frontiers | Frontiers in Marine Science

TYPE Review
PUBLISHED 03 February 2025
DOI 10.3389/fmars.2025.1473382

OPEN ACCESS

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RECEIVED 06 August 2024
ACCEPTED 13 January 2025
PUBLISHED 03 February 2025

CITATION
Bennett NJ, Relano V, Roumbedakis K, Blythe J, Andrachuk M, Claudet J, Dawson N, Gill D, Lazzari N, Mahajan SL, Muhl E-K, Riechers M, Strand M and Villasante S (2025) Ocean equity: from assessment to action to improve social equity in ocean governance. *Front. Mar. Sci.* 12:1473382. doi: 10.3389/fmars.2025.1473382

Ocean equity: from assessment to action to improve social equity in ocean governance

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Inequity is ubiquitous in the ocean, and social equity receives insufficient attention in ocean governance and management efforts. Thus, we assert that proponents of sustainability must center social equity in future ocean governance, to address past social and environmental injustices, to align with international law and conservation policy, and to realize objectives of sustainability. This obligation applies across all marine policy realms, including marine conservation, fisheries management, climate adaptation and the ocean economy, in all socio-political contexts and at different geographical scales. Indeed, many governmental, non-governmental, and philanthropic organizations are striving to advance social equity across their ocean sustainability focused agendas, policies, programs, initiatives, and portfolios. To date, however, there has been limited attention to how to meaningfully assess status and monitor progress on social equity in ocean governance (aka "ocean equity") across different marine policy realms. Here, we contribute to ongoing efforts to advance ocean equity through providing guidance on five steps to develop bespoke, fit to purpose and contextually appropriate assessment and monitoring frameworks and approaches to measure status of and track changes in ocean equity. These steps include: 1) Clearly articulating the overarching purpose and aim; 2) Convening a participatory group and process to co-design the assessment framework; 3) Identifying important objectives, aspects and attributes of social equity to assess; 4) Selecting and developing indicators, methods, and measures; and 5) Collecting, analyzing and evaluating data. Then, we discuss four subsequent steps to take into account to ensure that assessments lead to adaptations or transformations to improve ocean equity.

10.3389/fmars.2025.1473382

These steps include: 1) Communicating results to reach key audiences, to enable learning and inform decision-making; 2) Deliberating on actions and selecting interventions to improve ocean equity; 3) Ensuring actions to improve ocean equity are implemented; and, 4) Committing to continual cycles of monitoring, evaluation, learning and adapting at regular intervals. Following these steps could contribute to a change in how oceans are governed. The diligent pursuit of ocean equity will help to ensure that the course towards a sustainable ocean is more representative, inclusive and just.

KEYWORDS

ocean equity, ocean governance, marine policy, marine conservation, fisheries management, blue economy, adaptive management, monitoring and evaluation

1 Oceans and equity

Inequity is ubiquitous in the ocean. Global fisheries and fisheries in the high seas are dominated by a small number of nations (McCauley et al., 2018; Tickler et al., 2018; FAO, 2024). The rights, livelihoods and needs of small-scale fisheries are often undermined by industrial fishing fleets (EJF, 2022; Amnesty International, 2023; Andreoli et al., 2023). Broader ocean economy developments (e.g., oil and gas, aquaculture, deep sea mining, etc.) have followed a pattern of prioritizing wealth generation over producing social and economic benefits for local coastal communities (Cisneros-Montemayor et al., 2019; Österblom et al., 2020). At best, these developments have produced few jobs or economic opportunities for local communities (Stonich et al., 1997; Bergquist, 2007; Obi, 2010a, b; Ablo, 2015; Oteng-Ababio, 2018). At worst, this pattern has led to disruptive, harmful and polluting activities that have displaced communities, undermined livelihoods, undercut human health, and violated human rights (Blue Economy Tribunal, 2021; Bennett et al., 2021a; Blythe et al., 2023). Resource booms, elite tourism and amenity migration have given rise to gentrification, increased the cost of living, displaced local and marginalized user groups (e.g., small scale fishers, women), and led to privatization of public areas in coastal cities and towns (Spalding, 2013; Eduful and Hooper, 2015; Kadfak and Knutsson, 2017; García-Quijano and Lloréns, 2022). These and other social equity issues are often deeply entrenched and entangled with broader global and national politics, economic processes and entrenched power differentials (Gill et al., 2023).

Furthermore, ocean governance frameworks and sustainability management efforts have frequently neglected or insufficiently integrated social equity considerations (Bennett, 2018; Crosman et al., 2022; Claudet et al., 2024). Unfortunately, this disregard for social equity in ocean governance and management has often produced substantial negative consequences for coastal communities and further marginalized resource-dependent populations, rights-holders and vulnerable groups (Österblom et al., 2020; Jentoft et al., 2022; Blythe et al., 2023; Gill et al., 2023). For example, without attending to the equitable distribution of costs and benefits, the creation of Marine Protected Areas has often separated small-scale fishers and coastal Indigenous Peoples from areas and resources that they have historically used, relied on and managed - thus undermining their rights, livelihoods, food security and well-being (Jones, 2009; Brondo and Bown, 2011; Kamat, 2014; Cross, 2015; Sowman and Sunde, 2018). Similarly, fisheries management systems have frequently failed to consider the social implications of policies and management measures to decrease pressure and increase fish stocks (Stephenson et al., 2017; Parlee et al., 2021; Silver et al., 2022). Individual Transferable Quotas, for example, were designed to improve fisheries sustainability through reducing pressure on stocks and incentivizing stewardship – but have regularly led to financialization and corporate concentration in fisheries, while simultaneously undermining local economic benefits and jobs in coastal communities (Pinkerton and Edwards, 2009; Carothers et al., 2010; Chambers et al., 2017; Edwards and Pinkerton, 2019). However, such exclusionary practices and negative social impacts are not inevitable - when judiciously applied, integrating social equity considerations into marine conservation, fisheries management, climate adaptation and ocean economy developments can produce positive outcomes for coastal communities and populations and concurrently enhance sustainability (Capistrano and Charles, 2012; Cohen et al., 2019; Österblom et al., 2020; Bennett et al., 2021b; Sandbrook et al., 2023).

In recent years, there is increasing attention to the need to address social equity considerations in ocean governance and sustainability management (Bennett, 2018; Österblom et al., 2020; Crosman et al., 2022; Claudet et al., 2024). The interest can be at least partly attributed to longstanding and continuous efforts by Indigenous Peoples and civil society movements to raise the profile of past injustices and to advocate for greater attention to the rights, needs, voices, livelihoods and well-being of small-scale fishers, coastal communities, and other structurally marginalized groups across all marine policy domains (Charles et al., 2016; Pinkerton, 2017; Ertör, 2021; Jentoft et al., 2022; Mills, 2022; Blythe et al.,

2023). Rising tensions over dwindling resources due to climate change, overharvesting and resource degradation have brought equity and justice concerns further to the fore (Bennett et al., 2023). Among ocean focused professionals, there is also a growing understanding that addressing procedural and distributional equity issues is instrumental to the long-term success of conservation and sustainability efforts - as greater equity can reduce conflict, improve legitimacy and increase support (Österblom et al., 2020; Bennett et al., 2021b; Gurney et al., 2023). Furthermore, it is recognized as a moral and legal obligation to apply commonly accepted principles and internationally recognized doctrine related to human rights, social equity, and good governance in ocean governance, management and conservation efforts (FAO, 2015; Bennett et al., 2017; Kittinger et al., 2017; Smallhorn-West et al., 2023). Efforts to address social equity have thus arisen in all marine policy domains, including marine conservation (Hill et al., 2016; Gill et al., 2019; Bennett et al., 2021b), fisheries management (Capistrano and Charles, 2012; Hanich et al., 2015; Doering et al., 2016; Quimby and Levine, 2018; Das, 2023; Furman et al., 2023), climate adaptation (Sovacool et al., 2015; Araos et al., 2021; Eriksen et al., 2021; Tubridy et al., 2022), and the ocean economy (Cisneros-Montemayor et al., 2019; Österblom et al., 2020; Bennett et al., 2022), in different contexts and at various scales. Numerous governments, non-governmental organizations, and philanthropic organizations are also exploring how to better incorporate social equity considerations into their agendas, policies, management efforts, programs, and funding portfolios that focus on the ocean. In this paper, we often use the term 'ocean equity' as shorthand for this focus on social equity in ocean governance and sustainability efforts.

To date, however, there has been limited attention to how to measure status and track progress on social equity in ocean governance and sustainability management. While a number of analytical frameworks and sets of indicators to assess and improve social equity in conservation and environmental management have been proposed (Schreckenberg et al., 2016; Zafra-Calvo et al., 2017; Franks et al., 2018; Engen et al., 2021; Bennett et al., 2021b), a one-size-fits-all approach will not suffice for all social situations and policy contexts. Efforts to assess and monitor social equity need to be adapted to different marine policy domains, attentive to diverse social contexts, integrated with other monitoring systems and decision-making processes, and applicable at various scales. Here, we contribute to ongoing efforts to advance ocean equity through providing guidance on key steps for developing a bespoke, fit to purpose, and contextually appropriate assessment framework and process to measure status of, track changes in, and make improvements to ocean equity. Then, we discuss key considerations to take into account to ensure that assessments lead to adaptations, innovations, or transformations to improve ocean equity.

2 Assessing social equity

The literature on equity is vast. Here, we highlight a few specific points from this broad body of literature that are salient to the development of a framework and process for assessing social equity.

First, equity is a societal ideal (like democracy or human wellbeing) that has been endlessly examined by philosophers and scholars. While an in-depth review of the breadth of the literature is beyond the scope of this paper, a few introductory points regarding the definition of, contextually contingent nature of and key considerations related to equity are important for context. In simplest terms, equity refers to fair and just conditions and treatment of people – for example, in the development, application or outcomes of a law or policy (McDermott et al., 2013; Bennett et al., 2021b). But what constitutes equitable, fair and just is a matter of both philosophical debate and socio-cultural differentiation. While some might hold that equitable treatment is synonymous with equal treatment, other philosophical positions hold that consideration of equity should be based on utility, proportionality, merits, needs, or rights (Sikor et al., 2014; Franks et al., 2018; Bennett et al., 2019). Such philosophical underpinnings are often unrecognized in the various societal approaches that are adopted to promote human well-being or are implicit in public policies that seek to advance equity (Bennett et al., 2019). Furthermore, different social and cultural groups may judge equity differently based on local norms and customs (Dawson et al., 2018; Gurney et al., 2021; Lau et al., 2021). Another important point is that social equity is broadly understood to include distributional (i.e., fairness in the outcomes and impacts of decisions), procedural (i.e., fairness in who is involved and how decisions are made) and recognitional (i.e., fairness in acknowledgement and incorporation of diverse rights, values, and visions) considerations (Chan and Satterfield, 2013; Gill et al., 2019; Ruano-Chamorro et al., 2022). Distributional equity considerations are associated with allocation of public goods and services - both in terms of the aggregate (positive or negative) impacts on societal wellbeing, as well as distribution of those impacts within and among groups. Procedural equity considerations are associated with concerns for principles of democracy (e.g., upward control, political and legal equality) as well as good governance (e.g., principles of autonomy, sovereignty, voice, transparency, and accountability). Recognitional equity considerations are associated with ensuring that the dignity of diverse groups (e.g., Indigenous Peoples, small-scale fishers, rights holders, women) are respected, and duties of responsibility to them upheld, through acknowledging and integrating their rights, cultures, values, and visions.

Second, past literature related to social equity provides a strong foundation for developing guidance and monitoring approaches related to ocean equity. Such theoretical thinking has been applied to various fields of environmental management - including in recent scholarship on payments for ecosystem services (McDermott et al., 2013; Pascual et al., 2014), terrestrial and marine protected areas (Schreckenberg et al., 2016; Zafra-Calvo et al., 2017; Franks et al., 2018; Bennett et al., 2021b), fisheries management (Hanich et al., 2015; Doering et al., 2016; Quimby and Levine, 2018; Furman et al., 2023), and ocean governance (Österblom et al., 2020; Alexander et al., 2022; Crosman et al., 2022). This recent body of work has often drawn heavily from scholarship on environmental justice (Schlosberg, 2009; Walker, 2012; Schlosberg, 2013; Agyeman et al., 2016), which similarly emphasizes substantive outcomes and procedural considerations,

and on literature related to other related topics such as good environmental governance (OECD, 1995; Elahi, 2009; Lockwood, 2010) or economic equity theories (Atkinson, 1970; Sumaila and Walters, 2005; Pearce et al., 2006). Scholars and practitioners have sought to extend this thinking through advancing comprehensive theoretical frameworks for understanding the various aspects of equity - which have variously included recognitional, procedural, distributional, management, environmental, and contextual equity (see Figure 1 for definitions). McDermott et al. (2013) first proposed a framework for social equity that includes procedural, distributional, and contextual equity. Subsequent frameworks emphasized the importance of recognitional equity as a foundation for achieving procedural and distributional equity (Pascual et al., 2014; Schreckenberg et al., 2016). Bennett et al. (2021b) add to this through advocating for greater attention to management equity and environmental equity.

Third, various approaches have been operationalized and applied to assess or monitor social equity in conservation and environmental management. While some have addressed singular aspects (e.g., economic distribution), many studies have adopted the three part theoretical analytical framework that includes the recognitional, procedural and distributional aspects of equity (Dawson et al., 2018; Zafra-Calvo et al., 2019; Bennett et al., 2020; Engen et al., 2021). For example, several research groups have proposed and/or empirically applied these three aspects of equity to assess the management of protected areas (Dawson et al., 2018; Zafra-Calvo et al., 2019; Bennett et al., 2020). Zafra-Calvo et al. (2019) extended the framework to a global study of protected areas, relying on expert assessments to quantify levels of equity. Bennett et al. (2020) conducted a survey of small-scale fishers' perceptions of equity in marine protected areas in the Mediterranean Sea. A similar survey approach has also recently been developed by Engen et al. (2021), who applied the same three aspects of equity to assess what they called "blue justice for small-scale fishers" within coastal zone planning and management processes. In general, the equity assessment processes and indicators are developed by external actors based on existing frameworks rather than through bottom-up and participatory processes, which is fairly common for assessment, monitoring and indicator development (Muhl et al., 2022). Furthermore, the research methods and sampling approaches differ substantially across empirical studies - ranging from qualitative to quantitative methods, and including expert assessments, stakeholder assessments, focus groups and surveys.

Fourth, the broader literature points to the need for adaptations, innovations, transitions and/or transformations in order to achieve more equitable ocean governance (High Level Panel for a Sustainable Ocean Economy, 2020; Rudolph et al., 2020; Bennett, 2022; Crosman et al., 2022; Lombard et al., 2023; Claudet et al., 2024). However, there is no broad agreement on the types of actions that might need to be taken. In order to achieve more equitable ocean actions, there needs to be a clear and contextually relevant pathway between assessments of equity and decision-making processes in order to foster the changes that are needed (Villasante et al., 2021). Otherwise, there is a danger that equity assessments can be co-opted to support business-as-usual practices and promote one-size-fits-all solutions. To date, there is little evidence that shows that past equity assessments are achieving their potential to contribute to either meaningful adaptations or transformative change to improve social equity in ocean governance. The empirical papers that we reviewed present results but do not discuss how insights were shared, deliberated on, or integrated back into ocean governance, management, programs or funding.

In sum, there have been substantial advances in the literature on assessing social equity – yet, not one framework, monitoring

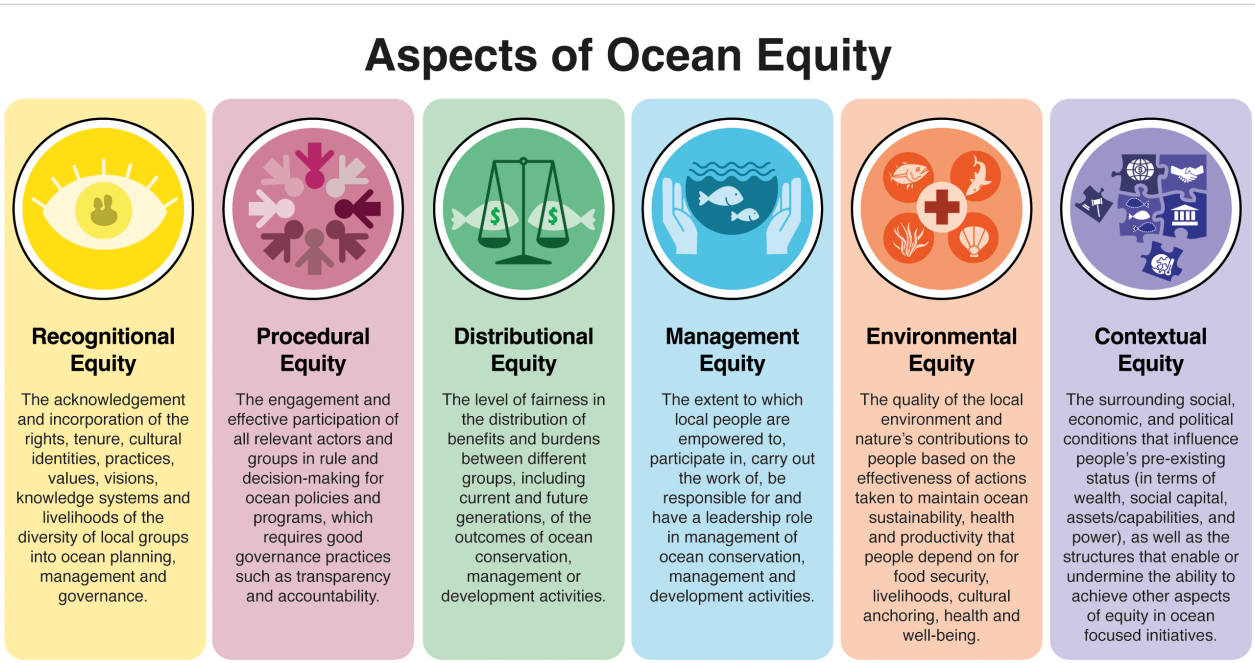

FIGURE 1
Definitions of various possible aspects of ocean equity (adapted from (Bennett et al., 2021b; Bennett, 2022)).

approach, or set of indicators can be applied to assess all marine policies, social contexts, or geographical scales. Ensuring that ocean equity assessment frameworks are fit for context and purpose is a challenge that we seek to address here through providing guidance related to key steps in the process. We also provide guidance on key steps to ensure equity assessments are better used to produce corrective actions — in other words, to inform adaptations, innovations, transitions and transformations in ocean governance and sustainability efforts to advance equity. The key steps to achieve both aims are summarized in Figure 2 and further explored in the following sections.

3 Developing a fit to purpose and context ocean equity assessment framework and approach

This section provides guidance on 5 key steps for the development of bespoke, fit to purpose, and contextually appropriate assessment frameworks and approaches for social equity in ocean governance. These steps include the following:

1. Establish scope and purpose: clearly articulating the overarching purpose and aim.
2. Convene and co-design: convening a participatory group and process to co-design the assessment framework.
3. Define objectives and attributes: identifying important objectives, aspects and attributes of social equity to assess.
4. Develop indicators and methods: selecting and developing indicators, methods, and measures.
5. Assess and evaluate: collecting, analyzing and evaluating data.

Although numbered, these steps will necessarily need to be an iterative process to ensure that all decisions and key elements of the ocean equity assessment framework mesh together (Figure 2).

3.1 Establish scope and purpose: clearly articulating the overarching purpose and aim

A first key step is to articulate the overarching purpose and aim guiding the development of the social equity assessment process. This clarity from the start on the focus of the assessment and what the process hopes to achieve will provide clear "goal posts" for those involved at all subsequent stages in the process. A clearly articulated purpose/aim can also help to identify the type of assessment or monitoring process that might need to be employed - which can include contextual or baseline assessments, ambient monitoring, management evaluation, performance measurement, impact assessment, historical analysis, predictive assessments, or

FIGURE 2
Key steps in developing an ocean equity assessment framework and moving from assessment to action to improve social equity in ocean governance.

synthetic analysis (Table 1) (Franks and Vanclay, 2013; Mascia et al., 2014; Bennett et al., 2021c). Potential examples of statements of purpose include: "To understand the current status of gender equity in blue economy initiatives in [location - nation or region] to inform government policies and programs that aim to create more inclusive coastal development."; "To assess the impact of [a specific program or project] by [organization name] on social and economic outcomes in a [specific] fishery in order to improve [program or project] design."; "To monitor equitable governance in [a marine protected area or network] over time to inform corrective adaptations by MPA managers."; or, "To examine from the perspective of various groups [within a local community or in a region] how they perceive the level of fairness of decision-making processes in a [community-based, co-managed, or government-led] fishery in order to improve governance."

Co-developing the purpose and aim with a broad working group that is locally led or that includes local representatives where the process is externally led can help to ensure that it is tailored to diverse local interests and concerns. However, we note that an initial articulation of the purpose and aim for creating a social equity analysis framework and indicators may need to occur prior to or in tandem with identifying participants and collaborating on the creation of a social equity analytical framework and indicators; regardless, the purpose should be revisited and aim clarified and adjusted accordingly once the participant group is established. We propose answering the following set of questions (adapted from Crosman et al., 2022) with those involved:

- What? - What is the scope in terms of the focal realm(s) of ocean governance (e.g., fisheries, marine conservation, blue economy, multiple) and in terms of the specific policy, project, program or sector to be addressed? What is the central equity concern that is of interest in relation to that policy, project, program or sector?
- Where? – In what location and at what geographical scale? (e.g., local, sub-national, national, transnational, regional, global).
- Who? – Who are the proponents of and who is leading the social equity assessment? Who should be involved in conducting it? (e.g., community organization, government, NGO, funder).
- Why? – What is the aim or end goal of the assessment? How will insights be used? How will it serve local people's interests and needs? (e.g., assess status to design a program, forecast impacts of a management intervention, understand impacts of a policy, assess progress towards achieving the target of a funder, reflect on achievement of community goals, enable comparison and learning across sites or interventions).
- When? - At what stage of an ocean governance process is equity being considered and analyzed? (e.g., before, during, after, ongoing, multiple time frames).
- Whom? - Which group or groups is/are the focus of analysis (to identify the social scale and unit(s) of analysis)? Equity for and among whom?

The responses to these questions can then be used to formulate the overarching purpose and aim statements (as articulated in the examples above) to guide the process of creating an assessment framework and to shape the approach (the how) for assessing ocean equity. The responses, purposes, and aims should be revisited once again with the participants in the group established during the subsequent step - this will be key to ensuring a broadly agreed foundation for co-producing the equity assessment framework.

TABLE 1 Various types of assessments or monitoring and evaluation processes (Adapted from (Franks and Vanclay, 2013; Mascia et al., 2014; Bennett et al., 2021c)).

Type of Assessment	Description
Contextual or baseline assessment	Documentation of the status of specific variables or conditions at a moment in time.
Ambient monitoring	Systematic observation of the status of and changes in conditions over time.
Management evaluation	Measurement of the management inputs, activities, and outputs to assess strengths, weaknesses and needs.
Performance measurement	Measurement of implementation or progress toward specified project, program, or policy objectives, including inputs, activities, processes, outputs and outcomes.
Impact assessment	Rigorous and systematic assessment of the causal effects of a policy, program, project, activity, or investment.
Historical analysis	Study of the past to understand ambient changes in specific conditions or the impacts of historical events, management activities, or interventions.
Predictive assessments	Application of future oriented methodologies (e.g., scenario planning, forecasting, structured decision-making) to identify and forecast the future impacts of potential interventions and deliberate on alternatives.
Synthetic analysis	A structured and rigorous analysis of data from more than one case study or location or a meta-analysis of published studies to collate and synthesize empirical evidence and draw out broad lessons.

3.2 Convene and co-design: convening group and participatory processes to co-design the assessment framework

The design of assessment frameworks and processes for social equity should be done in a participatory and collaborative fashion to ensure that objectives, attributes, indicators and outputs are tailored to the social and policy contexts where ocean policies, programs, or investments are applied. Participatory monitoring and evaluation (PME) is a common practice across numerous fields that enables the co-production or co-design of monitoring frameworks, indicators and knowledge products - which can increase the contextual relevance of analytical frameworks and indicators and the legitimacy of the results. High levels of participation among broad rights and stakeholder groups, ensuring that their diverse perspectives and knowledge is integrated into and can influence the process, can maximize the usefulness of outputs for decision-making and promote social learning among those involved (Gowda, 2012; Cockburn et al., 2019; Norström et al., 2020; Chambers et al., 2021; Luján Soto et al., 2021). Yet participation, if not done well, can also be co-optive and coercive (Cooke and Kothari, 2001) or result in the "illusion of inclusion" (Few et al., 2007); thus attention is needed to representation, process quality and power (Flannery et al., 2018). Representation refers to the adequate involvement of rights holders, knowledge holders, and stakeholder in the process - which will differ substantially based on the proponent, purpose, and scale of the assessment. Stakeholder mapping and analysis can help to identify key groups who are implicated and should be involved in an expert or working group to co-design the process (Mitchell et al., 1997; Reed et al., 2009). Establishing selection criteria for involvement in the expert working group can help to ensure that there is a balanced mix of groups and knowledge holders to co-design the framework and indicators. Steps should be taken to ensure those who are most impacted by the studied policy or initiative, and to whom implementers have duties of responsibility - including rights holders, resource users, and potentially marginalized groups (e.g., Indigenous Peoples, women, youth) - are involved in defining the process and what matters to them (Rivers et al., 2023). Of course, this will be more challenging if the scale of the initiative being studied is larger. Importantly, convening a participatory group and process provides an opportunity to ensure that the group(s) or population(s) being evaluated is supportive of the evaluation.

Consideration should also be given to the quality of participation processes to ensure that all voices are heard and perspectives are taken into account. Important considerations include trust and relationship building (which takes time), timing of workshops, language, cultural awareness, skilled facilitation, and groups size (Cvitanovic et al., 2021; Strand et al., 2022a; Rivers et al., 2023). Specific attention is needed to power - including material, structural, and discursive dimensions - that can interfere with meaningful participation, impede access to information, create differences in voice and influence, impede the integration of different knowledge systems and disrupt efforts to co-develop frameworks and indicators (Few et al., 2007; Flannery et al., 2018). Otherwise, "power grabbing" or hijacking of the process can occur by specific individuals or groups (Horcea-Milcu et al., 2022) or some groups may not have the capacity and agency to truly influence the process (Rivers et al., 2023). This may, in turn, produce assessment processes that mirror existing power inequalities and reinforce inequitable governance through closing rather than opening up possibilities to enhance equity. Separate fora may be needed to create space for various groups whose voices may otherwise be marginalized (Sowman et al., 2021; Stephenson et al., 2021; Strand et al., 2022b). One way to overcome some of the challenges of participation is ensuring that a solid ethical grounding and principles are at the foundation of co-production processes - for example, this might occur by starting with co-developing protocols around how engagement and participation will take place, what responsibilities and contributions are expected of various actors, timelines for the project, who should receive honorariums, and how and by whom the data that will be collected will be stored, accessed and used (Muhl et al., 2023).

3.3 Define objectives and attributes: identifying important objectives, aspects, and attributes of social equity

Proceeding with identifying or articulating the objectives of the ocean policy, program, or initiative being studied can help to guide the subsequent pinpointing of aspects, attributes and indicators of equity that will be the focus of analysis or monitoring (Figure 3) (Biedenweg et al., 2014; Breslow et al., 2017). Good objectives are clear, well-defined, specific, measurable, achievable, realistic, and may be time-bound. Objectives related to the advancement of social equity may already be explicitly stated in government policy documents, non-governmental organization programs, industry investments, or funding portfolios. In this case, objectives can simply be identified from available policy mandates or program materials. If not, equity related objectives related to focal ocean governance, management activities or programs should be collaboratively developed and articulated by the group.

Related and relevant aspects of equity might include any combination of recognitional, procedural, distributional, management, environmental and contextual or structural equity (Figure 1) (McDermott et al., 2013; Pascual et al., 2014; Bennett et al., 2021b). We offer the six aspects in Figure 1 for consideration, but discourage wholesale adoption of any framework without careful deliberation on what matters in that particular social and policy context. While not all aspects and attributes of equity will be relevant to all contexts, we encourage groups to deliberate carefully and ensure that due consideration is given to all potential aspects so that no hidden or difficult issues are rendered invisible. For example, recognitional equity may be a highly sensitive topic - as certain groups, their rights, cultural uses and knowledge systems may have been historically marginalized in ocean governance (Jones et al., 2017; Reid et al., 2020; Peer et al., 2022). Consideration and assessment of historical and ongoing contextual or structural inequities may be necessary to understand how context-specific inequities persist at the level of individual initiatives or for some groups - for example, state laws and policies can lead to the

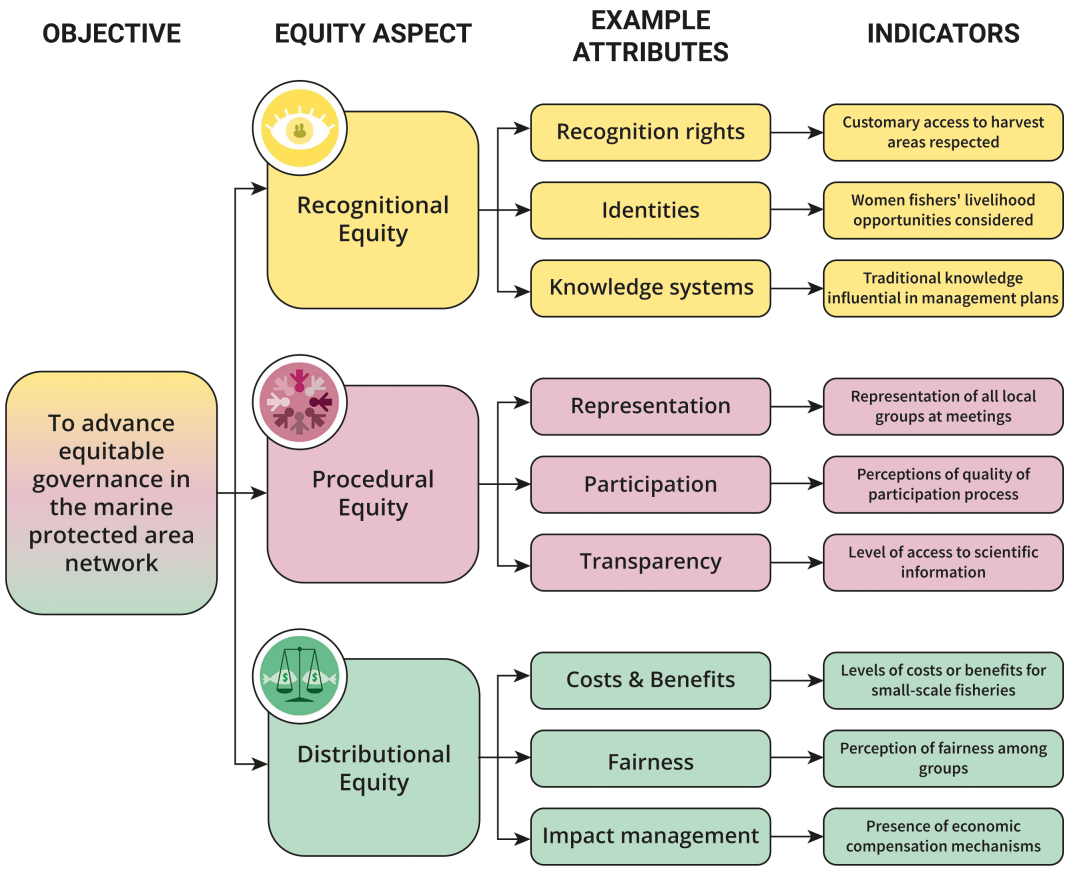

FIGURE 3
Diagram of hypothetical example showing how indicators are selected based on pre-defined objective, relevant aspects and important attributes of equity.

continued exclusion of customary institutions (Vaughan and Ayers, 2016; Christoffels-DuPlessis et al., 2022; Fischer et al., 2022; Reeder-Myers et al., 2022) and poverty or wealth inequities in the broader populace can stymie efforts to improve local economic conditions (Dasgupta and Beard, 2007; Tumusiime and Sjaastad, 2014). Moreover, the equity assessment framework will depend heavily on who is leading the assessment and whether those individuals are willing and able to consider all relevant aspects. For example, rights held by specific social or cultural groups that have a statutory basis, and the duties of other actors to uphold them, should be articulated within objectives and not overlooked. Assessments of often neglected aspects such as recognitional equity are dependent on the assessors not having inherent biases - and being willing to take a broad set of considerations and other perspectives into account.

Then, once the group identifies the objectives and equity aspects of interest, working group participants can collaboratively identify socially, culturally and contextually important attributes that are relevant to the realm of ocean governance under scrutiny (Breslow et al., 2017). For example, if the objective is to promote fairness in allocation of and benefits from fisheries, and a focal aspect of this is distributional equity - then important and relevant attributes might be related to livelihoods, access, impacts and benefits, or equitable outcomes (Table 2). Criteria for good attributes includes that they are understandable, unambiguous, directional (better or worse), operational and comprehensive (Keeney and Gregory, 2005). Grounding the choice of attributes, as well as related indicators and measures, in local cultural norms or principles can help to ensure relevance and buy-in (Pomeroy et al., 2005; Kourantidou et al., 2020). For example, the Gwaii Haanas Gina "Waadluxan KilGuhlGa" Land-Sea-People Management plan is grounded in Indigenous (Haida) principles and was co-developed by the Haida Nation and the Government of Canada in collaboration with local communities, rightsholders and stakeholders (Muhl, 2023). By using principles grounded in Haida law, goals, objectives and targets from which indicators could be drawn were co-developed (Muhl, 2023). The assessment framework - including chosen objectives, attributes, and indicators - might also be socialized and consulted on in the broader community to ensure relevance and increase legitimacy.

3.4 Develop indicators and methods: selecting and developing indicators, methods, and measures

Indicators are a measurable element that shows the quality, state, level, position or trend related to an object, subject or topic of study or observation (OECD, European Union and European

TABLE 2 Potential attributes related to the various aspects of social equity (from a review of the literature, see reference document in Supplementary Materials).

Aspects	Potential Attributes
Recognitional Equity	Rightsholders and stakeholders; Human and Indigenous rights; Rights, access and tenure; Cultures, values, practices; Knowledge systems; Diverse worldviews, perspectives, needs; Marginalized groups; Sovereignty, autonomy, and self-determination
Procedural Equity	Participation; Inclusion and representation; Marginalized groups; Voice; Influence; Local capacity and agency to engage or lead; Transparency; Free, prior and informed consent; Accountability; Access to justice; Grievance and remedy; Conflict resolution; Trust; Fit to context; Adaptive; Collaboration; Legitimacy
Distributional Equity	Impacts and benefits; Wellbeing; Livelihoods; Equitable distribution within and among groups; Perceptions of fairness; Impact reduction, mitigation, management; Opportunities and actions to increase benefits
Management Equity	Participation or engagement in management activities; Local responsibility or leadership in management; Local capacity for management; Local knowledge in management; Supportive rights and policy; Financial mechanisms for local management
Environmental Equity	Efficacy of conservation actions; Adequacy of management; Effectiveness of management; Environmental quality; Local environmental benefits and ecosystem services; Access to environmental benefits
Contextual or Structural Equity	Economic poverty and inequalities; Political marginalization; Social norms and institutions; National governance frameworks; Environmental and conservation governance frameworks; Conservation organizations and institutions

Commission, Joint Research Centre, 2008; Breslow et al., 2017). Indicators are measurements that highlight what is deemed important: "Conversely, that which is not measured can disappear from public debate and political consciousness" (Hicks et al., 2016). For example, research with coastal managers in South Africa found people saying that "If it's not on a map or in an Excel sheet, it doesn't exist" [(Rivers et al., 2023, p. 11)]. Those developing assessment frameworks often start with the identification of indicators by external actors in a top-down fashion. However, this is "putting the cart before the horse". The selection of indicators and associated measures should follow on from the participatory development of objectives, aspects and attributes of interest and importance as outlined above (see also Figure 3) (Biedenweg et al., 2016; Breslow et al., 2017; Dacks et al., 2019). This helps to ensure there is a clear rationale for each indicator, and that decisions can be clearly and transparently communicated.

Selecting or designing good and appropriate indicators is as much an art as a science to ensure they adequately respond to diverse priorities, are user friendly, and match local realities. Developing appropriate indicators requires an iterative and collaborative process of identifying and selecting candidate indicators, choosing methods, and then defining specific measures. Moving from the broad assessment framework to the selection of good and appropriate indicators requires that candidate indicators are first identified and then screened. As a reference for those identifying indicators of social equity, we reviewed the literature for social equity indicators and are providing it as a supplement to this paper (see Box 1 for more information; Supplementary Materials). Screening criteria for choosing good indicators might include, for example, whether they are socially important, contextually relevant, clearly linked to attributes of interest, related to the realm of ocean governance being examined, conceptually valid, understandable, measurable, and conform to rules for good scales (i.e., represent full range, have clear directionality, show clear ratio of differentiation across levels) (Keeney and Gregory, 2005; Biedenweg et al., 2017; Breslow et al., 2017). Logistical considerations - such as available data, level of cost-effectiveness, feasibility, and methods - will also need to be factored in (Bennett et al., 2021c). Co-developing a transparent screening (i.e., inclusion/exclusion) criteria with all relevant parties can be an effective and transparent way to select appropriate and grounded indicators (Béné et al., 2019). Selection criteria can then be applied to rate candidate indicators in order to facilitate final identification (Breslow et al., 2017). Several studies that exemplify varied approaches to the collaborative and stepwise indicator development process described here include the development of: Indigenous community health indicators related to environmental change (Donatuto et al., 2014); human wellbeing indicators related to watershed management in Puget Sound (Biedenweg et al., 2014), biocultural diversity indicators in resource management in the Pacific Islands (Dacks et al., 2019), socio-cultural principles and indicators related to nearshore marine conservation and

BOX 1 Review and reference document of indicators related to social equity

As a reference for those developing ocean equity indicators and measures, we carried out and provide a review of the literature (see the Supplementary Materials) to identify candidate indicators for measuring social equity at different scales (e.g., site level, national level) related to the fields of marine conservation, environmental management, and fisheries management. The review identified 53 relevant studies and produced a reference list of 593 indicators, which we categorized under various aspects and sub-attributes of equity (Table 2). We note that there is some overlap as some indicators fit and were listed under multiple aspects or attributes. The indicators varied substantially in terms of type, application, method, data and scale of application. This document is comprehensive, but not exhaustive, and is thus intended as a starting point for the development of social equity monitoring and evaluation frameworks and indicators that can be applied to assess equity in initiatives across different marine policy realms and at various scales. Indicators can be explored and examined by aspect, attribute, type, method, scale, data, previous application, or reference. Some aspects and attributes of equity were well covered in the review, while indicators for other aspects and attributes were scant or missing. Thus, new or modified indicators may also need to be developed for additional attributes, specific policy domains, scales, or social contexts.

management in Hawai'i (Tait et al., 2024), and ecosystem-based management indicators in Haida Gwaii (Muhl, 2023).

Indicators are operationalized using diverse methods and measures. Social equity assessments might employ quantitative (e.g., surveys, analysis of census data), qualitative (e.g., interviews, focus groups), participatory (e.g., arts-based methods, participatory action research), or a combination of methods (e.g., mixed methods approaches that use both interviews and surveys). Mixed methods might also be used in a sequential fashion - for example, initial qualitative interviews can inform survey design and sampling strategies, quantitative surveys can be followed by interviews and focus groups to explore patterns, explain changes or elaborate on perceptions or trends (Åkerblad et al., 2021). The choice of appropriate methods to employ will depend on many factors - such as the scale of the study, the social unit of analysis, the skills of the team conducting the assessment, the time frame, available data and budget. Moreover, it is mandatory that a suitable methodological approach is devised that will meet the overarching purpose of the assessment and that is suited to the social context. It is also important that the choice of methods is not driven by predetermined ontologies (ways of being in the world) and epistemologies (ways of knowing the world), and related assumptions about one right way to do research (Moon et al., 2019, 2021). Western forms of knowledge tend to dominate monitoring efforts and related decision-making processes, which can lead to a focus on easily measurable and quantifiable variables that emphasize narrow objectives at aggregate scales (Cash et al., 2006; Tengö et al., 2014; Niner et al., 2024). This can lead to indicators that are not place-based and methods that are not context-sensitive, and thus ill-represent lived experiences and undermine local ways of knowing (Keikelame and Swartz, 2019). Kourantidou et al. (2020) argue that successful indicators can help to bridge multiple types of knowledge and facilitate locally grounded actions, further stressing the importance of ensuring they are fit-to-context. At the same time, it is important to balance the need to develop grounded indicators that represent local realities with not overburdening local communities and participants with time and energy intensive methods. So, it will be important to consider whether there are more efficient and less intrusive methods that serve the purpose of the assessment.

Finally, measures are the specific unit, metric, scale, or narrative description that is applied to document and communicate the size, amount, level, quality, degree, or effect for an indicator. There are often various measures that might be used for the same indicator. Measures, for example, might be qualitative or quantitative depending on the methods being employed in the assessment process. Importantly, there are innovative ways to develop measures for hard to measure and intangible topics - such as aspects of cultural heritage, social relations, well-being, or good governance - associated with social equity (Satterfield et al., 2013; Gregory et al., 2023). While some indicators lend themselves to natural measures (e.g., age can be measured in years lived) or proxy measures (e.g., nutritional security can be measured using childhood stunting), other measures might be constructed based on the careful articulation of, classification of, and assigning importance to, multiple important elements (Keeney and Gregory, 2005; Satterfield et al., 2013). For example, culture is a complicated concept related to recognitional equity - which might require a constructed scale to be created that combines perceptions of recognition of and integration of cultural institutions, identities, values, knowledge systems, and practices in ocean governance.

3.5 Assess and evaluate: collecting and analyzing the data

Prior to collecting the data, it is important to consider study design, logistical considerations, research ethics and data ownership/sovereignty. Foundational study design considerations include desired sample population, sample size, and representation of various groups, which will vary substantially by methods (e.g., interviews, focus groups, surveys, participatory or arts-based) and the spatial scale of the research study. For example, a quantitative survey of socially differentiated impacts of social equity of a marine protected area network at a subnational level will have to consider sample size, randomness and representativeness of the sample, the need for counterfactual control groups or sites, and statistical power needed to limit bias and ensure comparisons can be made across user groups (Gill et al., 2019; Christie et al., 2020; Ruano-Chamorro et al., 2024). Based on the study design, logistical considerations will need to be planned and arranged - including the size of the team needed, travel, the research budget, the timeline and data management. Inclusion and training of local collaborators as co-researchers or research assistants should be considered - as long as this does not lead to the downloading of the burden for data collection onto local communities, particularly without adequate reimbursement for time, effort and expertise.

Research ethics should be taken into account in all studies that involve human subjects - and include consideration of the balance of risks and harms, prior and informed consent, and anonymity and confidentiality of participants' data - regardless of whether there are established institutional reviews required (Israel and Hay, 2006). Another important aspect to consider prior to and during data collection is whether there are existing ethical frameworks within a specific society, context or Indigenous group that need to be followed. Some Indigenous groups, for example, have existing protocols in place for research, already considering aspects such as ethics, consent, design, purpose and ownership (Chilisa, 2019; Wilson, 2020; Tuhiwai-Smith, 2021). These are critical considerations for 'decolonizing' the research processes of the past that have often been conducted without meaningful participation and consent of Indigenous Peoples and other traditional communities, and as a result reinforced dominant power structures through research and produced negative impacts for these groups (Tuhiwai-Smith, 2021). Moreover, researchers have an ethical responsibility to ensure that the research does not cause any harm to Indigenous Peoples and that free, prior, and informed consent is obtained for all stages of the research process (Ignace et al., 2023). Beyond formal requirements, additional ethical requirements include attention to building trusting relationships with project partners and research participants, ensuring adequate capacity for meaningful collaboration, managing expectations of

research, ensuring methods allow for ease of expression, and considering representation and voice (Chilisa, 2019; Wilson, 2020; Tuhiwai-Smith, 2021). Shared ownership of the data collected from the study is also something to be negotiated, especially when Indigenous Peoples and other traditional communities are part of the research to preserve their data sovereignty (Paul-Burke et al., 2022; Ignace et al., 2023).

After collecting the data, it should be analyzed and presented in a way that supports the achievement of the overarching purpose and aim of the ocean equity assessment (Thiault et al., 2021). This might require different analytical approaches - for example, descriptive analysis to communicate present perceptions of equity, rigorous impact assessments to understand impacts of interventions on equity (Ferraro and Hanauer, 2014; Baylis et al., 2016), or analysis of social differences to understand distributional impacts among groups. Analysis might also go beyond describing the data to exploring the how and why - for example, this might happen through qualitative or quantitative approaches (e.g., process tracing, causal chains, systems thinking) that examine the historical, contextual, or structural factors that are supporting or undermining equity. The analytical approaches and possibilities for presentation will also be defined by the data collection methods used and the nature of the data. Qualitative data collected from interviews or focus groups will provide rich narrative content that can be coded thematically and shared in text. Data produced through arts-based approaches to monitoring and evaluation can be presented through photographs, videos, or theatrical presentations (Simons and McCormack, 2007; Strand et al., 2022b). Quantitative data might be descriptively analyzed for individual indicators (Figure 4A), combined for various aspects of equity (Figure 4B), or even summed to create a composite index (Figure 4C). Analyses focused on different policy realms - e.g., marine conservation, fisheries, blue economy, climate adaptation - might also be aggregated for a holistic ocean equity score (Figure 4D). However, we caution that while combining indicators into a comprehensive equity index might be useful to provide a general snapshot or to compare across sites, it will obscure specific aspects or elements that are falling short. Indeed, all methodological and analytical approaches will have their limitations - including construct validity, levels of subjectivity, confidence, and uncertainty - which is important to be forthright about. Previously established working groups and other local actors can be engaged in providing feedback

FIGURE 4
Options for presenting quantitative evaluations of ocean equity as: **(A)** individual indicators, **(B)** combined aspects or **(C)** a composite index. Scores from multiple marine policy realms might also be aggregated for a holistic ocean equity score **(D)**. **(A–C)** include only recognitional, procedural, and distributional equity, whereas **(D)** includes recognitional, procedural, distributional, management, environmental, and contextual equity. These results are hypothetical and for demonstrative purposes only.

on or even collaborating on the analysis and presentation of results to ensure usefulness and validity of results.

4 Moving from assessment to action to improve ocean equity

As mentioned earlier in the paper, there is growing evidence that past equity assessments are not achieving their potential to contribute to meaningful adaptations, innovations or transformative changes to the status quo. Thus, this section discusses 4 key considerations for moving from assessment to action that advances ocean equity. In particular, we discuss:

1. Communicate and learn: Communicating results to reach key audiences, to enable learning and inform decision-making.
2. Deliberate and select interventions: Deliberating on actions and selecting interventions to improve ocean equity.
3. Implement actions: Ensuring actions to improve ocean equity are implemented.
4. Commit and Repeat: Committing to continual cycles of monitoring, evaluation, learning and adapting at regular intervals.

4.1 Communicate and learn: communicating results to key audiences, to enable learning and inform decision-making

An important outcome of monitoring and assessments is to provide information that will have a positive impact on policies, practices, and on-the-ground realities. Yet, too often assessments of social equity are only published in the academic literature and presented at scientific conferences. Effectively communicating the results of social equity assessments to different audiences, in different fora and in various formats will be necessary to enable learning and to support evidence-informed decision-making that advances ocean equity (Cvitanovic et al., 2016). For example, in terms of potential audiences, the findings from ocean equity assessments could provide evidence about the status or trajectory of change to community and civil society leaders, NGO practitioners, government decision-makers, funders or corporate actors who might then identify actions for improving ocean equity. Reaching each of these audiences may require that results are communicated in different fora - in community meetings, organizational retreats, national policy processes, or in boardrooms - and in formats ranging from reports to presentations to an exhibition. Best practices for effective communication include simplifying complex concepts and using plain language to ensure accessibility, developing visual aids such as charts, graphs, and illustrations, ensuring cultural sensitivity, and being aware of potential language barriers, among others. Most importantly, communications need to be transparent and accessible to all relevant audiences - but especially to local rights-holders and those impacted by decision-making (Bevitt et al., 2022; Ignace et al., 2023). Utilizing 'inclusive science communication' principles and practices can help to design communications strategies that simultaneously integrate insights from, elevate the perspectives of and reach more diverse groups and communities (Polk and Diver, 2020; Marsh et al., 2023).

It is essential to identify and engage audiences early in the process to start to build trust, to contextualize the framework to local realities, to increase legitimacy of the analysis and outputs, but also to get feedback on and facilitate co-creation of communications products. Communications should then be tailored to reach and suit the specific needs and backgrounds of various audiences in a way that is conducive to promoting two-way learning and producing change. For example, site-level coastal managers might require social equity data that is communicated in reports, during management meetings, and at community engagement meetings which could enable trust building with coastal communities (Dacks et al., 2019). National governments may require quantitative metrics on social equity in more formal assessment documents to justify policy decisions or support reporting against national and international commitments (e.g., CBD) (Sterling et al., 2020; Rivers et al., 2023). In such cases, it will be useful to connect findings to existing legislation and agreements at local, national and international scales (e.g., FAO SSF Guidelines, CBD Kunming-Montreal Biodiversity Framework, United Nations Declaration on the Rights of Indigenous Peoples, etc.). Government decision-makers and policy-makers might be engaged in discussion through the presentation of results from monitoring and evaluation processes using arts-based creative methods (e.g., photos, videos, theatre, storytelling, etc.) (Tremblay and Jayme, 2015; Galafassi et al., 2018; Strand et al., 2022a). Different groups may also require information at different times. For example, the informational needs of regional or national government staff may be closely aligned with political cycles, whereas site-level NGO requirements may be influenced by project or funding timelines. It can be useful to watch for and plan communications around windows of opportunity to create change, such as during planned legal reform or the initiation of marine spatial planning processes or prior to international policy meetings. Whenever possible, one should use existing communication forums to share findings from social equity assessments and create opportunities for two-way communication and dialogue about the assessments, as well as deliberations on future actions.

4.2 Deliberate and selective interventions: deliberating on actions and selecting interventions to improve ocean equity

Another aspect of assessments that often does not get enough attention is the subsequent processes of reflection and deliberation on the results that enables deeper learning, and the subsequent identification of actions and selection of interventions to be taken to achieve objectives - which may be to improve human wellbeing,

reduce vulnerability, or to improve ocean equity (Kaplan-Hallam and Bennett, 2018; Thiault et al., 2020). Reflection refers to giving something deep thought, whereas deliberation is the careful consideration and discussion of options to reach a decision about a course of action. Numerous approaches are available for deliberating on and selecting courses of action in group settings - such as future visioning (Pereira et al., 2018; Cork et al., 2023), scenario-planning (Peterson et al., 2003; Brown et al., 2016), backcasting (Carlsson-Kanyama et al., 2008; Robinson et al., 2011), or multi-criteria or structured decision-making (Kiker et al., 2005; Gregory et al., 2012; Schwartz et al., 2018) to visualize new possibilities, identify pathways to change and select interventions (Wyborn et al., 2020). Adequate time and resources will need to be allocated for these deliberation processes (Strand et al., 2022a). Composition of the group involved in deliberating on and choosing action is another important consideration - having a cross section of representatives from local groups and communities, NGOs, governments, or private sector organizations can facilitate a shared understanding and encourage support for mutually identified solutions (Galafassi et al., 2018). Skilled facilitation can help to ensure all participants are able to speak and all voices are heard. More difficult perhaps is to cultivate organizational humility, the culture of reflexivity and learning, and the willingness to engage with past failures of policies, programs, initiatives or actions that are necessary (Catalano et al., 2019). As Ostrom (1999, p. 493) suggested, all environmental policies should be viewed "as experiments with a probability of failure".

The identification of actions and selection of interventions to improve ocean equity based on insights from the assessments is a topic that deserves additional attention. In some cases, alternative and equitable future pathways may already exist and be known to community members (Blythe et al., 2023). In these cases, the focus should be on creating space for these pathways to be shared and implemented. In other cases, new action may be required. Potential actions may range from adaptive to more transformative. For example, a straightforward approach to identifying actions to improve ocean equity is to identify improvements to management or governance based on shortcomings unveiled in the assessment. When costs and benefits are shown to be unfairly distributed, actions should be taken to mitigate negative impacts (e.g., altering management rules, compensation schemes) and improve access to positive benefits (e.g., benefit sharing mechanisms, livelihood schemes). The balance of power and trusting relationships between organisations and community groups is often identified as an area for improvement in studies of equity, so identified actions may involve interventions related to procedural dimensions as much as tangible changes in financial distribution (Saif et al., 2022). Where transparency is assessed to be low, potential interventions may be identified to improve the communication of information, the processes through which decisions are made, and the resultant decisions. If Indigenous and traditional knowledge is not integrated into decision-making, capacity building may be needed to increase understanding, promote recognition, and create processes to facilitate integration. However, these types of actions at the level of management may be incremental and insufficient to address the underlying or root causes of inequity (Singh et al., 2023). More transformative actions may be needed to address issues such as systems of tenure, historical governance structures, hegemonic value or knowledge systems that do not recognize or leave space for local rights, participation, worldviews or knowledge systems of Indigenous Peoples, small-scale fishers, or other structurally marginalized groups in ocean governance. Interventions may be needed simultaneously that are adaptive and transformative, at different scales, and over different time frames in order to make resilient and long-term changes. Actions taken at this level may need to be innovative and novel, but might require re-upping historical access or be based on traditional knowledge and practices (Strand et al., 2022b). The selection of interventions to improve ocean equity will need to match the problem, be sensitive to the context and socially supported, but also be feasible within capacity, funding and logistical constraints.

4.3 Implement actions: ensuring actions to improve social equity are implemented

The most important, and by far the hardest step in this process, is the arduous and ongoing work of adapting government policies, creating NGO programs, shifting funding priorities and actually implementing on-the-ground management actions to improve ocean equity. There are many potential barriers to the implementation of strategies - insufficient awareness of the plan of action, inadequate stakeholder buy-in and political support, institutional barriers and resistance to change, inadequate capacity and resources, lack of knowledge and skills, ambiguous roles and responsibilities, and unclear performance and accountability metrics. Addressing these types of barriers may be necessary in order to be able to take meaningful action. Effective communication of any plan of action to advance ocean equity to all affected actors, and particularly to those responsible for implementing interventions, will ensure that both the long-term vision and short-term actions are understood. Involving a diversity of actors - including those who are impacted by decisions and those with decision-making authority - throughout the process of assessing ocean equity can help to build support from constituents and decision-makers for eventual co-developed priority interventions (Gill et al., 2023). Making it clear how addressing social equity will help to meet international political commitments (e.g., to equitable governance under the Convention on Biological Diversity, to human rights under the Universal Declaration on Human Rights, or to Indigenous rights under the Universal Declaration on the Rights of Indigenous Peoples) might help to increase political will among government representatives. Efforts to shift institutional barriers and resistance may require deep introspection regarding an organization's history, philosophy, and past actions related to equity, followed by a revisiting of organizational visions and mandates, objectives, leadership ethos, and team culture to embed support for equity into an organization's DNA (Bennett et al., 2021b).

Attention should also be given to ensuring that operational requirements are in place to support implementation of actions and interventions to improve ocean equity. This includes sufficient funding, capacity, knowledge and skills. Sufficient funding needs to be allocated not just to advancing ocean sustainability efforts, but also to carry out

actions and interventions to advance equity within ocean sustainability efforts. For example, to promote more equitable marine conservation efforts, funding may be required to support documentation of Indigenous Knowledge, participatory planning and management processes, benefit sharing or harm mitigation mechanisms, or Indigenous and community leadership in management. Efforts to promote equitable ocean governance practices will require strong leadership and adequate personnel to carry out the work - which may include supporting capacity where it already exists, augmenting capacity with new hires, or enhancing capacity where there are shortfalls. Governments and non-governmental organizations working in this space may need to hire new personnel with expertise in, for example, governance, social development, or marine social science (McKinley et al., 2020). Knowledge and skills might also be developed in these areas through capacity building efforts, but this should emphasize the potential for two-way learning and capacity building among stakeholders and implementers (Jacob et al., 2023). Continued research on and sharing of both successful and shared efforts to improve ocean equity, including synthetic analysis to identify bridges and barriers, lessons learned and best practices, will also help to build the knowledge base among ocean conservation practitioners.

Last, clear roles and responsibilities will need to be assigned and accountability mechanisms should be established for carrying out identified plans, actions or interventions to improve ocean equity. For example, fisheries managers may be the responsible party for facilitating and improving participation in co-management bodies and governments may be the body that will need to reallocate fisheries licenses and quota to improve equity in distribution of benefits (Ecotrust Canada and T. Buck Suzuki Foundation, 2018). Accountability mechanisms should also be created to make sure that responsible authorities are taking action, and that elite capture or corruption are not compromising efforts to promote equity. This might include establishment and tracking of key performance indicators from the top-down, the requirement for tracking and public reporting of key performance indicators or ocean equity assessments, and the establishment of grievance and conflict resolution processes to enable bottom-up complaints.

4.4 Commit and repeat: committing to ongoing cycles of monitoring, evaluation, learning and adapting at regular intervals

Finally, this should not be viewed as a one-time effort, as the improvement of ocean equity will take concerted effort and time. Change will often be incremental and slow. There will likely be both successes and set-backs along the way. Changes in the broader social, political, economic and environmental context are to be expected, with implications for equity. Continual learning and adaptation will be necessary to make progress. Despite the best intentions, mistakes will be made. Conflicts and push back may also emerge where course corrections are not favourable to those groups who have been beneficiaries of past arrangements (Moyo, 2005; Scheidel et al., 2020). Thus, there is a need to adopt a culture of learning (Wals, 2007) and commit to ongoing monitoring, evaluation, learning, and adapting of policies, programs, plans, practices and portfolios (Figure 2). Assessments should be iterative and repeated at regular intervals in the future - which might range from annually to every five years. Aligning the timing of monitoring and evaluation processes with specific governance, management, or strategic processes will help to ensure results are integrated into and inform future planning cycles in governments, organizations, or funding agencies focused on the ocean. For example, marine protected areas might renew their management plans every five years - providing an ideal window of opportunity to incorporate insights from an assessment of social equity. Looking ahead, timelines should be specified, responsible parties should be identified and budgets should be allocated to enable continued monitoring, evaluation and learning. Future assessments should also be mindful to continually learn from and build on past assessments.

5 Conclusion

Equitable ocean governance is a moral and legal obligation and instrumental to the long-term success of broader ocean sustainability efforts. Yet the level of equity embodied in most ocean policies, management practices, programs, initiatives, and funding portfolios is unknown, and guidance on how to understand and assess equity is severely lacking. This is a major concern given reports of unjust and equitable policies across various realms of marine policy. In this paper, we provide guidance on key steps to develop a bespoke, contextually appropriate, and fit for purpose assessment framework for assessing ocean equity. Such an analysis might be used by various organizations in numerous ways - to do a snapshot assessment of current status, to monitor change over time, or to measure impacts of interventions - and applied to different realms of ocean policy at various scales. And, yet, there is a danger this could become a tick-box exercise, implemented without intention of or attention to improvement. It is important to move beyond a culture of auditing and towards taking action to create meaningful change. Thus, we also provide guidance on steps needed to move from assessment to action to improve social equity in ocean governance. Doing this well will not be easy - it will require collaboration, trust, leadership, time, capacity, resources, power sharing, knowledge and skills, accountability and conflict resolution, and ongoing commitment to promote actions and facilitate long-lasting shifts towards ocean equity. Change may not occur quickly, it will often be incremental. Yet, applying the process that we have developed could help to contribute to a change in how oceans are governed. The diligent pursuit of ocean equity will help to ensure that the course towards sustainable ocean governance is more representative, inclusive and just.

6 Positionality statement

We are a team of 14 researchers and practitioners working for a combination of universities (11), non-governmental organizations (2), and an independent research institute (1) on topics related to marine conservation, fisheries, and ocean governance. Our team includes men (6) and women (8). Most members of the team were born in, live in and work at institutions in high income countries in

Europe and North America; however, one member of the team is from Brazil and lives in Mexico, and two members of the team live in South Africa. All co-authors have a high level of formal university education. While we collectively have experience working in diverse geographical and social contexts across all regions of the world, we acknowledge that we represent a small subset of perspectives on the topics being studied, including social equity, ocean governance, marine conservation and fisheries. Thus, we explicitly recognize that the views of the authors and those presented in this paper are biased by our positionality.

Author contributions

NB: Conceptualization, Funding acquisition, Investigation, Project administration, Writing – original draft. VR: Investigation, Writing – review & editing. KR: Investigation, Visualization, Writing – review & editing. JB: Conceptualization, Investigation, Writing – review & editing. MA: Investigation, Writing – review & editing. JC: Investigation, Writing – review & editing. ND: Investigation, Writing – review & editing. DG: Investigation, Writing – review & editing. NL: Investigation, Writing – review & editing. SM: Investigation, Writing – review & editing. E-KM: Investigation, Writing – review & editing. MR: Investigation, Writing – review & editing. MS: Investigation, Writing – review & editing. SV: Investigation, Writing – review & editing.

Funding

The author(s) declare financial support was received for the research, authorship, and/or publication of this article. Funding for the process that led to this paper was provided by the Blue Nature Alliance via the Conservation International Foundation to WWF under the project "Developing Social Equity Metrics to Monitor and Improve Marine Conservation" (Grant #CI-114807)(NB & MA). SV, KR, NL & VR were supported by the EQUALSEA (Transformative adaptation towards ocean equity) project under the European Horizon 2020 Program ERC Consolidator Grant Agreement # 101002784 funded by the European Research Council. The French Foundation for Biodiversity Research (FRB) and the Centre for the Synthesis and Analysis of Biodiversity (CESAB) provided funding to members of the team who are part of the Blue Justice Working Group (JC, JB, DG, NL, SM, NB). KR gratefully acknowledges funding from the European Union's Horizon Europe research and innovation program under the Marie Skłodowska-Curie Postdoctoral Fellowship (Grant Agreement No. 101107839).

Acknowledgments

All co-authors acknowledge support from their respective institutional affiliations.

Conflict of interest

Author MA was employed by Reconnect Consulting. MA worked as a paid consultant to WWF.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fmars.2025.1473382/full#supplementary-material

References

Ablo, A. D. (2015). Local content and participation in Ghana's oil and gas industry: Can enterprise development make a difference? *Extract. Industries Soc.* 2, 320–327. doi: 10.1016/j.exis.2015.02.003

Agyeman, J., Schlosberg, D., Craven, L., and Matthews, C. (2016). Trends and directions in environmental justice: from inequity to everyday life, community, and just sustainabilities. *Annu. Rev. Environ. Resour.* 41, 321–340. doi: 10.1146/annurev-environ-110615-090052

Åkerblad, L., Seppänen-Järvelä, R., and Haapakoski, K. (2021). Integrative strategies in mixed methods research. *J. Mix. Methods Res.* 15, 152–170. doi: 10.1177/1558689820957125

Alexander, K. A., Fleming, A., Bax, N., Garcia, C., Jansen, J., Maxwell, K. H., et al. (2022). Equity of our future oceans: practices and outcomes in marine science research. *Rev. Fish Biol. Fish.*, 297–311. doi: 10.1007/s11160-021-09661-z

Amnesty International (2023). *The human cost of overfishing: How the overuse of fisheries resources in Sanyang threatens human rights* (London, UK: Amnesty International).

Andreoli, V., Meeuwig, J. J., Skerritt, D. J., Schuhbauer, A., Sumaila, U. R., and Zeller, D. (2023). Fisheries subsidies exacerbate inequities in accessing seafood nutrients in the Indian Ocean. *NPJ Ocean Sustain* 2, 1–9. doi: 10.1038/s44183-023-00031-9

Araos, M., Jagannathan, K., Shukla, R., Ajibade, I., Coughlan de Perez, E., Davis, K., et al. (2021). Equity in human adaptation-related responses: A systematic global review. *One Earth* 4, 1454–1467. doi: 10.1016/j.oneear.2021.09.001

Atkinson, A. B. (1970). On the measurement of inequality. *J. Econ. Theory* 2, 244–263. doi: 10.1016/0022-0531(70)90039-6

Baylis, K., Honey-Rosés, J., Börner, J., Corbera, E., Ezzine-de-Blas, D., Ferraro, P. J., et al. (2016). Mainstreaming impact evaluation in nature conservation. *Conserv. Lett.* 9, 58–64. doi: 10.1111/conl.12180

Béné, C., Prager, S. D., Achicanoy, H. A. E., Toro, P. A., Lamotte, L., Bonilla, C., et al. (2019). Global map and indicators of food system sustainability. *Sci. Data* 6, 279. doi: 10.1038/s41597-019-0301-5

Bennett, N. J. (2018). Navigating a just and inclusive path towards sustainable oceans. *Mar. Policy* 97, 139–146. doi: 10.1016/j.marpol.2018.06.001

Bennett, N. J. (2022). Mainstreaming equity and justice in the ocean. *Front. Mar. Sci.* 9. doi: 10.3389/fmars.2022.873572

Bennett, N. J., Alava, J. J., Ferguson, C. E., Blythe, J., Morgera, E., Boyd, D., et al. (2023). Environmental (in)justice in the anthropocene ocean. *Mar. Policy* 147, 105383. doi: 10.1016/j.marpol.2022.105383

Bennett, N. J., Blythe, J., Cisneros-Montemayor, A. M., Singh, G. G., and Sumaila, U. R. (2019). Just transformations to sustainability. *Sustainability* 11, 3881. doi: 10.3390/su11143881

Bennett, N. J., Blythe, J., White, C. S., and Campero, C. (2021a). Blue growth and blue justice: Ten risks and solutions for the ocean economy. *Mar. Policy* 125, 104387. doi: 10.1016/j.marpol.2020.104387

Bennett, N. J., Calò, A., Di Franco, A., Niccolini, F., Marzo, D., Domina, I., et al. (2020). Social equity and marine protected areas: Perceptions of small-scale fishermen in the Mediterranean Sea. *Biol. Conserv.* 244, 108531. doi: 10.1016/j.biocon.2020.108531

Bennett, N. J., Katz, L., Yadao-Evans, W., Ahmadia, G. N., Atkinson, S., Ban, N. C., et al. (2021b). Advancing social equity in and through marine conservation. *Front. Mar. Sci.* 8. doi: 10.3389/fmars.2021.711538

Bennett, N. J., Schuhbauer, A., Skerritt, D., and Ebrahim, N. (2021c). Socio-economic monitoring and evaluation in fisheries. *Fish. Res.* 239, 105934. doi: 10.1016/j.fishres.2021.105934

Bennett, N. J., Teh, L., Ota, Y., Christie, P., Ayers, A., Day, J. C., et al. (2017). An appeal for a code of conduct for marine conservation. *Mar. Policy* 81, 411–418. doi: 10.1016/j.marpol.2017.03.035

Bennett, N. J., Villasante, S., Espinosa-Romero, M. J., Lopes, P. F. M., Selim, S. A., and Allison, E. H. (2022). Social sustainability and equity in the blue economy. *One Earth* 5, 964–968. doi: 10.1016/j.oneear.2022.08.004

Bergquist, D. A. (2007). Sustainability and local people's participation in coastal aquaculture: Regional differences and historical experiences in Sri Lanka and the Philippines. *Environ. Manage.* 40, 787–802. doi: 10.1007/s00267-006-0108-y

Bevitt, K., Cohen, P. J., Diver, R., Kutub Uddin, M., Lukanga, E., Patel, A., et al. (2022). *A good practice guide for ethical and inclusive communications involving small-scale fisheries* (Penang, Malaysia and Rome, Italy: FAO and WorldFish). doi: 10.4060/cc0548en

Biedenweg, K., Hanein, A., Nelson, K., Stiles, K., Wellman, K., Horowitz, J., et al. (2014). Developing human wellbeing indicators in the puget sound: focusing on the watershed scale. *Coast. Manage.* 42, 374–390. doi: 10.1080/08920753.2014.923136

Biedenweg, K., Harguth, H., and Stiles, K. (2017). The science and politics of human well-being: a case study in cocreating indicators for Puget Sound restoration. *Ecol. Soc* 22, art11. doi: 10.5751/ES-09424-220311

Biedenweg, K., Stiles, K., and Wellman, K. (2016). A holistic framework for identifying human wellbeing indicators for marine policy. *Mar. Policy* 64, 31–37. doi: 10.1016/j.marpol.2015.11.002

Blue Economy Tribunal (2021). *International Tribunal on the Impact of Blue Economy in Indian Ocean countries: Verdicts of the Six Tribunal Series held between August 2020 - February 2021* (Mumbai, India: SNEHA/Delhi Forum/World Forum of Fisher Peoples). Available online at: http://blueeconomytribunal.org/wp-content/uploads/International-Tribunals-Report-on-BE.pdf (Accessed December 8, 2021).

Blythe, J. L., Gill, D. A., Claudet, J., Bennett, N. J., Gurney, G. G., Baggio, J. A., et al. (2023). Blue justice: a review of emerging scholarship and resistance movements. *Camb. Prisms Coast. Futur.* 1, 1–12. doi: 10.1017/cft.2023.4

Breslow, S. J., Allen, M., Holstein, D., Sojka, B., Barnea, R., Basurto, X., et al. (2017). Evaluating indicators of human well-being for ecosystem-based management. *Ecosyst. Health Sustain.* 3, 1–18. doi: 10.1080/20964129.2017.1411767

Brondo, K. V., and Bown, N. (2011). Neoliberal conservation, garifuna territorial rights and resource management in the cayos cochinos marine protected area. *Conserv. Soc* 9, 91–105. doi: 10.4103/0972-4923.83720

Brown, I., Martin-Ortega, J., Waylen, K., and Blackstock, K. (2016). Participatory scenario planning for developing innovation in community adaptation responses: three contrasting examples from Latin America. *Reg. Environ. Change* 16, 1685–1700. doi: 10.1007/s10113-015-0898-7

Capistrano, R. C. G., and Charles, A. T. (2012). Indigenous rights and coastal fisheries: A framework of livelihoods, rights and equity. *Ocean Coast. Manage.* 69, 200–209. doi: 10.1016/j.ocecoaman.2012.08.011

Carlsson-Kanyama, A., Dreborg, K. H., Moll, H. C., and Padovan, D. (2008). Participative backcasting: A tool for involving stakeholders in local sustainability planning. *Futures* 40, 34–46. doi: 10.1016/j.futures.2007.06.001

Carothers, C., Lew, D. K., and Sepez, J. (2010). Fishing rights and small communities: Alaska halibut IFQ transfer patterns. *Ocean Coast. Manage.* 53, 518–523. doi: 10.1016/j.ocecoaman.2010.04.014

Cash, D. W., Adger, W. N., Berkes, F., Garden, P., Lebel, L., Olsson, P., et al. (2006). Scale and cross-scale dynamics: governance and information in a multilevel world. *Ecol. Soc* 11, 8. doi: 10.5751/ES-01759-110208

Catalano, A. S., Lyons-White, J., Mills, M. M., and Knight, A. T. (2019). Learning from published project failures in conservation. *Biol. Conserv.* 238, 108223. doi: 10.1016/j.biocon.2019.108223

Chambers, C., Helgadóttir, G., and Carothers, C. (2017). Little kings": community, change and conflict in Icelandic fisheries. *Marit. Stud. Heidelb.* 16, 1–26. doi: 10.1186/s40152-017-0064-6

Chambers, J. M., Wyborn, C., Ryan, M. E., Reid, R. S., Riechers, M., Serban, A., et al. (2021). Six modes of co-production for sustainability. *Nat. Sustain.* 4, 983–996. doi: 10.1038/s41893-021-00755-x

Chan, K. M. A., and Satterfield, T. (2013). Justice, equity and biodiversity. *Encycl. Biodivers.* 4, 434–441. doi: 10.1016/B978-0-12-384719-5.00252-5

Charles, A., Westlund, L., Bartley, D., Fletcher, W., Garcia, S., Govan, H., et al. (2016). Fishing livelihoods as key to marine protected areas: insights from the World Parks Congress. *Aquat. Conserv. Mar. Freshw. Ecosyst.* 26, 165–184. doi: 10.1002/aqc.2648

Chilisa, B. (2019). *Indigenous Research Methodologies* (Thousand Oaks, CA: SAGE Publications, Inc).

Christie, A. P., Abecasis, D., Adjeroud, M., Alonso, J. C., Amano, T., Anton, A., et al. (2020). Quantifying and addressing the prevalence and bias of study designs in the environmental and social sciences. *Nat. Commun.* 11, 6377. doi: 10.1038/s41467-020-20142-y

Christoffels-DuPlessis, A., Erinosho, B., Major, L., Morgera, E., Sunde, J., and Vermeylen, S. (2022). "Navigating a Sea of Laws: Small-Scale Fishing Communities and Customary Rights in Ghana and South Africa," in *The Palgrave Handbook of Blue Heritage*. Eds. R. Boswell, D. O'Kane and J. Hills (Springer International Publishing, Cham). doi: 10.1007/978-3-030-99347-4

Cisneros-Montemayor, A. M., Moreno-Báez, M., Voyer, M., Allison, E. H., Cheung, W. W. L., Hessing-Lewis, M., et al. (2019). Social equity and benefits as the nexus of a transformative Blue Economy: A sectoral review of implications. *Mar. Policy* 109, 103702. doi: 10.1016/j.marpol.2019.103702

Claudet, J., Blythe, J., Gill, D. A., Bennett, N. J., Gurney, G. G., Evans, L., et al. (2024). Advancing ocean equity at the nexus of development, climate and conservation policy. *Nat. Ecol. Evol.* 8, 1205–1208. doi: 10.1038/s41559-024-02417-5

Cockburn, J., Human, H., Biggs, H., and Rosenberg, E. (2019). Participatory Monitoring, Evaluation, Reflection and Learning (PMERL): Meta-Reflection Report 2018-2019. Makhanda, South Africa: Tsitsa Project, Rhodes University.

Cohen, P. J., Allison, E. H., Andrew, N. L., Cinner, J., Evans, L. S., Fabinyi, M., et al. (2019). Securing a just space for small-scale fisheries in the blue economy. *Front. Mar. Sci.* 6. doi: 10.3389/fmars.2019.00171

Cooke, B., and Kothari, U. (2001). *Participation: the new tyranny?* (London & New York: Zed Books).

Cork, S., Alexandra, C., Alvarez-Romero, J. G., Bennett, E. M., Berbés-Blázquez, M., Bohensky, E., et al. (2023). Exploring alternative futures in the anthropocene. *Annu. Rev. Environ. Resour.* 48, 25–54. doi: 10.1146/annurev-environ-112321-095011

Crosman, K. M., Allison, E. H., Ota, Y., Cisneros-Montemayor, A. M., Singh, G. G., Swartz, W., et al. (2022). Social equity is key to sustainable ocean governance. *NPJ Ocean Sustain.* 1, 1–9. doi: 10.1038/s44183-022-00001-7

Cross, H. (2015). Displacement, disempowerment and corruption: challenges at the interface of fisheries, management and conservation in the Bijagós Archipelago, Guinea-Bissau. *Oryx* 50, 693–701. doi: 10.1017/S003060531500040X

Cvitanovic, C., McDonald, J., and Hobday, A. J. (2016). From science to action: Principles for undertaking environmental research that enables knowledge exchange and evidence-based decision-making. *J. Environ. Manage.* 183, 864–874. doi: 10.1016/j.jenvman.2016.09.038

Cvitanovic, C., Shellock, R. J., Mackay, M., van Putten, E. I., Karcher, D. B., Dickey-Collas, M., et al. (2021). Strategies for building and managing 'trust' to enable knowledge exchange at the interface of environmental science and policy. *Environ. Sci. Policy* 123, 179–189. doi: 10.1016/j.envsci.2021.05.020

Dacks, R., Ticktin, T., Mawyer, A., Caillon, S., Claudet, J., Fabre, P., et al. (2019). Developing biocultural indicators for resource management. *Conserv. Sci. Pract.* 1, e38. doi: 10.1111/csp2.38

Das, J. (2023). Blue economy, blue growth, social equity and small-scale fisheries: A global and national level review. *Stud. Soc Sci. Res.* 4, 38. doi: 10.22158/sssr.v4n1p38

Dasgupta, A., and Beard, V. A. (2007). Community driven development, collective action and elite capture in Indonesia. *Dev. Change* 38, 229–249. doi: 10.1111/j.1467-7660.2007.00410.x

Dawson, N., Martin, A., and Danielsen, F. (2018). Assessing equity in protected area governance: approaches to promote just and effective conservation. *Conserv. Lett.* 11, e12388. doi: 10.1111/conl.12388

Doering, R., Goti, L., Fricke, L., and Jantzen, K. (2016). Equity and ITQs: about fair distribution in quota management systems in fisheries. *Environ. Values* 25, 729–749. doi: 10.3197/096327116X14736981715742

Donatuto, J., Grossman, E. E., Konovsky, J., Grossman, S., and Campbell, L. W. (2014). Indigenous community health and climate change: integrating biophysical and social science indicators. *Coast. Manage.* 42, 355–373. doi: 10.1080/08920753.2014.923140

Ecotrust Canada and T. Buck Suzuki Foundation (2018). *Just Transactions, Just Transitions: Towards Truly Sustainable Fisheries in British Columbia* (Vancouver, B.C: Ecotrust Canada).

Eduful, A., and Hooper, M. (2015). Urban impacts of resource booms: The emergence of oil-led gentrification in Sekondi-Takoradi, Ghana. *Urban Forum* 26, 283–302. doi: 10.1007/s12132-015-9257-5

Edwards, D. N., and Pinkerton, E. (2019). Rise of the investor class in the British Columbia Pacific halibut fishery. *Mar. Policy* 109, 103676. doi: 10.1016/j.marpol.2019.103676

EJF (2022). *At the Tipping Point: How bottom trawling is precipitating the collapse of Senegal's artisanal fisheries* (Environmental Justice Foundation). Available online at: https://ejfoundation.org/resources/downloads/Senegal-BT-Report-DIGITAL.pdf (Accessed October 28, 2024).

Elahi, K. Q. (2009). UNDP on good governance. *Int. J. Soc Econ.* 36, 1167–1180. doi: 10.1108/03068290910996981

Engen, S., Hausner, V. H., Gurney, G. G., Broderstad, E. G., Keller, R., Lundberg, A. K., et al. (2021). Blue justice: A survey for eliciting perceptions of environmental justice among coastal planners' and small-scale fishers in Northern-Norway. *PloS One* 16, e0251467. doi: 10.1371/journal.pone.0251467

Eriksen, S., Schipper, E. L. F., Scoville-Simonds, M., Vincent, K., Adam, H. N., Brooks, N., et al. (2021). Adaptation interventions and their effect on vulnerability in developing countries: Help, hindrance or irrelevance? *World Dev.* 141, 105383. doi: 10.1016/j.worlddev.2020.105383

Ertör, I. (2021). [amp]]lsquo;We are the oceans, we are the people!': fisher people's struggles for blue justice. *J. Peasant Stud.* 1, 1–30. doi: 10.1080/03066150.2021.1999932

FAO (2015). *Voluntary guidelines for securing sustainable small-scale fisheries in the context of food security and poverty eradication* (Rome: Food and Agriculture Organization of the United Nations). Available online at: http://www.fao.org/documents/card/en/c/21360061-9b18-42ac-8d78-8a1a7311aef7/ (Accessed October 29, 2015).

FAO (2024). *The State of World Fisheries and Aquaculture 2024: Blue Transformation in Action* (Rome: Food and Agriculture Organization of the United Nations). doi: 10.4060/cd0683en

Ferraro, P. J., and Hanauer, M. M. (2014). Advances in measuring the environmental and social impacts of environmental programs. *Annu. Rev. Environ. Resour.* 39, 495–517. doi: 10.1146/annurev-environ-101813-013230

Few, R., Brown, K., and Tomkins, E. ,. L. (2007). Public participation and climate change adaptation: avoiding the illusion of inclusion. *Clim. Policy* 7, 46–59. doi: 10.1080/14693062.2007.9685637

Fischer, M., Maxwell, K., Nuunoq,, Pedersen, H., Greeno, D., Jingwas, N., et al. (2022). Empowering her guardians to nurture our Ocean's future. *Rev. Fish Biol. Fish.* 32, 271–296. doi: 10.1007/s11160-021-09679-3

Flannery, W., Healy, N., and Luna, M. (2018). Exclusion and non-participation in marine spatial planning. *Mar. Policy* 88, 32–40. doi: 10.1016/j.marpol.2017.11.001

Franks, P., Booker, F., and Roe, D. (2018). *Understanding and assessing equity in protected area conservation* (London, UK: IIED).

Franks, D. M., and Vanclay, F. (2013). Social Impact Management Plans: Innovation in corporate and public policy. *Environ. Impact Assess. Rev.* 43, 40–48. doi: 10.1016/j.eiar.2013.05.004

Furman, K. L., Harlan, S. L., Barbieri, L., and Scyphers, S. B. (2023). Social equity in shore-based fisheries: Identifying and understanding barriers to access. *Mar. Policy* 148, 105355. doi: 10.1016/j.marpol.2022.105355

Galafassi, D., Daw, T. M., Thyresson, M., Rosendo, S., Chaigneau, T., Bandeira, S., et al. (2018). Stories in social-ecological knowledge cocreation. *Ecol. Soc* 23, art23. doi: 10.5751/ES-09932-230123

García-Quijano, C. G., and Lloréns, H. (2022).Coastal gentrification in Puerto Rico is displacing people and damaging mangroves and wetlands. In: *The Conversation*. Available online at: http://theconversation.com/coastal-gentrification-in-puerto-rico-is-displacing-people-and-damaging-mangroves-and-wetlands-184214 (Accessed August 19, 2022).

Gill, D. A., Blythe, J., Bennett, N., Evans, L., Brown, K., Turner, R. A., et al. (2023). Triple exposure: Reducing negative impacts of climate change, blue growth, and conservation on coastal communities. *One Earth* 6, 118–130. doi: 10.1016/j.oneear.2023.01.010

Gill, D. A., Cheng, S. H., Glew, L., Aigner, E., Bennett, N. J., and Mascia, M. B. (2019). Social synergies, tradeoffs, and equity in marine conservation impacts. *Annu. Rev. Environ. Resour.* 44, 347–372. doi: 10.1146/annurev-environ-110718-032344

Gowda, M. J. C. (2012). *Participatory monitoring and evaluation* (New Delhi, India: Concept Publishing Company).

Gregory, R., Failing, L., Harstone, M., Long, G., McDaniels, T., and Ohlson, D. (2012). *Structured Decision Making: A Practical Guide to Environmental Management Choices* (Chichester, UK: John Wiley & Sons).

Gregory, R., Halteman, P., Kaechele, N., and Satterfield, T. (2023). Methods for assessing social and cultural losses. *Science* 381, 478–481. doi: 10.1126/science.adi2206

Gurney, G. G., Adams, V. M., Álvarez-Romero, J. G., and Claudet, J. (2023). Area-based conservation: Taking stock and looking ahead. *One Earth* 6, 98–104. doi: 10.1016/j.oneear.2023.01.012

Gurney, G. G., Mangubhai, S., Fox, M., Kim, M. K., and Agrawal, A. (2021). Equity in environmental governance: perceived fairness of distributional justice principles in marine co-management. *Environ. Sci. Policy* 124, 23–32. doi: 10.1016/j.envsci.2021.05.022

Hanich, Q., Campbell, B., Bailey, M., and Molenaar, E. (2015). Research into fisheries equity and fairness—addressing conservation burden concerns in transboundary fisheries. *Mar. Policy* 51, 302–304. doi: 10.1016/j.marpol.2014.09.011

Hicks, C. C., Levine, A., Agrawal, A., Basurto, X., Breslow, S. J., Carothers, C., et al. (2016). Engage key social concepts for sustainability. *Science* 352, 38–40. doi: 10.1126/science.aad4977

High Level Panel for a Sustainable Ocean Economy (2020). *Transformations for a Sustainable Ocean Economy: A Vision for Protection, Production and Prosperity* (Washington, D.C: World Resources Institute). Available at: https://www.oceanpanel.org/ocean-action/files/transformations-sustainable-ocean-economy-eng.pdf (Accessed January 23, 2025).

Hill, L. S., Johnson, J. A., and Adamowski, J. (2016). Meeting Aichi Target 11: Equity considerations in Marine Protected Areas design. *Ocean Coast. Manage.* 134, 112–119. doi: 10.1016/j.ocecoaman.2016.09.017

Horcea-Milcu, A.-I., Leventon, J., and Lang, D. J. (2022). Making transdisciplinarity happen: Phase 0, or before the beginning. *Environ. Sci. Policy* 136, 187–197. doi: 10.1016/j.envsci.2022.05.019

Ignace, L., Burton, L., Mynott, S., Meehan, M., Olson, E., Steel, J., et al. (2023). Researchers' responsibility to uphold Indigenous rights. *Science* 381, 129–131. doi: 10.1126/science.adh4470

Israel, M., and Hay, I. (2006). *Research Ethics for Social Scientists* (London: Sage Press).

Jacob, C., DuPrey Diederichsen, S., Fullbrook, L., Lombard, A. T., Rees, S. E., Rivers, N., et al. (2023). A two way process – Social capacity as a driver and outcome of equitable marine spatial planning. *Mar. Policy* 149, 105507. doi: 10.1016/j.marpol.2023.105507

S. Jentoft, R. Chuenpagdee, A. Bugeja Said and M. Isaacs (Eds.) (2022). *Blue Justice: Small-Scale Fisheries in a Sustainable Ocean Economy* (Cham: Springer). doi: 10.1007/978-3-030-89624-9

Jones, P. J. S. (2009). Equity, justice and power issues raised by no-take marine protected area proposals. *Mar. Policy* 33, 759–765. doi: 10.1016/j.marpol.2009.02.009

Jones, R., Rigg, C., and Pinkerton, E. (2017). Strategies for assertion of conservation and local management rights: A Haida Gwaii herring story. *Mar. Policy* 80, 154–167. doi: 10.1016/j.marpol.2016.09.031

Kadfak, A., and Knutsson, P. (2017). Investigating the waterfront: the entangled sociomaterial transformations of coastal space in Karnataka, India. *Soc. Natural Resour.* 30, 707–722. doi: 10.1080/08941920.2016.1273418

Kamat, V. R. (2014). The ocean is our farm": marine conservation, food insecurity, and social suffering in Southeastern Tanzania. *Hum. Organ.* 73, 289–298. doi: 10.17730/humo.73.3.f43k115544761g0v

Kaplan-Hallam, M., and Bennett, N. J. (2018). Adaptive social impact management for conservation and environmental management. *Conserv. Biol.* 32, 304–314. doi: 10.1111/cobi.12985

Keeney, R. L., and Gregory, R. S. (2005). Selecting attributes to measure the achievement of objectives. *Oper. Res.* 53, 1–11. doi: 10.1287/opre.1040.0158

Keikelame, M. J., and Swartz, L. (2019). Decolonising research methodologies: lessons from a qualitative research project, Cape Town, South Africa. *Glob. Health Action* 12, 1561175. doi: 10.1080/16549716.2018.1561175

Kiker, G. A., Bridges, T. S., Varghese, A., Seager, T. P., and Linkov, I. (2005). Application of multicriteria decision analysis in environmental decision making. *Integr. Environ. Assess. Manage.* 1, 95–108. doi: 10.1897/IEAM_2004a-015.1

Kittinger, J. N., Teh, L. C. L., Allison, E. H., Bennett, N. J., Crowder, L. B., Finkbeiner, E. M., et al. (2017). Committing to socially responsible seafood. *Science* 356, 912–913. doi: 10.1126/science.aam9969

Kourantidou, M., Hoover, C., and Bailey, M. (2020). Conceptualizing indicators as boundary objects in integrating Inuit knowledge and western science for marine resource management. *Arct. Sci.* 6, 279–306. doi: 10.1139/as-2019-0013

Lau, J. D., Gurney, G. G., and Cinner, J. (2021). Environmental justice in coastal systems: Perspectives from communities confronting change. *Glob. Environ. CHANGE-Hum. Policy Dimens.* 66, 102208. doi: 10.1016/j.gloenvcha.2020.102208

Lockwood, M. (2010). Good governance for terrestrial protected areas: A framework, principles and performance outcomes. *J. Environ. Manage.* 91, 754–766. doi: 10.1016/j.jenvman.2009.10.005

Lombard, A. T., Clifford-Holmes, J., Goodall, V., Snow, B., Truter, H., Vrancken, P., et al. (2023). Principles for transformative ocean governance. *Nat. Sustain.* 6, 1587–1599. doi: 10.1038/s41893-023-01210-9

Luján Soto, R., Cuéllar Padilla, M., Rivera Méndez, M., Pinto-Correia, T., Boix-Fayos, C., and de Vente, J. (2021). Participatory monitoring and evaluation to enable social learning, adoption, and out-scaling of regenerative agriculture. *Ecol. Soc* 26, 29. doi: 10.5751/ES-12796-260429

Marsh, C. L., Gold, A. U., and Rongstad Strong, B. (2023). Elevating community voices through inclusive science communication: a case study of the We are Water program in the Southwestern United States. *Front. Commun.* 8. doi: 10.3389/fcomm.2023.1214105

Mascia, M. B., Pailler, S., Thieme, M. L., Rowe, A., Bottrill, M. C., Danielsen, F., et al. (2014). Commonalities and complementarities among approaches to conservation monitoring and evaluation. *Biol. Conserv.* 169, 258–267. doi: 10.1016/j.biocon.2013.11.017

McCauley, D. J., Jablonicky, C., Allison, E. H., Golden, C. D., Joyce, F. H., Mayorga, J., et al. (2018). Wealthy countries dominate industrial fishing. *Sci. Adv.* 4, eaau2161. doi: 10.1126/sciadv.aau2161

McDermott, M., Mahanty, S., and Schreckenberg, K. (2013). Examining equity: A multidimensional framework for assessing equity in payments for ecosystem services. *Environ. Sci. Policy* 33, 416–427. doi: 10.1016/j.envsci.2012.10.006

McKinley, E., Acott, T., and Yates, K. L. (2020). Marine social sciences: Looking towards a sustainable future. *Environ. Sci. Policy* 108, 85–92. doi: 10.1016/j.envsci.2020.03.015

Mills, E. N. (2022). Transnational fishers' movements: emergence, evolution, and contestation. *Marit. Stud.* 21, 393–410. doi: 10.1007/s40152-022-00280-3

Mitchell, R. K., Agle, B. R., and Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: defining the principle of who and what really counts. *Acad. Manage. Rev.* 22, 853–886. doi: 10.5465/amr.1997.9711022105

Moon, K., Blackman, D. A., Adams, V. M., Colvin, R. M., Davila, F., Evans, M. C., et al. (2019). Expanding the role of social science in conservation through an engagement with philosophy, methodology, and methods. *Methods Ecol. Evol.* 10, 294–302. doi: 10.1111/2041-210X.13126

Moon, K., Cvitanovic, C., Blackman, D. A., Scales, I. R., and Browne, N. K. (2021). Five questions to understand epistemology and its influence on integrative marine research. *Front. Mar. Sci.* 8. doi: 10.3389/fmars.2021.574158

Moyo, S. (2005). Land and natural resource redistribution in Zimbabwe: access, equity and conflict. *Afr. Asian Stud.* 4, 187–224. doi: 10.1163/1569209054547283

Muhl, E.-K. (2023). *Co-production of knowledge for indicators, otters and ecosystem-based management* (University of Waterloo). Available online at: https://uwspace.uwaterloo.ca/handle/10012/19619 (Accessed May 23, 2024).

Muhl, E.-K., Armitage, D., Anderson, K., Boyko, C., Busilacchi, S., Butler, J., et al. (2023). Transitioning toward "deep" knowledge co-production in coastal and marine systems: examining the interplay among governance, power, and knowledge. *Ecol. Soc* 28, 17. doi: 10.5751/ES-14443-280417

Muhl, E. K., Armitage, D., Silver, J., Swerdfager, T., and Thorpe, H. (2022). Indicators are relational: navigating knowledge and power in the development and implementation of coastal-marine indicators. *Environ. Manage.* 70, 448–463. doi: 10.1007/s00267-022-01670-3

Niner, H. J., Wilson, D., Hoareau, K., Strand, M., Whittingham, J., McGarry, D., et al. (2024). Reflections on the past, present, and potential futures of knowledge hierarchies in ocean biodiversity governance research. *Front. Mar. Sci.* 11. doi: 10.3389/fmars.2024.1347494

Norström, A. V., Cvitanovic, C., Löf, M. F., West, S., Wyborn, C., Balvanera, P., et al. (2020). Principles for knowledge co-production in sustainability research. *Nat. Sustain.* 3, 182–190. doi: 10.1038/s41893-019-0448-2

Obi, C. I. (2010a). Oil extraction, dispossession, resistance, and conflict in Nigeria's oil-rich Niger delta. *Can. J. Dev. Studies/Revue Can. d'études du développement* 30, 219–236. doi: 10.1080/02255189.2010.9669289

Obi, C. I. (2010b). The petroleum industry: A paradox or (sp)oiler of development? *J. Contemp. Afr. Stud.* 28, 443–457. doi: 10.1080/02589001.2010.512740

OECD (1995). *Participatory Development and Good Governance* (Paris, France: Organization for Economic Co-operation and Development). Available online at: http://www.oecd.org/dac/governance-development/31857685.pdf (Accessed December 10, 2014).

OECD and European Union and European Commission, Joint Research Centre (2008). *Handbook on Constructing Composite Indicators: Methodology and User Guide* (Paris, France: OECD).

Österblom, H., Wabnitz, C. C. C., Tladi, D., Allison, E. H., Arnaud-Haond, S., Bebbington, J., et al. (2020). *Towards Ocean Equity* (Washington, DC: World Resources Institute).

Ostrom, E. (1999). Coping with tragedies of the commons. *Annu. Rev. Polit. Sci.* 2, 493–535. doi: 10.1146/annurev.polisci.2.1.493

Oteng-Ababio, M. (2018). [amp]]lsquo;The oil is drilled in Takoradi, but the money is counted in accra': the paradox of plenty in the oil city, Ghana. *J. Asian Afr. Stud.* 53, 268–284. doi: 10.1177/0021909616677371

Parlee, C. E., Foley, P., López Gómez, M. A., Miah, M., Mather, C., and Stephenson, R. L. (2021). Full spectrum sustainability and a theory of access: Integrating social benefits into fisheries governance. *Mar. Policy* 134, 104764. doi: 10.1016/j.marpol.2021.104764

Pascual, U., Phelps, J., Garmendia, E., Brown, K., Corbera, E., Martin, A., et al. (2014). Social equity matters in payments for ecosystem services. *BioScience* 64, 1027–1036. doi: 10.1093/biosci/biu146

Paul-Burke, K., O'Brien, T., Burke, J., and Bluett, C. (2022). Mapping Māori knowledge from the past to inform marine management futures. *N. Z. Sci. Rev.* 76, 32–41. doi: 10.26686/nzsr.v76i1-2.7831

Pearce, D. W., Atkinson, G., and Mourato, S. (2006). *Cost-benefit Analysis and the Environment: Recent Developments* (Paris, France: Organisation for Economic Co-operation and Development). Available online at: https://trid.trb.org/view/795431 (Accessed November 7, 2018).

Peer, N., Muhl, E.-K., Janna, J., Brown, M., Zukulu, S., and Mbatha, P. (2022). Community and marine conservation in South Africa: are we still missing the mark? *Front. Mar. Sci.* 9, 884442. doi: 10.3389/fmars.2022.884442

Pereira, L., Hichert, T., Hamann, M., Preiser, R., and Biggs, R. (2018). Using futures methods to create transformative spaces: visions of a good Anthropocene in southern Africa. *Ecol. Soc* 23, 19. doi: 10.5751/ES-09907-230119

Peterson, G. D., Cumming, G. S., and Carpenter, S. R. (2003). Scenario planning: a tool for conservation in an uncertain world. *Conserv. Biol.* 17, 358–366. doi: 10.1046/j.1523-1739.2003.01491.x

Pinkerton, E. (2017). Hegemony and resistance: Disturbing patterns and hopeful signs in the impact of neoliberal policies on small-scale fisheries around the world. *Mar. Policy* 80, 1–9. doi: 10.1016/j.marpol.2016.11.012

Pinkerton, E., and Edwards, D. N. (2009). The elephant in the room: The hidden costs of leasing individual transferable fishing quotas. *Mar. Policy* 33, 707–713. doi: 10.1016/j.marpol.2009.02.004

Polk, E., and Diver, S. (2020). Situating the scientist: creating inclusive science communication through equity framing and environmental justice. *Front. Commun.* 5. doi: 10.3389/fcomm.2020.00006

Pomeroy, R. S., Watson, L. M., Parks, J. E., and Cid, G. A. (2005). How is your MPA doing? A methodology for evaluating the management effectiveness of marine protected areas. *Ocean Coast. Manage.* 48, 485–502. doi: 10.1016/j.ocecoaman.2005.05.004

Quimby, B., and Levine, A. (2018). Participation, power, and equity: examining three key social dimensions of fisheries comanagement. *Sustainability* 10, 3324. doi: 10.3390/su10093324

Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., et al. (2009). Who's in and why? A typology of stakeholder analysis methods for natural resource management. *J. Environ. Manage.* 90, 1933–1949. doi: 10.1016/j.jenvman.2009.01.001

Reeder-Myers, L., Braje, T. J., Hofman, C. A., Elliott Smith, E. A., Garland, C. J., Grone, M., et al. (2022). Indigenous oyster fisheries persisted for millennia and should inform future management. *Nat. Commun.* 13, 2383. doi: 10.1038/s41467-022-29818-z

Reid, A. J., Eckert, L. E., Lane, J.-F., Young, N., Hinch, S. G., Darimont, C. T., et al. (2020). Two-Eyed Seeing": An Indigenous framework to transform fisheries research and management. *Fish Fish.* 22, 243–261. doi: 10.1111/faf.12516

Rivers, N., Strand, M., Fernandes, M., Metuge, D., Lemahieu, A., Nonyane, C. L., et al. (2023). Pathways to integrate Indigenous and local knowledge in ocean governance processes: Lessons from the Algoa Bay Project, South Africa. *Front. Mar. Sci.* 9. doi: 10.3389/fmars.2022.1084674

Robinson, J., Burch, S., Talwar, S., O'Shea, M., and Walsh, M. (2011). Envisioning sustainability: Recent progress in the use of participatory backcasting approaches for sustainability research. *Technol. Forecast. Soc Change* 78, 756–768. doi: 10.1016/j.techfore.2010.12.006

Ruano-Chamorro, C., Gurney, G. G., and Cinner, J. E. (2022). Advancing procedural justice in conservation. *Conserv. Lett.* 15, e12861. doi: 10.1111/conl.12861

Ruano-Chamorro, C., Gurney, G. G., Mangubhai, S., Fox, M., Lau, J., Naisilisili, W., et al. (2024). Perceived equity in marine management and conservation: Exploring gender intersectionality in Fiji. *Biol. Conserv.* 296, 110692. doi: 10.1016/j.biocon.2024.110692

Rudolph, T. B., Ruckelshaus, M., Swilling, M., Allison, E. H., Österblom, H., Gelcich, S., et al. (2020). A transition to sustainable ocean governance. *Nat. Commun.* 11, 1–14. doi: 10.1038/s41467-020-17410-2

Saif, O., Keane, A., and Staddon, S. (2022). Making a case for the consideration of trust, justice, and power in conservation relationships. *Conserv. Biol.* 36, e13903. doi: 10.1111/cobi.13903

Sandbrook, C., Albury-Smith, S., Allan, J. R., Bhola, N., Bingham, H. C., Brockington, D., et al. (2023). Social considerations are crucial to success in implementing the 30×30 global conservation target. *Nat. Ecol. Evol.* 7, 784–785. doi: 10.1038/s41559-023-02048-2

Satterfield, T., Gregory, R., Klain, S., Roberts, M., and Chan, K. M. (2013). Culture, intangibles and metrics in environmental management. *J. Environ. Manage.* 117, 103–114. doi: 10.1016/j.jenvman.2012.11.033

Scheidel, A., Del Bene, D., Liu, J., Navas, G., Mingorría, S., Demaria, F., et al. (2020). Environmental conflicts and defenders: A global overview. *Glob. Environ. Change* 63, 102104. doi: 10.1016/j.gloenvcha.2020.102104

Schlosberg, D. (2009). *Defining Environmental Justice: Theories, Movements, and Nature* (New York: Oxford University Press).

Schlosberg, D. (2013). Theorising environmental justice: the expanding sphere of a discourse. *Environ. Polit.* 22, 37–55. doi: 10.1080/09644016.2013.755387

Schreckenberg, K., Franks, P., Martin, A., and Lang, B. (2016). Unpacking equity for protected area conservation. *Parks* 22, 11–26. doi: 10.2305/IUCN.CH.2016.PARKS-22-2KS.en

Schwartz, M. W., Cook, C. N., Pressey, R. L., Pullin, A. S., Runge, M. C., Salafsky, N., et al. (2018). Decision support frameworks and tools for conservation. *Conserv. Lett.* 11, e12385. doi: 10.1111/conl.12385

Sikor, T., Martin, A., Fisher, J., and He, J. (2014). Toward an Empirical Analysis of Justice in Ecosystem Governance: Justice in ecosystem governance. *Conserv. Lett.* 7, 524–532. doi: 10.1111/conl.12142

Silver, J. J., Okamoto, D. K., Armitage, D., Alexander, S. M., Atleo, C., Burt, J. M., et al. (2022). Fish, people, and systems of power: understanding and disrupting feedback between colonialism and fisheries science. *Am. Nat.* 200, 168–180. doi: 10.1086/720152

Simons, H., and McCormack, B. (2007). Integrating arts-based inquiry in evaluation methodology: opportunities and challenges. *Qual. Inq.* 13, 292–311. doi: 10.1177/1077800406295622

Singh, G. G., Keefer, J., and Ota, Y. (2023). An inequity assessment framework for planning coastal and marine conservation and development interventions. *Front. Mar. Sci.* 10, 1256500. doi: 10.3389/fmars.2023.1256500

Smallhorn-West, P., Allison, E., Gurney, G., Karnad, D., Kretser, H., Lobo, A. S., et al. (2023). Why human rights matter for marine conservation. *Front. Mar. Sci.* 10, 1089154. doi: 10.3389/fmars.2023.1256500

Sovacool, B. K., Linnér, B.-O., and Goodsite, M. E. (2015). The political economy of climate adaptation. *Nat. Clim. Change* 5, 616–618. doi: 10.1038/nclimate2665

Sowman, M., and Sunde, J. (2018). Social impacts of marine protected areas in South Africa on coastal fishing communities. *Ocean Coast. Manage.* 157, 168–179. doi: 10.1016/j.ocecoaman.2018.02.013

Sowman, M., Sunde, J., Pereira, T., Snow, B., Mbatha, P., and James, A. (2021). Unmasking governance failures: The impact of COVID-19 on small-scale fishing communities in South Africa. *Mar. Policy* 133, 104713. doi: 10.1016/j.marpol.2021.104713

Spalding, A. K. (2013). Lifestyle migration to Bocas del Toro, Panama: exploring migration strategies and introducing local implications of the search for paradise. *Int. Rev. Soc. Res.* 3, 67–86. doi: 10.1515/irsr-2013-0005

Stephenson, R. L., Benson, A. J., Brooks, K., Charles, A., Degnbol, P., Dichmont, C. M., et al. (2017). Practical steps toward integrating economic, social and institutional elements in fisheries policy and management. *ICES J. Mar. Sci.* 74, 1981–1989. doi: 10.1093/icesjms/fsx057

Stephenson, R. L., Hobday, A. J., Allison, E. H., Armitage, D., Brooks, K., Bundy, A., et al. (2021). The quilt of sustainable ocean governance: patterns for practitioners. *Front. Mar. Sci.* 8. doi: 10.3389/fmars.2021.630547

Sterling, E. J., Pascua, P., Sigouin, A., Gazit, N., Mandle, L., Betley, E., et al. (2020). Creating a space for place and multidimensional well-being: lessons learned from localizing the SDGs. *Sustain. Sci.* 15, 1129–1147. doi: 10.1007/s11625-020-00822-w

Stonich, S. C., Bort, J. R., and Ovares, L. L. (1997). Globalization of shrimp mariculture: The impact on social justice and environmental quality in Central America. *Soc Nat. Resour.* 10, 161–179. doi: 10.1080/08941929709381016

Strand, M., Rivers, N., Baasch, R., and Snow, B. (2022a). Developing arts-based participatory research for more inclusive knowledge co-production in Algoa Bay. *Curr. Res. Environ. Sustain.* 4, 100178. doi: 10.1016/j.crsust.2022.100178

Strand, M., Rivers, N., and Snow, B. (2022b). Reimagining ocean stewardship: arts-based methods to "Hear" and "See" Indigenous and local knowledge in ocean management. *Front. Mar. Sci.* 9. doi: 10.3389/fmars.2022.886632

Sumaila, U. R., and Walters, C. (2005). Intergenerational discounting: a new intuitive approach. *Ecol. Econ.* 52, 135–142. doi: 10.1016/j.ecolecon.2003.11.012

Tait, M. K., Gaughen, K. M., Tsang, A., Walton, M. M., Marcoux, S. D., Kekoa, L., et al. (2024). Holomua Marine Initiative: community-generated socio-cultural principles and indicators for marine conservation and management in Hawai'i. *Ecol. Soc.* 29, 4. doi: 10.5751/ES-13640-290104

Tengö, M., Brondizio, E. S., Elmqvist, T., Malmer, P., and Spierenburg, M. (2014). Connecting diverse knowledge systems for enhanced ecosystem governance: the multiple evidence base approach. *AMBIO* 43, 579–591. doi: 10.1007/s13280-014-0501-3

Thiault, L., Gelcich, S., Marshall, N., Marshall, P., Chlous, F., and Claudet, J. (2020). Operationalizing vulnerability for social–ecological integration in conservation and natural resource management. *Conserv. Lett.* 13, e12677. doi: 10.1111/conl.12677

Thiault, L., Jupiter, S., Johnson, J., Cinner, J., Jarvis, R., Heron, S., et al. (2021). Harnessing the potential of vulnerability assessments for managing social-ecological systems. *Ecol. Soc* 26. doi: 10.5751/ES-12167-260201

Tickler, D., Meeuwig, J. J., Palomares, M.-L., Pauly, D., and Zeller, D. (2018). Far from home: Distance patterns of global fishing fleets. *Sci. Adv.* 4, eaar3279. doi: 10.1126/sciadv.aar3279

Tremblay, C., and Jayme, B. de O. (2015). Community knowledge co-creation through participatory video. *Action Res.* 13, 298–314. doi: 10.1177/1476750315572158

Tubridy, F., Lennon, M., and Scott, M. (2022). Managed retreat and coastal climate change adaptation: The environmental justice implications and value of a coproduction approach. *Land Use Policy* 114, 105960. doi: 10.1016/j.landusepol.2021.105960

Tuhiwai-Smith, L. (2021). *Decolonizing methodologies: Research and indigenous peoples. 3rd Edition* (London: Zed Books).

Tumusiime, D. M., and Sjaastad, E. (2014). Conservation and development: justice, inequality, and attitudes around bwindi impenetrable national park. *J. Dev. Stud.* 50, 204–225. doi: 10.1080/00220388.2013.841886

Vaughan, M. B., and Ayers, A. L. (2016). Customary access: sustaining local control of fishing and food on Kaua 'i's north shore. *Food Cult. Soc* 19, 517–538. doi: 10.1080/15528014.2016.1208339

Villasante, S., Tubío, A., Gianelli, I., Pita, P., and García-Allut, A. (2021). Ever changing times: sustainability transformations of galician small-scale fisheries. *Front. Mar. Sci.* 8. doi: 10.3389/fmars.2021.712819

Walker, G. (2012). *Environmental Justice: Concepts, Evidence and Politics* (New York: Routledge).

Wals, A. E. J. (2007). *Social learning towards a sustainable world: Principles, perspectives, and praxis* (Wageningen, The Netherlands: Wageningen Academic). Available online at: https://brill.com/edcollbook-oa/title/68793 (Accessed July 19, 2024).

Wilson, S. (2020). *Research Is Ceremony: Indigenous Research Methods* (Winnipeg, Manitoba, Canada: Fernwood Publishing).

Wyborn, C., Davila, F., Pereira, L., Lim, M., Alvarez, I., Henderson, G., et al. (2020). Imagining transformative biodiversity futures. *Nat. Sustain.* 3, 670–672. doi: 10.1038/s41893-020-0587-5

Zafra-Calvo, N., Garmendia, E., Pascual, U., Palomo, I., Gross-Camp, N., Brockington, D., et al. (2019). Progress toward equitably managed protected areas in aichi target 11: A global survey. *BioScience.* 69, 191–197. doi: 10.1093/biosci/biy143

Zafra-Calvo, N., Pascual, U., Brockington, D., Coolsaet, B., Cortes-Vazquez, J. A., Gross-Camp, N., et al. (2017). Towards an indicator system to assess equitable management in protected areas. *Biol. Conserv.* 211, 134–141. doi: 10.1016/j.biocon.2017.05.014