areas.[60] Experimental Fishing Permits (EFPs) are used throughout the U.S. to foster collaborations between industry and NOAA to design and test new gear types, monitoring tools, new fisheries, among other innovations. EFPs may be ideal for testing adaptive management approaches in a way that is collaborative with industry and fishing communities.[61] Cornish et al. (2023) provide a primer on Participatory Action Research (PAR) – "an approach to research that prioritizes the value of experiential knowledge for tackling problems caused by unequal and harmful social systems and for envisioning and implementing alternatives.[62]" The primer describes considerations for PAR project design from building relationships to collaborative analysis to taking action. Thompson et al. 2020 review and analyze how Indigenous peoples participated in environmental monitoring worldwide, and how their participation influenced monitoring objectives, indicators, methods and monitoring outcomes. They also discuss power, governance, and the use of both Indigenous and scientific knowledge in monitoring efforts.[63]

Best Practice 5: Value Multiple Forms of Knowledge

Develop and refine methods to elevate diverse forms of knowledge into decision-making processes to ensure that all relevant perspectives are considered.

Description of Best Practice 5

Communities possess critical first-hand experience and knowledge about climate change impacts, but the current management system often presents barriers to their consideration or does not even recognize this knowledge. However, given the rapid pace of climate change impacts and diversity of community experiences and responses, it is imperative that multiple forms of knowledge are considered in the fishery management process.[64] Best Practice 5 explores how fishery practitioners can better accommodate multiple forms of knowledge in existing decision-making processes, and, more broadly, create conditions to value and elevate additional forms of knowledge and center these knowledge holders as experts in common with traditionally recognized sources of fishery expertise.

As previously discussed, we recognize that the various forms of knowledge (e.g., fishermen and Indigenous knowledge) are not homogenous, nor are they interchangeable. They are developed and transmitted differently and require different processes to inform management. Since there is no universally accepted term or definition for these knowledge systems, we use general language about multiple or additional knowledge systems to include any form of knowledge generated outside what we call “western fisheries science,” referring to the scientific information currently and typically used in U.S. fisheries management. When referring to a specific initiative, we adopt specific terms such as local knowledge or Indigenous knowledge.

Western fisheries science does not fully capture the diverse impacts on fishing communities’ livelihoods, subsistence, traditions and lived experience — nor their unique adaptive responses. It is increasingly recognized that the “best available science” must include multiple knowledge systems to enable more holistic understanding and rapid responses.[65] Additionally, recognition and inclusion of diverse knowledge systems is a core component of equitable management processes. According to NASEM, recognitional equity “involves acknowledging the rights, knowledge, values, interests, and priorities of a diverse array of individuals and groups and incorporating them into management considerations”.[66] Valuing — and acting on — diverse knowledge sources is critical for building trust in fisheries management.

What influences success and what challenges might practitioners face?

Factors that contribute to success can include having staff (both in science and management) with training and expertise in working with Indigenous knowledge holders — including best practices for data sovereignty (Table 5) — or are themselves traditional or Indigenous knowledge holders. Workshop participants identified increased social science capacity (beyond economists) as an enabling condition because non-economic social scientists are likely more comfortable with qualitative data and familiar with working with fishermen’s or Indigenous knowledge.

Challenges practitioners may face include capacity and time for staff training, and the ability for data collection that incorporates diverse forms of knowledge to capture climate change impacts on

various communities. Workshop participants acknowledged that staff must already "do more with less" in preparing documents and research projects, and additional considerations about including different forms of knowledge may represent more burden. Additionally, there can be deeply entrenched, if unconscious, attitudinal and cultural barriers to acceptance and valuing of knowledge beyond western science.

Another major challenge is the potential for "information overload," as managers are already inundated with information that they have insufficient pathways and mechanisms to act on. Currently, the fisheries management system is best able to incorporate quantitative, low uncertainty, biophysical data as collected in standardized processes. Much work remains to be done to determine how to make other forms of knowledge useful and applicable for managers without oversimplifying or assimilating it, and to guide managers to make decisions based on multiple forms of knowledge.

Finally, there are risks that even well-intentioned efforts can create harm to communities. Workshop participants cautioned against mistreating sensitive or Indigenous data by using it in applications that knowledge holders do not consent to, failing to respect data sovereignty and the tendency to pan-Indigenize policy and practices (i.e., applying the views and knowledge of one Indigenous person or solutions based on knowledge from one Tribe or Nation to multiple Nations/Tribes). Ultimately, there may be clashes with mandates for transparent or publicly accessible data, and what may be sacred or private to communities.

Additional topics for consideration

Workshop participants and post-workshop interviewees stressed that effective knowledge sharing requires a reciprocal approach, where data and insights collected from communities are not only used but shared back with them in an accessible and meaningful manner. This applies to both western scientific knowledge, such as climate models, and Indigenous knowledge, where data sovereignty principles are crucial. Data sovereignty refers to the right of each Indigenous nation to "govern the collection, ownership and application of the tribe's data,[67]" as established (albeit inadequately) in U.S. treaties and emphasized in the United Nations Declaration on the Rights of Indigenous Peoples. Additionally, mechanisms should be developed to compensate communities and knowledge holders for their contributions, acknowledging their time and expertise. It is also important to avoid forcing data into existing systems or expecting it to conform to specific formats to be valuable. Moreover, recognizing that Indigenous knowledge is not solely qualitative and addressing disparities in the perceived legitimacy and value of different knowledge forms are essential. Being attentive to these aspects can foster more equitable and respectful knowledge exchange.

TABLE 5. Tactics supporting Best Practice 5.

Best Practice 5: Value Multiple Forms of Knowledge Develop and refine methods to elevate diverse forms of knowledge into decision-making processes to ensure that all relevant perspectives are considered.		
Tactic	**When and Where Tactic May be Implemented**	**Examples/Resources**
Employ community-engaged research principles, including defining goals, terms, priorities, etc. in collaboration with stakeholders, tribes and Indigenous communities. Collaborative research and participatory processes to understand climate impacts also promote inclusion and uptake of multiple forms of knowledge. However, be mindful of data ownership.	While conducting fisheries and climate science, developing indicators, developing ecosystem status reports; while pursuing collaborative research with fishermen; developing fisheries research grant proposals; defining goals and priorities for climate and/or EEJ research	The Great Lakes Indian Fish and Wildlife Commission (GLIFWC), an intertribal agency that provides technical ecological and legal assistance to 11 member Ojibwe tribes for implementation of their treaty rights, conducted a Climate Change Vulnerability Assessment that weaves together Indigenous Traditional Ecological Knowledge with Scientific Ecological Knowledge, covering over 60 species of interest to member tribes. The assessment, now in its second iteration, is intended as a resource for member tribes and their partners as they prepare for climate change. The report includes language specifying knowledge ownership and how this knowledge can be used.[68] The Gulf of Mexico Fisheries Management Council and South Atlantic Fisheries Management Council have both used participatory workshops with diverse stakeholders to develop comprehensive conceptual models of ecological, physical, socio-economic and regulatory aspects of fisheries and managed resources, as well as stakeholder priorities and goals.[69, 70] Reid et al. 2020 describe three Canadian case studies of using “two-eyed seeing” that pairs Indigenous and western knowledge systems for fisheries governance.[71] Bentley et al. 2019 discuss combining scientific and fishers’ knowledge to co-create indicators of food web structure and function in the Irish Sea.[72]
Establish policies to ensure data sovereignty for communities, especially Indigenous communities, e.g., ownership, control, access and possession of data (OCAP).	Prior to data collection, and in consultation with NOAA General Counsel and Tribal representatives	The Fundamentals of OCAP is a required training for researchers at Canadian universities. While Canada-specific, contains broadly applicable principles for Indigenous Peoples asserting data sovereignty or individuals interacting with Indigenous data or information.[73] Cannon et al. 2024 provides recommendations for researchers and Indigenous governments to respect and assert Indigenous data sovereignty, including guiding questions for data management decisions, based on management of climate and cumulative impacts on salmon in British Columbia.[74] The US Indigenous Sovereignty Network provides research information, training opportunities and advocacy regarding Indigenous Peoples and data sovereignty. It also provides a searchable Indigenous Data Sovereignty & Ethics Resource Hub.[75]

Share back community knowledge and data for use by communities.	Iteratively following data collection and analysis	The North Pacific Fishery Management Council has developed a searchable Local Knowledge, Traditional Knowledge, and Subsistence (LKTKS) Database, where communities can access their shared data.[76] The GLIFWC Climate Change Vulnerability Assessment (see first row) is presented as a resource for member tribes and their partners as they prepare for climate change.[77]
Develop venues and events that support knowledge exchange and direct input of fishermen's knowledge into management.	Periodic trainings and workshops for Regional Fishery Management Council staff, NOAA Fisheries scientists, NOAA regional office staff, extension officers and other fisheries professionals. Events and venues should be held in the communities and at times that are most accessible to community participants.	New Hampshire Sea Grant (NHSG) held a series of workshops where commercial fishermen trained NOAA Fisheries employees, Congressional staffers, state fisheries scientists, extension officers and other fisheries management professionals on operating fishing gear and bycatch reduction technology, as well as how fishery regulations impact fishing operations. The workshops were highly rated and recommended, and helped form relationships across these sectors. Additionally, NHSG supports the Shoals Marine Laboratory Sustainable Fisheries undergraduate course, which invites commercial fishermen to lead and teach classes.[78, 79]
Be attentive to and transparent about what kinds of data inform decision making, their origin and how they are formatted. What is considered "data" becomes an avenue for inclusion.	While considering existing data and data needs during scoping and developing alternatives, while developing impact analyses and discussion papers. In materials that NOAA Science Centers present to Regional Fishery Management Councils, including Ecosystem Status Reports, Ecosystem Socioeconomic Profiles and stock assessments. In particular, assess what knowledge sources inform Final Actions.	NOAA Technical Memorandum, "A Comparison of Waves I (2012/2013) and II (2018/2019) of the Survey on the Socio-Economic Aspects of Commercial Fishing Crew in the Northeast U.S.", describes in detail the methods and data from two waves of a demographic and well-being survey of commercial crews working in the Northeast, which has been used to inform decision making in recent NEFMC actions.[80] In 2013, Colburn and Jepson published NOAA Technical Memorandum, "Development of social indicators of fishing community vulnerability and resilience in the U.S. Southeast and Northeast regions," which details the methods and data utilized to create the NOAA Fisheries Community Social Vulnerability Indices (CSVIs), or Social Indicators.[81]
Identify on-ramps for Indigenous and other forms of knowledge throughout the management process.	Examples include public comment, via expertise on SSCs, in the research priorities process, presentations to Councils alongside Federal agency presentations, scoping and development of alternatives; impact analyses and discussion papers.	The North Pacific Fishery Management Council LKTKS Task Force developed a protocol with recommendations for the Council to identify, analyze, and consistently incorporate local and traditional knowledge into decision-making processes. One on-ramp the task force identified is in public meetings: the Council now allows Tribal members to provide customary introductory statements prior to the start of the timer during public testimony.[82] Additionally, the LKTKS Task Force identified 11 specific on-ramp recommendations, such as hold public workshops during the Council research priority setting process, consistently invite Tribal co-management partners to present to the Council or committees and solicit LK and TK social science expertise on the SSC.[83] Raymond-Yakoubian et al. 2017 discuss the incorporation of traditional knowledge into Alaska federal fisheries management.[84]

Provide training and guidance for practitioners, such as Regional Fishery Management Council staff and Scientific and Statistical Committee members, about ethical considerations for working with data about/from underserved communities, including the benefits and risks of using open data, with specific training to understand ethics and protocols around Indigenous knowledge.	In new member and staff/committee trainings for Regional Fishery Management Councils and on NOAA Technical Memos; annually/upon onboarding SSC members.	New Council Member trainings regularly provide guidance for fishery managers on engaging with stakeholders and community members. As the impacts of climate change continue to disproportionately burden various communities, New Council Member Training will continue to evolve.[85] The U.S. Office of Personnel Management's Center for Leadership Development offers courses for practitioners to improve skill-building, leadership and engagement.[86] NOAA Fisheries has developed guidance and best practices for engaging and incorporating Traditional Ecological Knowledge (TEK) in decision making, including example methods for collecting TEK, recommendations on data confidentiality agreements, and documentation and consent considerations for integrating TEK with best available science.[87]

3. CONCLUSION

The best practices, tactics and resources presented above are intended to guide fishery practitioners in their efforts to ensure equitable, just and climate-resilient fisheries. Engaging stakeholders and knowledge holders in collaborative efforts and investing in capacity-building initiatives will be crucial for advancing fisheries management that is both equitable and resilient in the face of climate challenges. While no single action will resolve the complex set of equity and justice issues that are interconnected with climate impacts, practitioners can collectively take important steps forward by establishing clear goals and metrics, enhancing workforce capabilities, redesigning internal processes, fostering community leadership and valuing multiple forms of knowledge. The outlined tactics, examples and resources can support practitioners in developing actionable strategies. They draw from the broad set of experiences, expertise and approaches contributed by workshop participants, survey respondents and interviewees, but they are by no means exhaustive. As practitioners continue in their efforts to advance EEJ in the context of climate change, it is important to continue to share learnings and knowledge, receive feedback from stakeholders and communities and adapt accordingly. Over time, the set of solutions can continue to grow and improve but will undoubtedly continue to reflect the five best practices in this guidance document. Moving forward, we encourage fishery practitioners to leverage and build upon these best practices to support the well-being of fishing communities in a changing climate.

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APPENDIX I: WORKSHOP DEVELOPMENT & STRUCTURE

Pre-workshop design, scoping interviews and stakeholder survey

In October 2023, EDF formed a working group composed of staff from Northern Economics, Co-Creative Labs, the Northeast Fisheries Science Center, NOAA Fisheries Office of Policy, New England Fishery Management Council and North Pacific Fishery Management Council to collaboratively design the workshop. During this phase, the working group conducted 16 informal scoping calls with representatives from Regional Fishery Management Councils, Science Centers, NOAA Fisheries Headquarters and Regional Offices and non-governmental organizations throughout all fishery management regions. Representatives were selected based on their ongoing work and expertise with climate-resilient fisheries and/or EEJ. The working group used the scoping calls to solicit priority topics for workshop discussion, insights into ongoing initiatives and related challenges in the climate and EEJ space and potential workshop participants.

In February 2023, EDF distributed an eight-question online survey (available in English, Spanish, and Vietnamese) to scope workshop topics and discussion questions about key challenges, priorities, and examples of how EEJ considerations should be incorporated into climate-resilient fishery policies and initiatives in various communities. We employed a snowball distribution approach, first contacting individuals with broad fishery networks, including Regional Fishery Management Councils, fishery association leaders, extension officers (e.g. state Sea Grant representatives) and research network listservs. We asked initial contacts to distribute the survey widely and encouraged further distribution, with an emphasis on reaching underserved communities.

Survey questions (Appendix II) were developed to recruit community-based feedback on local inequities and injustices that affect the ability to adapt to climate change, whether climate change impacts or the regulations and policies that respond to those impacts created or exacerbated injustices and examples where efforts to promote climate resilience also promote equity. Seventy-one responses representing various fishing sectors, non-governmental organizations, dealers, processors, researchers, etc. across a broad geographic range (Table 6) were summarized into the following areas of interest: climate impacts exacerbating injustice, climate regulations exacerbating injustice, general remarks on injustice associated with the procedural, recognitional, and distributional equity, data gaps, broader economic concerns or injustices that underlie climate vulnerability and general pushback. The survey was not used to draw specific conclusions about stakeholder perceptions of climate and equity; rather, the working group used the areas of interest to help structure breakout group sessions throughout the workshop. During the workshop, anonymous survey quotes were highlighted to provide context of broader stakeholder perceptions for participants.

TABLE 6. Summary of survey respondents by region.

Region	Number of Respondents
West Coast	17
Gulf Coast	15
East Coast	9
Pacific Islands	9
Caribbean	5
Alaska	5
Washington, D.C.	3
Great Lakes	1
International	7
Total	**71**

Workshop structure

The workshop was held remotely over two half-day sessions on April 24-25, 2024, with 45 participants representing NOAA Fisheries, Council staff, academics, NGOs and other policy advocates around the nation. Workshop participants were recruited from the eight Regional Fishery Management Councils to reflect the many perspectives on EEJ and climate change challenges around the nation. Ultimately, the workshop was developed for fishery practitioners and not fishermen to inform how fishery practitioners gather and incorporate EEJ considerations into climate-resilient fishery policies and initiatives. This form of self-reflection allowed participants to share successes and challenges associated with identifying and developing adaptive management policies that improve engagement with underserved communities.

Day one of the workshop included a series of presentations to guide discussion (Table 7). The workshop commenced with a welcome presentation by EDF that summarized the goals and objectives, as well as ongoing climate and EEJ-related policy initiatives. NOAA Fisheries leaders then provided keynote presentations to offer additional context on the regional climate action plans, CEFI, and the EEJ National Strategy. Next, a handful of workshop participants delivered two series of 10-minute “spark talks” to set the stage for discussion, with a focus on how to improve the way fishery practitioners go about addressing the challenges of climate change and EEJ concurrently.

TABLE 7. Presentations and sessions used to guide workshop discussions.

Plenary	
On the Road to Climate Ready Fisheries and Fishing Communities	Roger Griffis, NOAA Fisheries
Equity and Environmental Justice in U.S. Federal Fisheries	Danika Kleiber, Pacific Islands Fisheries Science Center
Spark Talks: Climate-Resilient Fisheries in Light of EEJ	
Importance of Equity Considerations in Climate Resilience Strategies	Kathy Mills, Gulf of Maine Research Institute
Harvester Perceptions of Climate Vulnerability in the Northeastern U.S.	Jocelyn Runnebaum, The Nature Conservancy
Climate Change and Tribal Fisheries in Northwest Washington	Tommy Moore, Northwest Indian Fisheries Commission
Spark Talks: EEJ in Light of Climate Change Impacts	
Lessons Learned: Identifying, Analyzing, and Incorporating Multiple Knowledge Systems in the North Pacific	Kate Haapala, North Pacific Fishery Management Council
Overview of the Council Coordination Committee's Workgroup on EEJ	Rachel Feeney, New England Fishery Management Council
Responding to and Planning for Climate Change Impacts on Fisheries	Staff, National Marine Fisheries Service

Following each spark talk session, workshop participants were divided into pre-determined breakout groups balanced by practitioner, expertise, and region to discuss the presentations and other fishery initiatives surrounding the intersections of climate-resilient fisheries and EEJ. Participants were asked to highlight any challenges and opportunities with respect to different types of equity (e.g., recognitional, procedural and distributional). Each breakout group drafted a list of the challenges and possible solutions, and then discussed what has been effective or ineffective in their own work when ensuring climate-resilient fisheries initiatives are equitable and environmentally just. To end the day, each breakout group presented the most essential pieces of advice they would offer to improve the way fishery practitioners' approach EEJ under a changing climate.

Day two of the workshop continued with a recap of the day one discussions, followed by breakout group exercises to further refine the challenges and solutions previously identified. Each group was tasked with distilling their comprehensive lists into a shortlist of essential advice and best practices for fellow practitioners. Groups then identified key steps for applying and operationalizing their recommendations. Practitioners refined approximately 20 new best practices through additional breakout discussions, where they shared examples and supporting resources, emphasizing the need to balance environmental sustainability with social equity.

In the plenary session, each group presented their best practices, examples, and next steps. The workshop facilitator then consolidated these into an interactive slide, allowing participants to vote on the relevance of each practice. Participants collaboratively combined overlapping practices and provided additional context where needed to ensure clarity and completeness. This approach

highlighted how integrating EEJ principles into fisheries policies can help address the disproportionate impacts of climate change on vulnerable communities and ecosystems.

Participants then discussed the final list of draft best practices, focusing on how to address potential obstacles, such as engaging hard-to-reach communities, managing administrative tasks and reducing participation barriers, among many others. Participants also collectively provided supporting resources and examples of successful implementation. Finally, participants holistically adjusted the wording and order of the best practices to ensure each best practice was justified and logically sequenced. This process underscored the importance of integrating EEJ into all fisheries policies at inception, demonstrating how thoughtful, inclusive practices can lead to more equitable and effective climate adaptation strategies.

APPENDIX II: SURVEY TO INFORM BEST PRACTICES FOR EQUITABLE, JUST, AND CLIMATE-RESILIENT FISHERIES

This survey will be used to inform discussion at an upcoming workshop with fishery practitioners on identifying best practices for equitable, just, and climate-resilient fisheries. Through the survey, we hope to identify key challenges and priorities for how equity and environmental justice (EEJ) considerations should be incorporated into climate-resilient fishery policies and initiatives. All responses are anonymous.

Section 1 – Demographics

Question 1

How would you define your involvement within fisheries? Please check all that apply.

a. Commercial fisherman
b. Recreational fisherman (e.g., charter, for-hire, private angler)
c. Subsistence harvester
d. Fishery Manager
e. Fisherman/fishery representative
f. NGO representative
g. Dealer
h. Fishery supply/support industries (e.g., bait & tackle)
i. Seafood processor
j. Researcher/scientist
k. Other – Please fill in.

Question 2

Please write the state(s) or region(s) in which you work or fish.

Answer: _____

Section 2 – EEJ and Climate Resilience

NOAA and other organizations refer to **three** aspects of equity and justice:

1. **Distributional justice:** fair division of resources, benefits, or costs.
2. **Recognitional justice:** respect for diverse individuals' identities, including their rights, knowledge, and culture, in decision making.
3. **Procedural justice:** affected communities can meaningfully participate throughout decision-making processes.

Consider these three types of equity and justice in your responses below.

Question 3

The NOAA Fisheries EEJ Strategy has a primary goal of prioritizing "identification, equitable treatment, and meaningful involvement of underserved communities."

In your view, what or who are the underserved communities in your location? Examples might include immigrant populations, fishermen in rural or remote areas, people of color, women and girls, fish processors and distribution workers, etc.

Question 4

How has inequity or injustice affected your or other members of your community's ability to adapt to climate change impacts on fisheries? If you have not yet experienced climate impacts, you can speak about what you anticipate in the future.

Question 5

How have the impacts of climate change on fisheries (e.g., increased storms, sea level rise, shifting fish stocks) created or exacerbated injustice in your community (e.g., access to fish, ability to make a living)? If you have not yet experienced climate impacts, you can speak about what you anticipate in the future. You can speak personally or share examples you observe in your community.

Question 6

How have fisheries regulations, policies, or initiatives related to climate change (e.g. quota allocations, new closures, TAC adjustments) created or exacerbated injustice in your community (e.g., access to fish, ability to make a living)? If climate-related regulations, policies, or initiatives have not been implemented in your region, you can speak about what you anticipate in the future. You can speak personally or share examples you observe in your community.

Question 7

What positive or successful examples have you observed where efforts to promote equity promote climate resilience or vice versa? Please describe.

Question 8

What else would you like to share or expand upon related to your answers above?

APPENDIX III: WORKSHOP AGENDA

Best Practices for Equitable, Just, and Climate Resilient Fisheries

April 24-25, 2024

Day 1: April 24, 2024	
Eastern Time	**Agenda Item**
12:00 pm	**Welcome & Kickoff (20 mins)**
12:20 pm	**Opening Context (40 mins)**
1:00 pm	**Issue Background (45 mins)** Roger Griffis (NOAA Fisheries): On the Road to Climate Ready Fisheries and Fishing Communities Danika Kleiber (PIFSC): Equity and Environmental Justice in U.S. Federal Fisheries
1:45 pm	*Break (15 mins)*
2:00 pm	**Spark Talks - Climate Resilient Fisheries in Light of EEJ (45 mins)** Kathy Mills (GMRI): Importance of Equity Considerations in Climate Resilience Strategies Jocelyn Runnebaum (TNC): Harvester Perceptions of Climate Vulnerability in the Northeastern US Tommy Moore (Northwest Indian Fisheries Commission): Climate Change and Tribal Fisheries in NW Washington
2:45 pm	**Breakout Groups - Best Practices: Climate Resilient Fisheries in Light of EEJ (45 mins)**
3:30 pm	***Break (15 mins)***
3:45 pm	**Spark Talks - EEJ in Light of Climate Change Impacts (45 mins)** Kate Haapala (NPFMC): Lessons Learned: Identifying, Analyzing, and Incorporating Multiple Knowledge Systems in the North Pacific Rachel Feeney (NEFMC): Overview of the Council Coordination Committee's Workgroup on EEJ NOAA Fisheries Staff: Responding to and Planning for Climate Change impacts on Fisheries
4:30 pm	**Breakout Groups - Best Practices: EEJ in Light of Climate Change Impacts (45 mins)**
5:15 pm	**Closing Comments (30 mins)**
5:45 pm	***Adjourn Day 1***

Day 2: April 25, 2024	
Eastern Time	**Agenda Item**
12:00 pm	**Welcome & Kickoff (45 mins)**
12:45 pm	**Plenary Discussion - Developing Best Practices (45 mins)**
1:30 pm	***Break (15 mins)***
1:45 pm	**Breakout Groups - Applying Best Practices (45 mins)**
2:30 pm	**Breakout Groups - Supports and Resources (1 hr)**
3:30 pm	***Break (15 mins)***
3:45 pm	**Breakout Groups/Plenary - Addressing Obstacles to Implementing Best Practices (1 hr, 15 mins)**
5:00 pm	**Closing Comments & Next Steps (45 mins)**
5:45 pm	***Adjourn Day 2***

APPENDIX IV: SUMMARY OF VALIDATION INTERVIEWS

Background

In June 2024, Northern Economics conducted post-workshop interviews to validate the best practices developed from the workshop and to identify any equity or climate resilience issues or approaches that did not surface during workshop discussion. The interview feedback was used to refine the best practices.

Northern Economics worked with EDF to identify potential interviewees based on their involvement with federal fisheries management and connections to fishing communities, especially underserved populations. In total, 16 interviews were conducted with a range of stakeholders, tribes, and fishery management practitioners across the nation (Table 8). Of those, 4 were workshop participants and 12 were new to the project. The largest group of interviewees (6) were affiliated with fishery-focused community organizations. Regional Fishery Management Council-affiliated interviewees were the next largest group (5) followed by participants working with tribal organizations (3). One social-science fisheries researcher and one NOAA social scientist were also interviewed.

TABLE 8. Post-workshop interviewees by region. Potential interviewees in the Gulf of Mexico and Mid-Atlantic regions were contacted but unable to be interviewed.

Number of Interviewees by Region	
North Pacific	4
National	3
Pacific	3
New England	2
Caribbean	2
Pacific Islands	1
South Atlantic	1

Interview structure and feedback

During each interview, Northern Economics provided a brief overview of climate resilient fishery initiatives and how they relate to equity, then asked interviewees to identify any climate resilient fishery initiatives they were aware of. Generally, initiatives described were highly contextual to interviewee regions and fishery participation and included topics such as research and data integration, infrastructure and technology upgrades, adaptation, and community and stakeholder engagement. Interviewees were then asked to discuss any equity challenges they saw in how the climate resilient initiatives they described were designed or implemented. The most described issues

included policy and data mismatches, power imbalances and representation, lack of capacity and trust, barriers to participation, and use conflicts.

Interviewees were next asked to describe what actions, steps, or approaches they believe are needed to ensure that climate resilient fisheries are equitable and just, then asked to reflect on the validity of the workshop best practices. General comments on the best practices were mostly positive, with interviewees noting that they felt like they are valid practices for improving equity and environmental justice in fishery management. Overall, interviewees provided a wide range of perspectives on where they felt the best practices succeeded and on where they could use more clarification or expansion. Key takeaways included:

- Positive attributes of the best practices:
    - Promoting Traditional Knowledge sources
    - Empowering community engagement in management
    - Supporting community liaisons and relationship building
    - Increasing federal social science staffing/expertise
    - Placing the onus of increasing equity on practitioners rather than communities
- Potential areas of improvement:
    - Providing actionable steps and examples
    - Specifying practitioner and community roles
    - Providing supplemental tools for implementation
    - Distinguishing sovereign tribal and indigenous groups from other community groups
    - Clarifying or simplifying language
- None of the best practices felt redundant or unnecessary, however some potential gaps included:
    - The need to address management priorities
    - The need for management restructuring
    - Equity accountability mechanisms
    - The need to tailor approaches to local contexts and management systems
    - Avenues for policy engagement

To the extent possible, the key takeaways from the interviews were used to refine the best practices. This is most evident in the creation of the tactics tables for each best practice. Additionally, Best Practice 1 was created as a direct result of the interviews and the identified need for accountability.