

<https://doi.org/10.1038/s44183-024-00084-4>

Accounting for existing tenure and rights over marine and freshwater systems



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Global commitments to conservation and sustainable development increasingly demand sensitivity to the rights and territories of Indigenous peoples and local communities. However, existing tenure systems are often overlooked by global actors and their initiatives. Using key informant surveys, literature, and established databases, we describe 62 distinct tenure systems (or place-based, governance relationships between people and coasts) across 24 countries. In all systems, people held rights to access and use aquatic resources to support healthy diets, livelihoods, and culture. The three collective-choice rights (i.e., management, exclusion, transferability) were present in 29% of systems – suggesting conditions sufficient for “self-governance”. People gained or held rights due to their residency (in 63% of systems); through historical use (52%), permits (35%), and/or kinship (29%). Our synthesis provides an opportunity for policy and action to recognize these systems of tenure, and to stimulate further actions that illuminate and recognize the rights of communities toward their sovereignty.

In December 2022, at the 15th Conference of the Parties to the Convention on Biological Diversity, 188 governments committed, among other targets, to effectively conserve and manage 30% of all marine, coastal, and terrestrial ecosystems by 2030^{1,2}. The target, known as “30 by 30,” includes a clause about “recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories,” (p. 9)¹. This addition, propelled by the International Indigenous Forum on Biodiversity, represents a fundamental shift in global biodiversity agreements³. It acknowledges the intertwined relationships between biodiversity, the UN Sustainable Development Goals, the Universal Declaration of Human Rights, the UN Declaration on the Rights of Indigenous Peoples, the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines), the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries, and Forests, and REDD +, among others. The thread tying these commitments together is simple, and “well-established” by the Inter-governmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES): “policies that support secure tenure rights and equitable access to land, fisheries and forests, as well as poverty alleviation, create enabling conditions for sustainable use of wild species,” (p. 24)⁴.

Tenure is the bundle of rights, rules, and responsibilities that define who is allowed to use which resources, in what way, for how long, and under what conditions^{5,6}. In local and Indigenous contexts, tenure evokes a mutual relationship of nurturing with humans and non-humans, of people *belonging to* nature more than nature belongs to people^{7,8}. Western conceptions of tenure, however, organize nature as a type of good from which property rights can be derived and resources can be enclosed, extracted, and sold in a market^{9,10}. These differences are rooted in different worldviews that either cast humans-as-separate-from-nature, as is common in Western cultures, or humans-as-indistinguishable-from the idea of nature, as in non-Western traditions^{11,12}. For the Baniwa and Enawene of the Amazon rainforest, for example, fish from particular places constitute ancestral kin whose artistic, ritual, and social life mirrors that of humans^{13,14}. By protecting these fish, the people are protecting and honoring their cultural history, identity, and connection to the place.

Effective implementation of “30 by 30” will require a better understanding of the nature, extent, and governance of existing tenure in order to prevent further marginalization and account for management and conservation by Indigenous Peoples and local communities. On land, the territories of Indigenous Peoples and local communities cover an estimated 22% of the world’s land surface and encompass 80% of the world’s

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biodiversity^{15,16}. At sea, the fluid nature of coastal environments makes documenting area-based tenure difficult. Yet, scholars have documented the long history of the human connection with the oceans, estuaries, and wetlands^{17,18}. Confluences of land and water have been sources of life pre-dating human history, yet the current rights and deeply local relationships between societies and marine, freshwater, and brackish environments have been overlooked and forgotten by national governments, private companies, and even non-governmental organizations (NGOs) in a march towards colonization, economic development, and exclusionary conservation regimes^{19–23}. In particular, at present, the accelerating pace of development of the global ocean economy²⁴ has raised concern among critical scientists and civil society of an “ocean grabbing”^{25,26} – a process that is “(re)defining and (re)allocating access, use and control of fisheries resources away from small-scale fishers and their communities,” (p. 3)²⁶. The consequences of such reallocation are strikingly apparent in freshwater, inland fisheries, in which communities have lost access to food, livelihoods, cultural services, and abundant ecosystems as a result of development, water diversion, land drainage, damming, deforestation, and pollution²⁷. These processes of marginalization are not only unjust, but by excluding the users and stewards of most of the world’s remaining biodiversity¹⁵, risk losing thousands of years of knowledge that have supported adaptation and resilience²⁸, leading to ineffective environmental conservation^{29–35}. Additionally, by overlooking or encroaching on the tenure of small-scale fishers, the producers of nearly half of the world’s fish³⁶, the future of global food security and nutrition is in jeopardy, especially for the “tropical majority” who depend on aquatic foods for essential nutrients³⁷.

The first step in reversing this trend is to recognize the complex spatial relationships between people and natural spaces through a better understanding of tenure and user rights. To do this, here we use the Schlager and Ostrom³⁸ conceptualization of the “bundle” of rights. While there are other available approaches (e.g.,^{39,40}), Schlager and Ostrom’s approach is more appropriate for the granularity and type of data available, yet allows for the categorization of social relationships among humans and non-humans (e.g., plants, animals, wind, light, currents, etc.) in particular places, to determine in a very basic sense who is allowed to use which resources, in what way, for how long, and under what conditions^{6,38}. As described by Schlager and Ostrom (p. 250)³⁸, the bundle includes:

- Access: “The right to enter a defined physical property.”
- Withdrawal (or harvest): “The right to obtain the ‘products’ of a resource (e.g., catch fish, appropriate water, etc.).”
- Management: “The right to regulate internal use patterns and transform the resource by making improvements.”
- Exclusion: “The right to determine who will have an access right [to the resource/area].”
- Transferability (also called alienation): “The right to sell or lease either or both of the above collective-choice rights [(management and exclusion)].” In our analysis, we depart from Schlager and Ostrom³⁸ to consider that transferability can contribute to self-governance when it constitutes the right to socially transfer the bundle of rights trans-generationally, e.g., from parent to child or master to apprentice.

Rights can be held informally (*de facto*), upheld through social legitimacy, or formally (*de jure*), recognized by the State or in a written agreement, or both. Access and withdrawal are often held together as the most basic rights; they confer duties and responsibilities to authorized users³⁸. The addition of any or all of the next three rights – management, exclusion, and/or transferability – raises users to *decision-makers*. They grant the authority to make a *collective choice* about how the territory and associated resources (and relationships among humans and non-humans) are to take place or be managed (i.e., management), who is allowed to access this space (i.e., exclusion), and how that access right moves (or doesn’t) to a different person or group of people (i.e., transferability). Communities with the full “bundle” of rights are users, managers, and decision-makers, and they are thus more likely to demonstrate self-governance³⁸. Self-governance and the incentive for collective actions would be reliant on within-community (e.g., trans-

generational) transfer. In this context, self-governance is when individuals that depend on common-pool resources for the maintenance of their livelihoods are involved in the decision-making processes about their governance, i.e., the central authority (usually the State) does not have a monopoly on the use of coercion⁴¹. Self-governance empowers fishers to develop governance arrangements that are beneficial to them, and often, to the non-humans in their sphere of influence⁴².

Studies about small-scale fisheries, community-based natural resource management, and coastal Indigenous Peoples often involve or encounter marine and freshwater tenure, but may fail to name or describe it. Instead, they may choose to focus on conventional fisheries management strategies, i.e., rules designed to sustain economically important fisheries resources^{43–45}. They may ask questions about which use *rules* are most effective at meeting ecological, economical, or social goals⁴⁶. Yet, few studies have peeled back the layers to analyze which *rights* small-scale fishers, Indigenous Peoples, and local communities hold, and how this empowers (or disempowers) them to *make the rules*—not just about fishing, but about how their situated interaction in territories and societies are governed. This more nuanced approach to fisheries governance goes beyond the narrow scope of “rights-based management” (which includes market-based strategies, e.g., catch shares) and examines tenure as it affects community well-being. At the same time, it is too narrow to encompass a broader “human rights-based” approach to fisheries management (*censu* Allison et al. ⁴⁰), which importantly bring into consideration rights of the individual to decent work, public services, food, clothing, housing, medical care, education, cultural life, etc.^{40,47,48}.

Here, we seek to take a first step towards making the (globally) invisible systems of tenure and rights over “fluid geographies”⁴⁹ more visible. Key informants from 51 countries indicated the presence or absence of territorial use rights (which we used as proxy for tenure) in 1,012 institutional arrangements associated with small-scale fisheries. Institutional arrangements are rules, norms, and behaviors⁴¹ and sometimes, the larger political structures they accumulate into, e.g., regulations, managed fisheries, organizations, government departments, etc. From these 1,012 governance arrangements, 224 arrangements spanning 34 countries were associated with the presence or possible presence of territorial use rights. For each of these countries, we used keywords from the arrangements associated with territorial use rights to conduct a literature search of the related concepts of marine and freshwater tenure and co-management. Our methods pull away from surface-level descriptions of fisheries management or conservation action, and analyze the collective authorities of fishers, kin, residents, women, and other traditional and local communities.

Using the literature, we built out a database that describes the nature, extent, and governance of marine and freshwater tenure systems. In this paper, we describe four critical aspects of tenure: 1) which collective-choice rights people have (i.e., management, exclusion, and/or transferability), 2) how the basic rights of access and withdrawal are gained and transferred (i.e., permit/license, kinship, place of residence, historical use), 3) how tenure is recognized (i.e., through the Constitution, a co-management arrangement, a written agreement, a national network, or no evidence of recognition), and 4) how tenure systems spatially overlap with marine and terrestrial protected areas reported to the World Database of Protected Areas (WDPA)⁵⁰.

Which rights people have and how they are gained and transferred provides an idea of the nature of tenure (who is allowed to use which resources, in what way, for how long, and under what conditions) and how it could change in the future. How tenure is recognized, supported, or bolstered by national law or powerful groups, or the lack thereof, provides an indication for the security of tenure and highlights the rights-holders perhaps more vulnerable to marginalization in marine spatial and land use planning and biodiversity conservation processes. The relationship between tenure and protected areas reported to the World Database provides a preliminary insight into the opportunities for including tenure systems in the “30 by 30” target, either as protected areas, “other effective area-based conservation measures” (OECMs), or traditional territories.

Results

Out of the 51 countries for which we had survey data, key informants from 34 countries indicated the presence or possible presence of some form of territorial user right arrangement applied to the governance of marine and/or freshwater areas. Using this as our starting point for the literature review, we found evidence of tenure in 24 out of 34 countries (Fig. 1). We used the literature to identify and synthesize key information on 62 distinct tenure systems in these 24 countries in Supplementary Table 1. Throughout this paper, we use the term “identified” to describe the 62 tenure systems for which we found evidence and distinguished based on geographic location, governance system, and whether there was evidence of State recognition or not. Identified tenure systems exhibited evidence that a specific group (e.g., kin, members of a cooperative, residents, etc.) was free to manage (i.e., determine and implement use and withdrawal rules) and/or exclude (i.e., determine access limitations) a local, geographically-defined marine or freshwater area. All rights-holders also held access and withdrawal rights (the precursor to collective-choice rights). Seventy-one percent of the identified tenure systems were in marine areas (i.e., an ocean, sea, or adjacent saltwater/brackish area such as an estuary, wetland, or lagoon)⁵¹, 24% were in freshwater areas (i.e., a lake, river, brook, stream, pond, inland canal, dam, and other landlocked waters)⁵¹, and 5% included tenure over both marine and freshwater areas.

Which rights people have

We ascertained the presence of the three collective-choice rights (i.e., management, exclusion, and transferability) based on evidence found in the literature (see Table 1). Eighty-one percent of systems showed evidence of both management and exclusion (Fig. 2). All three rights were present in 29% of systems, suggesting self-governance (via our definition with social transfer) and the increased empowerment of rights-holders to manage their fisheries³⁸. The 18 self-governing tenure systems were in Asia (Indonesia, Sri Lanka), Latin America and the Caribbean (Brazil, Chile, Mexico), the Pacific (Fiji), and Sub-Saharan Africa (Congo, Nigeria) (Supplementary Table 1). Transferability (i.e., the power to sell, lease, or socially pass on a management or exclusion right) was the least frequently right described in the literature, present only in 34% of systems (29% + 5% + 0% + 0% in Fig. 2), compared to management (99%) and exclusion (83%).

How access and withdrawal rights are gained and transferred

For each tenure system, we examined the literature for evidence of any or all of four mechanisms for assigning access and withdrawal rights: place of residence, historical use, formal permit/license, kinship (i.e., through family or other social relations such as teacher/apprentice). Of the four mechanisms, place of residence or adjacency was the most frequent method for assigning tenure rights, found in 87% of systems with evidence of formal recognition and 44% of systems without evidence of formal recognition, or a total of 63% of all systems (Fig. 3). Place of residence is frequently combined with either historical use (in 20 out of 39 systems) or permit (in 13 systems). Co-managed tenure systems (i.e., in which fishers and government share management authority, sometimes with the participation of NGOs)⁵² frequently (in 73% of cases) assigned access and withdrawal rights through place of residence. Residency is also a common method to grant/gain formal rights. For example, residency is used in 13 out of the 15 tenure systems that, from comparing maps and geographic descriptions in the literature, appear to be entirely within a protected area reported to the World Database⁵⁰.

In half of the tenure systems with no evidence of formal recognition, access and withdrawal is controlled by kinship (i.e., familial/social ties) (Fig. 3). For example, families that own land in certain Congo floodplains have the right to harvest fisheries resources left behind in temporary pools when the water recedes, and pass this right down to their children⁵³. “Acampamentos” in the São Francisco River in Brazil are passed down to apprentices or family members⁵⁴; and members of the Bozo tribe in Mali have exclusive ownership of certain fishing channels in the dry season through an arrangement called “manga jil”⁵⁵. Kinship is less frequent among formal systems – present in only 24% of identified tenure systems. Kinship also appears to be a winning strategy for self-governance, present in 11 out of the 18 tenure systems with evidence of all three collective-choice rights (i.e., management, exclusion, and transferability). For example, the first three clans to settle the Negombo and Chilaw Lagoons in Sri Lanka gained exclusive access rights to the estuary fisheries^{56,57}. All three collective-choice rights have been maintained through inheritance (in Negombo, since the 15th century), and today, only descendants of the original clans have tenure over stake-seine fisheries^{56,57}. In Raja Ampat, Indonesia, the descendants of the first six clans that settled in Tomolol hold tenure⁵⁸. In Negombo, rights were passed down through the paternal line⁵⁹, but they can also be passed

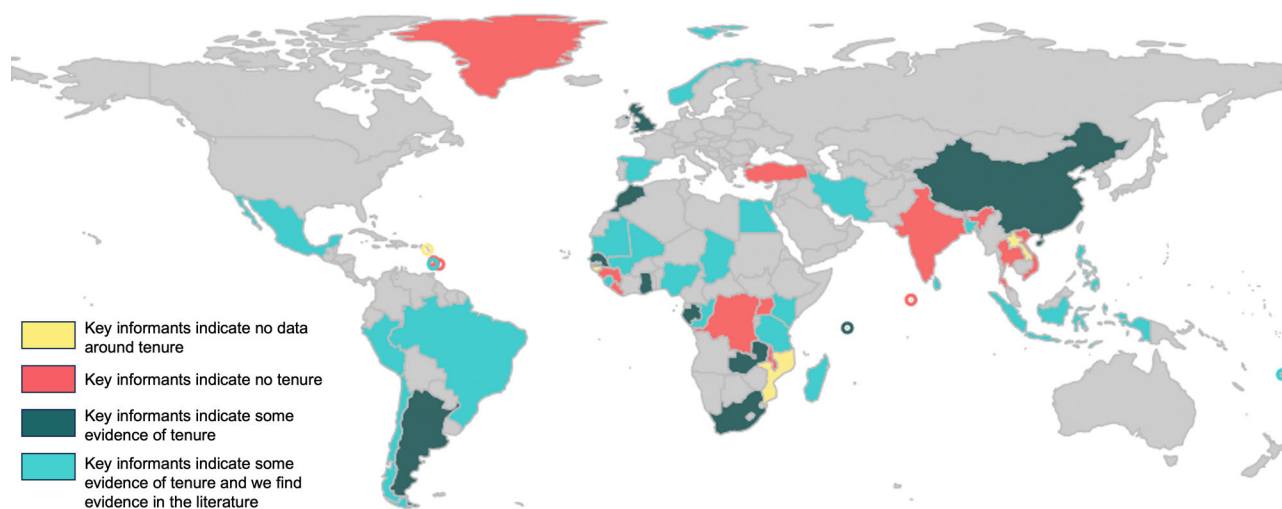


Fig. 1 | We examined two sources for evidence of tenure in 51 countries. (1) Survey response data in which key informants indicated the presence or absence of territorial use rights (a proxy for tenure) in the institutional arrangements of small-scale fisheries, and (2) Google Scholar literature on co-management, customary marine tenure, territorial use rights for fisheries, and property rights. In 17 countries, key informants either indicated no data ($n = 4$, yellow), or the absence of territorial use rights ($n = 13$, red). These countries were not further examined via literature. In 10

countries (dark turquoise), key informants indicated the presence or possible presence of territorial use rights, but no additional evidence was found in the literature. In the remaining 24 countries (light turquoise) in which key informants indicated some evidence of tenure, we found and described 62 marine and freshwater tenure systems from the literature. See Supplementary Figure 1 for a conceptual flow diagram of country selection and a list of countries in each category.

Table 1 | The three collective-choice rights

| Collective-Choice Right | Definition ³⁸ | Indications of the presence of this right among the community |
|-------------------------|--|---|
| Management | “The right to regulate internal use patterns and transform the resource by making improvements.” | <ul style="list-style-type: none"> • Created or co-created a management plan • Partners with government or an NGO in a formal co-management arrangement • Monitors the resource/territory • Has developed use rules (e.g., gear restrictions, temporal restrictions, no-take zones, input controls, output controls, cultural practices that distribute effort over time and space) • Enforces the rules (i.e., imposes sanctions on rule-breakers) • Patrols the territory |
| Exclusion | “The right to determine who will have an access right, and how that right may be transferred.” | <ul style="list-style-type: none"> • Has written requirements about who can access the territory/resources • Has informal, but widely understood, requirements about who can access the territory/resources • When faced with threat from outsiders, has successfully kept them out • Grants outsiders the right of access and withdrawal in exchange for something (e.g., compliance, monitoring, payment) • Has developed rules around transfer/inheritance of rights |
| Transferability | “The right to sell or lease either or both of the above collective-choice rights.” Includes social transfer (e.g., parent to child, master to apprentice). | <ul style="list-style-type: none"> • Passes down rights through kinship (e.g., to family members of apprentices) • Has developed rules to transfer/sell rights |

As collective-choice rights are not always explicitly mentioned in the literature, the following indicators were useful in identifying the presence of each right. A single indicator is enough to signal its associated right.

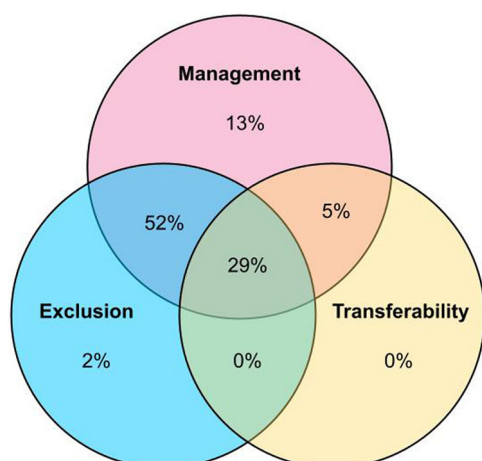


Fig. 2 | Combinations of rights. The percentage of tenure systems that only indicated a management right (13%), indicated management and transferability but not exclusion (5%), only transferability (0%), exclusion and transferability but not management (0%), only exclusion (2%), management and exclusion but not transferability (52%), and all three rights (29%). Numbers are rounded to the nearest whole number and thus add up to 101%.

matrilineally, or both (e.g., Sri Lankan “Jakottu” Fish Kraal Fisheries⁵⁶; Congolese Temporary Floodplain Tenure⁵³).

Historical use determines access and withdrawal rights in 80% of formal systems and 31% of the systems with no evidence of formal recognition. It goes beyond residence by granting rights to the traditional users of a territory, Indigenous or not. The timescale of historical use ranges from the order of decades (e.g., Mexican Puerto Peñasco Fishing Concession⁶⁰) to nearly ten thousand years (e.g., Norwegian Sea Sámi Customary Marine Tenure^{61,62}).

Kinship and historical use are strongly associated with a transferability right. In ninety percent of the identified cases with a transferability right, access was controlled via historical use, kinship, or both. This suggests that although we left the definition of transferability open to include economic transfer (i.e., by selling, leasing) and social transfer (i.e., by inheritance, apprenticeship), transfer overwhelmingly occurred socially in the identified cases.

In this study, we use the term “permit” to mean that access and withdrawal rights are conferred via a license issued by the State. About half of the recognized systems studied here exhibit evidence of permits. While it is not counted in this study, informal systems may develop their own “permitting” systems and use it as a criterion to grant access and withdrawal rights⁶³. In Mexico, for example, the local Comcáac authorities developed a system to grant access to non-Indigenous fishers to their fishing concession only after paying a “permitting” fee, among other conditions set by the rest of the community⁶³. In freshwater fisheries in northeast Nigeria, as well as rivers, creeks, lakes (natural and manmade), and fishing pools in Nigeria’s coastal states, “permitting” or “rental” fees are established by communities, families, or individuals^{64–66}.

Instruments of (formal) recognition

For 74% of tenure systems, we found some evidence of formal recognition in the literature. These included one or a combination of the following scenarios: 1) tenure rights (including traditional or customary rights) are recognized in the State Constitution, 2) there is a formal co-management arrangement in place in which the State shares management authority with tenure rights-holders, sometimes with the participation of one or multiple NGOs, 3) some tenure rights are protected in legislation at any jurisdictional scale, even if they are the most basic (i.e., access and withdrawal), 4) tenure (even informal tenure) serves as the basis for a recognized network of community management areas, 5) parties (usually non-government) have entered into a written agreement that articulates the rights of rights-holders, and 6) there is no evidence of formal rights recognition in the literature examined.

Co-management was the most frequent instrument of recognition, present in 65% of tenure systems. Co-management legislation can broadly recognize the rights of traditional users (e.g., Indonesia Laws No. 21 and 35 in West Papua restore customary tenure rights⁶⁷), allocate exclusive rights to a defined area (e.g., Mauritania Law 2000/24 grants residents of the Banc d’Arguin exclusive fishing rights⁶⁸), establish co-management bodies (e.g., Philippines Executive Order No. 240 establishes Fisheries and Aquatic Resources Management Councils⁶⁹), articulate eligibility requirements for rights-holders (e.g., Decree 171/1998 of the Forum of the Patos Lagoon (Brazil) restricts licenses to full-time fishers that live in the estuary⁷⁰, Negombo Fishing Regulations (1958) (Sri Lanka) require fishers to be members of an association⁵⁶, or provide an opportunity to apply for a concession or title (e.g., Law No. 20.249 “Lafkenche Law” allows aboriginal communities in Chile to apply for “Espacios Costero-Marinos de Pueblos

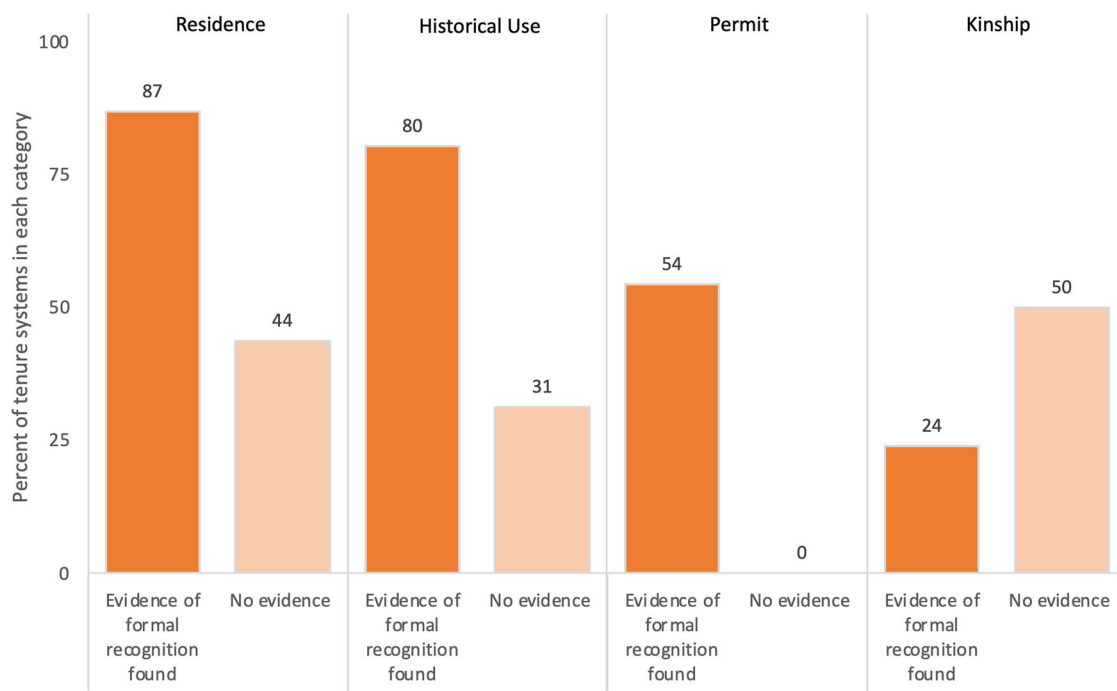


Fig. 3 | How rights are conferred in systems with and without evidence of formal recognition. Mechanisms for controlling access and withdrawal rights in tenure systems with formal recognition (i.e., through co-management, the constitution, a

formal network, or written agreement) and no evidence of formal recognition and/or informal legitimacy. Note: percentages do not add up to 100; one tenure system can use multiple mechanisms to confer access and withdrawal rights.

Originarios⁷¹, Philippines Department Administrative Order 02 (1993) introduces Certificates of Ancestral Domain Claims for Indigenous peoples⁷², among other things. International NGOs have helped fund, design, and implement the co-management of “jalmohals” (waterbodies) in Bangladesh⁷³, managed access areas in Indonesia and the Philippines^{74,75}, Marine Protected Areas in Raja Ampat, Indonesia⁶⁷, community-based fisheries management in Coron Island, Philippines⁷², beach management units in Kenya and Tanzania⁷⁶, and Locally-Managed Marine Areas (LMMAs) in Fiji and Madagascar⁷⁷⁻⁷⁹.

Recognition through the national constitution, national networks (e.g., LMMAs, NGO-facilitated managed access), and written agreements were less common. One particularly interesting case was the traditional fishing rights in Jenggalla and Gondang Villages in Lombok, Indonesia⁸⁰. Although not recognized by the local government, customary fishing rights are recognized by a written agreement between fishers and a pearl mariculture company that operates in the bay⁸⁰. In exchange for use rights, the mariculture company has compensated and granted certain liberties to fishers, which led to the formation of a local fishing association⁸⁰.

A quarter (26%) of identified systems had no evidence of formal recognition in either the literature or in key informant surveys. There tends to be a lack of information about these systems available, and they tend to be temporary and/or composed of small fishing spots, yet many benefit from widespread compliance. For example, fishers have rights over “acampamentos” (camps) on rivers and “pesqueiros” (fishing spots) in coastal areas in Brazil^{54,81,82}. The practice of passing “marcas” (markings, or fishing spots) down through families and vessels in Juan Fernández Archipelago, Chile, has kept the fishing fleet small and stable since the 1890s⁸³. Tenure over brush piles occurs in Bangladesh, Brazil, and Sri Lanka^{59,84-87}. These are small, fish aggregating structures created by lodging brush (usually from mangroves) vertically into the mud to create structure in shallow waters, then harvesting the distinct fishing spots later. Some unrecognized tenure systems operate in spite of laws that vest the governance of natural resources with the State (e.g., the remote fishing village of La Isilla, Peru)⁸⁸. Despite the lack of State recognition, 44% of these systems demonstrated all three collective-choice rights, suggesting self-governance (Fig. 4). In contrast, 24%

of systems with evidence of formal recognition demonstrated self-governance. In the majority (61%) of formally recognized systems, rights-holders experienced two out of the three collective-choice rights (Fig. 4).

Intersection with the World Database of Protected Areas (WDPAs)

In order to test the feasibility of marine and freshwater tenure systems to contribute to the “30 by 30” target and assess the appropriateness of it for recognizing tenure, we defined the extent of each tenure system with available geographic data (i.e., a map or landmarks identifiable on Google Maps) and compared them to marine and terrestrial protected areas that have been reported to the World Database of Protected Areas⁵⁰. The suggested definition for protected areas on this platform is: “A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values,” (p. 8)⁸⁹. However, there is no third-party validation process for State-reported protected areas in the World Database, so they may instead conform to national definitions.

Thirty-one percent of the identified tenure systems appeared to fall completely within reported protected areas, and therefore likely already count towards the “30 by 30” target (Fig. 5). Of those, 26% seemed to have self-governance, and 21% showed no evidence of formal recognition. Those that were formally recognized tended to be government concessions to Indigenous Peoples or local communities for sustainable use. This was the case for Iranian Nayband National Marine and Coastal Park⁹⁰, Spanish Os Miñarzos Marine Reserve of Fishing Interest⁹¹, Brazilian Indigenous Rights in the Mamiraua Sustainable Development Reserve^{92,93}, Brazilian Marine Extractive Reserves⁹⁴, Gambian Special Management Area for TRY Oyster Women’s Association⁹⁵, and Mauritanian Imrâguen Rights in Banc d’Arguin National Park⁶⁸. In some cases, traditional communities were required to apply for the legal right to continue to access, use, and manage their traditional territories^{96,97}. In addition to the marine and freshwater tenure systems that were entirely within a reported protected area, 34% partially overlapped with one or multiple protected areas. This could occur when only one management area of the tenure system was within a reported

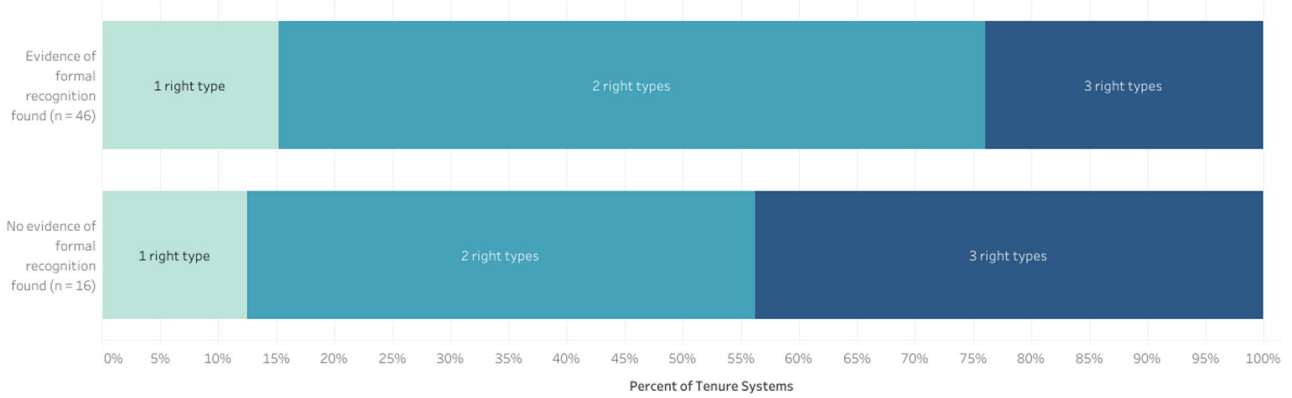


Fig. 4 | Proportion of systems with and without evidence of formal recognition with one, two, and three collective-choice rights (i.e., management, exclusion, transferability). Tenure rights-holders more frequently demonstrate self-governance (i.e., three rights) in systems without evidence of formal recognition.

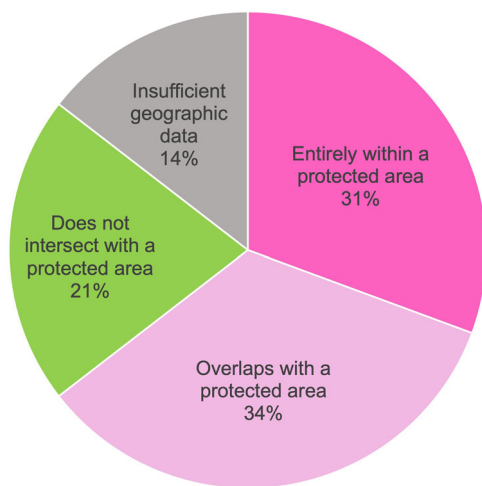


Fig. 5 | The spatial intersection of tenure systems with protected areas. States reported protected areas to the World Database on Protected Areas⁵⁰.

protected area, but others were not (e.g., the Velondriake Locally-Managed Marine Area (LMMA) has been reported to the *World Database*, but other LMMAs in Madagascar are not). Twenty-one percent of tenure systems did not intersect with reported protected areas, and 15% had insufficient geographic data in the literature to determine the overlap.

Spatial closures within tenure systems

Communities with tenure may choose to create no-take fishing areas for multiple, diverse objectives, for example, to conserve biodiversity, honor ancestors, prepare for a feast, or enhance local livelihoods^{18,32,58,98-107}. We found evidence in the literature of at least one no-take spatial closure (temporary or permanent) in 37% of identified tenure systems. Ninety-one percent of the tenure systems with spatial closures were formally recognized.

Discussion

The rights of small-scale fishers, Indigenous Peoples, and local communities to access coasts, shorelines, oceans, or other waterbodies are a foundation of food systems, livelihoods and cultures. These groups are viewed (admittedly to differing degrees) by international agreements, national constitutions and/or societies as rights-holders. When rights-holders can also collectively regulate who has access and withdrawal rights (i.e., exclusion) and the internal use rules (i.e., management), their common-pool resource institutions tend to be more durable, leading to greater tenure security^{98,108}. This was the case in most identified tenure systems, and is true in other

geographies outside the scope of this study as well, such as many Pacific Island countries and territories⁷⁸.

Our choice to include systems with either a management right or exclusion right (rather than both) led to the inclusion of three additional systems (i.e., that did not indicate an exclusion right). We suppose that management rights may be more desirable for some researchers to examine and illuminate compared to the exclusion of other users. We are not the first to identify the individual components of these systems (e.g., user groups, species, rights, formal and informal institutions) because we rely on what is reported in the literature. Yet, in some cases, we are the first to call these collections of areas, humans, non-humans, rights, rules, and responsibilities a single tenure system (with some degree of subjectivity).

Our result that 90% of the identified cases with a transferability right controlled access via historical use, kinship, or both underscores the importance of including social means of rights transfer in addition to or *in lieu* of economic transfer in any examination of tenure or self-governance. While not exempt from the social and environmental concerns of consolidation frequently associated with individual fishing right programs¹⁰⁹, collective tenure spreads decision-making power across a group, and if passed intergenerationally, consolidation, if any, occurs on longer time-scales with much more deliberation. While Schlager and Ostrom³⁸ acknowledge the widespread practice of passing down rights through familial lines, their definition of self-governance excludes it, and instead identifies communities with the “possibility that resources will be transferred to their highest value use,” (p. 251, footnote 8)³⁸. In our definition of self-governance, which we recommend for future studies of tenure, we give more weight to collective social legitimacy rather than focusing solely on economic efficiency.

How rights-holders gain access and withdrawal rights through eligibility or “boundary” rules⁴¹ has important implications for tenure security and equity. The more clearly-defined the boundaries, the greater the tenure security^{98,108}. On the flip side, the tighter the boundaries, the more people who are excluded¹¹⁰. Given the place-based nature of tenure, it is unsurprising that rights-holders use residency frequently as an access mechanism, especially in recognized systems, where it may be easier for external regulators to verify then, say, kinship or historical use. Communities that are adjacent to the marine areas they manage are significantly better at conserving them than those that are not^{32,111}. McCay et al.¹¹¹ explains, “Adjacency, combined with a high level of community dependence on the fisheries and relatively small size of the adjacent fishing areas, means that people not only know each other, but they have a good chance of seeing and hearing what is happening both on land and at sea, and they are personally invested in reporting, formally and informally, events that potentially affect the resources,” (p. 54)¹¹¹. Adjacent communities may hold formal land tenure – where tenure and rights to aquatic spaces are an extension of the arrangements on land. For example, the Fijian traditional fishing grounds

(“qoliqoli”) are often (though not always) adjacent to the land-holding group¹¹². In other places, the high tide mark may indicate a change in rights and tenure arrangements. For example, in the Lau and Langalanga Lagoons of Solomon Islands, the “saltwater” people live in the lagoon on manmade islands and hold marine tenure, but have no rights to the adjacent coast¹¹³. Our result that collective-choice rights-holders infrequently use permits as a method of access and withdrawal is supported by the broader IHH study. Permits govern the largest portion of small-scale fisheries catch in IHH, but in the majority of cases, permits do not devolve management, exclusion, or transferability rights to fishers when used alone³⁶. Combining permits with other mechanisms (i.e., place of residence, historical use, and/or vessel registration), however, was more highly correlated with devolved rights³⁶.

The security of tenure is said to be higher if arrangements and rights are formally-recognized and written or registered within laws, plans and/or titles^{25,26,60}. Many contemporary manifestations of tenure may be hybrids¹¹⁴. For example, co-management arrangements may contain blends of formal and informal elements^{8,115}, and build upon customary institutions such as “qoliqoli” in Fiji, “dina” in Madagascar, and “sasi” in Indonesia, whether they are legally gazetted or not^{77,78,116–118}. Territorial Use Rights for Fisheries (TURFs) are another example. TURFs are clearly-defined geographic areas in which fishers have the rights of management and exclusion¹¹⁹. While the original FAO conception of TURFs included customary arrangements that “have been known to exist for centuries,” in “sea tenure situations,” (p. 1)¹¹⁹ in many cases, TURFs have been used as a contemporary label for formal co-management. For example, in Mexico, formal TURFs have laid the foundation for much of the existing marine tenure today^{120,121}. The FEDECOOP TURFs, which were the first small-scale fishery in a developing country to earn Marine Stewardship Council certification, are regarded as a property rights success story^{111,122}. In Chile, “Management and Exploitation Areas for Benthic Resources” have also earned international recognition, and have expanded to include nearly 800 nearshore, community co-managed sites^{123,124}.

Yet, formalizing tenure is not always straightforward, desired by rights-holders, nor unquestionably “good.” Often, inherently flexible and dynamic systems can change their form or stimulate disputes¹²⁵. The transition from self-management to co-management is not always empowering, and may require bureaucratic/financial burdens, restrict local ecological knowledge, and create conflict between stakeholders^{97,126,124}. For example, ECMPOs, which promise to formalize Indigenous tenure in Chile, have proven difficult to implement despite the rapid and widespread growth in the number of submitted applications⁹⁷. This is due, at least partially, to territorial disputes between marine uses, e.g., aquaculture, marine protected areas, and “Management and Exploitation Areas for Benthic Resources”⁹⁷. In other cases, formal efforts have laid the framework for tenure by organizing coastal stakeholders into decision-making bodies (e.g., beach management units in Lake Victoria^{127–129}, community fisheries organizations in Cambodia¹³⁰), but without sufficient government support or local capacity, have fallen short of their lofty goals.

One of the critical challenges in environmental governance is how such local efforts are considered and respected within powerful, globalized, and large-scale initiatives. One such initiative that has received concern from many rights-holders groups, and high levels of enthusiasm and buy-in from governments and the conservation sector is the “30 by 30” target. There are (at least) three pathways through which “30 by 30” has committed to recognize and support tenure. The most direct is the commitment to recognize “indigenous and traditional territories, where applicable, [...] recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories,” (p. 9)¹. The two (arguably) more prominent or mainstream conservation tools are the establishment of protected areas and the recognition of “other effective area-based conservation measures” (OECMs), which conserve biodiversity, but not necessarily as the primary objective^{1,131}. We find that many identified tenure systems may already count towards “30 by 30” through reported protected areas. Given the exclusionary history of conservation, there is an urgency to recognize and maintain the recognition of existing rights in such

systems. However, caution must be taken not to simplify such rights as instrumental to an externally-framed conservation end goal, and to ensure rights-holders are valued as equal partners, and their existing and broader set of rights are maintained and upheld^{132–134}. OECMs are another potential pathway to recognize tenure given the definition accepts they may be managed for purposes (e.g., hunting, fishing, and cultural significance) other than biodiversity conservation¹³². However, to gain international recognition they require clear geographic boundaries and proof of effective biodiversity conservation¹³¹, two monumental, burdensome and risk-laden expectations. The newest pathway to recognize tenure through “30 by 30,” is Indigenous and traditional territories. The process and expectations surrounding such areas is uncertain, and whilst recognition might bolster rights and tenure, the processes and outcomes are far from free of risk to rights-holders. If the territories are counted by the same methods that place the coverage of the territories of Indigenous Peoples and local communities at 22% of global lands, we may very well be at the 30% target for land with the addition of protected areas. This study and others like it, which identify and describe candidates for recognition as Indigenous and traditional territories, will be especially important for reaching “30 by 30” at sea.

Our initial review to account for tenure in marine and freshwater systems in select geographies provides a broad overview of the many dynamic relationships between human societies and fluid geographies. An essential caveat of this study is that tenure was only examined in a selection of countries; those where we conducted key informant interviews and where key informants indicated there to be territorial use rights. A broader geographic lens would certainly reveal more communities with marine and freshwater tenure^{133,134}. For example, while we only examined Fiji in the South Pacific, Govan et al.,⁷⁸ found 341 cases of marine tenure (via LMMAs) across seven additional countries⁷⁸. We also acknowledge that the Western, property-rights-based conceptual framework that we used is inadequate and inappropriate to capture the depth and diversity of environmental-societal interactions and relationships. Future studies will need to develop a more nuanced typology for all other rights in the bundle (e.g.,^{39,40}). Their identification would require an intensive primary data collection effort in most cases. Other approaches have demonstrated the importance of the dynamics of power associated with rights (e.g.,¹³⁵), which was a weakness of our examination.

“How can you own that which outlives you?” These words, spoken by the Kaling chieftain Macli-ing Dulang of the Philippines, have been echoed by communities with tenure around the world¹³⁶. It reflects a broader sense of tenure than property ownership or fisheries management (for example), and instead evokes a sense of *belonging* to the coasts, as if born by the same mother¹³⁷. Rights-holders with deep connections to place must “stay with the trouble” of (i.e., endure and adapt to) complex processes of (for example) extreme weather events, natural disasters, legal and social change that impact upon daily lives^{133,134}. New initiatives that seek to improve territorial recognition, may (inadvertently or deliberately) place new expectations and costs on rights-holders in order they comply. Through appropriate, context-specific recognition and support, tenure regimes, rights, and rights-holders are tied to agency, sovereignty, and cultural integrity.

Methods

Country selection

This study focused on countries for which there was a high relative importance of small-scale fisheries, both in-country and globally. We defined importance based on national indicators of reliance on marine and freshwater ecosystems (e.g., fisheries production, employment and contribution to diets) combined with expert opinion (methods and data described in detail in the Illuminating Hidden Harvests (IHH) Initiative³⁶). Researchers associated with IHH conducted a survey (2014–2017) in 51 of the top-ranked countries completed by a total of 543 key informants³⁶. Key informants were international and national individuals and teams of experts from academia, government, research consulting, NGOs, and fisheries management agencies (see the complete list, p. XV–XXI)³⁶. Individuals or small groups completed one survey for each country. One question asked if

each listed institutional arrangement was managed, at least in some cases or areas, by Territorial Use Rights for Fisheries (TURFs). The guidance for response read: “Indicate if fishery under this arrangement is managed partially or entirely under a TURF system (such as concessions or customary marine tenure) or not.” We acknowledge the term TURFs and the focus on small-scale fisheries may have narrowed the response space and led informants to leave out some tenure arrangements.

We focused the literature and database review on the 34 countries for which key informants indicated the presence or possible presence of territorial use rights (Supplementary Figure 1). Although we excluded the 17 countries for which key informants reported the absence of territorial use rights or no data, we note a broader survey of experts or a broader framing of the question and literature may well have illustrated the presence of tenure. Respondents described 224 institutional arrangements (e.g., fisheries, regulations, actors, traditions, etc.) associated or possibly associated with territorial use rights. We verified and expanded these descriptions of institutional arrangements using: (1) The Fishery Solutions Center Global Catch Shares Database¹³⁸ [accessed June 2021–April 2022] which details fishery management systems in marine and freshwater environments that “allocate a secure area or privilege to harvest a share of a fishery’s total catch to an individual or group,” (p. 2)¹³⁹; (2) A global, marine-focused survey of TURFs defined as “an area in which individuals or communities are given some level of exclusive access to marine resources within a defined boundary,” (p. 2)¹⁴⁰; (3) A library of 1,168 peer-reviewed and gray literature of formal and informal “community based co-management” arrangements¹⁴¹.

Building the database

Once the scope of countries was narrowed to 34, we built out the database (Supplementary Table 1) with an iterative process of conducting a literature search on Google Scholar from June 2021 to April 2022 using the arrangement names and descriptions, reviewing literature, identifying tenure systems, and returning to the institutional arrangements to see if any descriptions could add context. A second literature search on Google Scholar was completed from January through March 2023 using the name of each of the 34 countries, plus the terms “property rights fisheries,” “territorial use rights,” and “marine tenure.” Articles reviewed were limited to those written in English. The literature search provided all data analyzed in this study, and allowed us to build qualitative descriptions of each tenure system and its institutional arrangements at international, national, sub-national and local levels (Supplementary Table 1). In sum, 64 institutional arrangements from the IHH survey could be associated with the resulting 62 tenure systems.

We do not consider this compilation to be a complete inventory of tenure rights around the world. Many tenure rights are informal and not documented in the literature or simply were outside of the knowledge of the network of key informants in which this survey was built. Furthermore, our study is weak in illustrating rights and relationships beyond those categorizations by the Schlager and Ostrom³⁸ framework for property rights that we chose to imply here. For example, communities may view stewardship as inherently different from the concept of management.

Indicators for collective-choice rights

Marine and freshwater tenure can be described in diverse ways, and so rather than looking for the presence of the terms management, exclusion, and transferability, we looked for indications of each (see Table 1). Where we identified a right as present, we assumed that all users do not experience all rights, and where the information was provided, we noted how rights were distributed differently (i.e., based on gender, class, ethnicity) in relevant communities.

Data Availability

The dataset generated, collated and analyzed during the current study is available at <https://airtable.com/app4N9jVrmvmZcpiZ/shrVoQmaJp00m2Acg/tblR4Zw47kvLCpj51>. Citations for manuscripts providing

primary data for different countries or tenure systems are listed therein. The full citations are available in Supplementary Material.

Received: 18 December 2023; Accepted: 18 September 2024;

Published online: 30 September 2024

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Acknowledgements

This work was made possible with funding support from the Oak Foundation, the David and Lucile Packard Foundation, the Food and Agriculture Organization of the UN (FAO), and the Duke University Nicholas School of the Environment EIF-KGKI Internship Fund. This work was prepared by the Marine Tenure Initiative and is part of the Illuminating Hidden Harvests initiative. The key informant survey was supported by the FAO,

Duke University, and WorldFish Illuminating Hidden Harvests (IHH) Initiative. We are grateful for the expert insights provided by Bernard Adrien, Abdullah Al Mamun, Joanna Alfaro, Kristie Alleyne, Marcela Álvarez, Oscar Amarasinghe, Godfred Ameyaw Asiedu, Andrea Araya, Christopher M. Aura, Andrew Baio, Jude Bijoux, Nikkita Browne, Guy Bungubetshi, Ling Cao, Achini De Silva, Tomris Deniz, Shiwanthika Dharmasiri, Baping Douague, Zacari Edwards, Ayokunle Oluwatoyin Enikuomehin, María Eva Góngora, Fabrício Gandini Caldeira, Phung Giang Hai, Caitlin Gilmour, Didem Göktürk, Patricia Hubert Medar, Ilham Ilham, Methsiri Jayantha, M.G. Kularathne, Steven Lee, Upul Liyanage, Julia Mantinian, John Mathias, Sérgio Mattos, Micheal Mukisa, Margaret Nakato, Rehema Namaganda, Ahmed Nasr-Allah, Kjell Nedreaas, Francis Maduwuba Nwosu, Paul Onyango, Horace Owiti Onyango, Elizabeth Palta, Kaviphone Phouthavong, Siya Qiu, Johanna Rojas, Clonesha Romeo, Mauro Luis Ruffino, Ibrahim Salah, Noela Sánchez-Camero, Sheck Sherif, Masood Siddique, Hunter T. Snyder, Djiga Thiao, Djiga Thiao, Alhassane Toure, Shanika Weralugolla, Olaf L.F. Weyl, Orisia Williams, Edward Wilsteed, and Shiming Zou. A preliminary version of this manuscript was submitted as a Master's Project in partial fulfillment of the requirements for the Master of Environmental Management degree in the Nicholas School of the Environment of Duke University. Thank you to Nicolás L. Gutierrez for providing access to the co-management library. Thanks to Chloe Young and Kirsty Nash for figure preparation.

Author contributions

X.B., N.F., and B.T., conceptualized the research. B.T. and X.B. developed and implemented the methodology. B.T., X.B., and P.J.C. interpreted the findings and drafted the manuscript and figures. B.T., X.B., P.J.C., N.F., A.H.C., H.G., E.A.B., K.F., and S.L.A. reviewed, edited and refined the manuscript.

Competing interests

Author BT acted as a paid consultant for Environmental Defense Fund and Meridian Institute while completing this work, but declares no non-financial

competing interests. All other authors declare no financial or non-financial competing interests.

Additional information

Supplementary information The online version contains supplementary material available at <https://doi.org/10.1038/s44183-024-00084-4>.

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