

Review

What's on the horizon for community-based conservation? Emerging threats and opportunities

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Community-based conservation can support livelihoods and biodiversity, while reinforcing local and Indigenous values, cultures, and institutions. Its delivery can help address cross-cutting global challenges, such as climate change, conservation, poverty, and food security. Therefore, understanding trends in community-based conservation is pertinent to setting and implementing global goals. We undertook a horizon scan to prioritize 15 emerging threats and opportunities expected to impact the future effectiveness of community-based conservation. Topics relate to global biodiversity policy; human rights; shifting human geography; inclusion, diversity, equity, and access; conservation finance and income; and economic reforms. Our findings offer guidance on strengthening community-based conservation to achieve global environmental and development goals.

Motivations for a horizon scan on community-based conservation

Community-based conservation strives to integrate culturally sensitive socioeconomic development with nature conservation to catalyze benefits for both people and nature. It aims to foster stewardship of local ecosystems and biodiversity by enabling, championing, and elevating local and collaborative governance systems and management practices [1–3]. The discourse on community-based conservation has evolved to embrace local value systems and knowledge, decolonize conservation, support human well-being, and ensure the equitable distribution of benefits and costs from conservation [4,5]. The practice of community-based conservation can either be grassroots driven or implemented top-down, for example, via government directives or policies of the funding institution [2].

Effective implementation is dependent on delivery mechanisms, community characteristics, the wider socioeconomic and political context [6], and proactive adaptation [7]. Outcomes can be mixed, with initiatives prone to negative social outcomes when local world views are ignored or resource management rights not effectively devolved [8]. Critiques highlight that existing legislation around natural resource management and an overemphasis on economic benefits undervalue cultural connections with place, commodify nature, and create economic competition

Highlights

The intertwined, global issues of climate change, rapid biodiversity loss, and failure to eradicate poverty present a wicked problem; they need to be addressed jointly, because each has implications for communities on the ground, and one can fuel another.

For decades, community-based conservation has tried to tackle these inter-related challenges with mixed success and, at times, counterproductive results, but has arisen as a promising and popular approach on global agendas.

We undertook a horizon scan on community-based conservation and identified 15 topics that offer opportunities to yield positive change for people and the planet. The analysis also provides insights into pitfalls to avoid in achieving 2030 global policy targets.

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and associated decision inequities, even violence, ultimately disenfranchising rather than empowering communities [4,7,9,10]. Community rights remain limited in many regions; nonetheless, community-based conservation has proven resilient, innovative, and continues to spread [7,11]. The total land area legally recognized as under the direction of **Indigenous peoples and local community** (IP&LC, see [Glossary](#)) is almost as large as that in protected areas owned and managed by governments [12]. Moreover, territories under Indigenous stewardship either legally or *de facto* cover more than a quarter of the planet's land area and encompass many biodiversity hotspots and ecologically intact ecosystems [12,13].

Thus, community-based conservation can contribute to policy developments and influence legislation in three inextricably linked and worsening global predicaments: climate change, biodiversity loss, and the broader economic and social dimensions of the United Nations (UN) **Sustainable Development Goals (SDGs)**. Against a reality of unfavorable temperature trajectories, Parties to the **UN Framework Convention on Climate Change (UNFCCC)** are struggling to develop mechanisms to implement the **Paris Agreement's** 1.5°C target for global warming [14]. Given the biodiversity crisis [15], Parties to the **Convention on Biological Diversity (CBD)** have concluded protracted negotiations for the **Kunming–Montreal Global Biodiversity Framework (GBF)** [16]. Halfway through the implementation timeframe for reaching the 2030 SDGs, progress is in jeopardy considering intersecting impacts from coronavirus disease 2019 (COVID-19), the largest number of violent conflicts since World War II, and climate change [17].

Community-based conservation can not only support, but also be significantly impacted by these multilateral policy instruments. Therefore, we implemented a horizon scan in 2021 to understand threats and opportunities expected to hinder or facilitate community-based conservation effectiveness within the coming 10–15 years. Horizon scanning is a foresight technique for detecting early signals of future change (as opposed to identifying past or current trends). The technique gathers, organizes, and prioritizes new and existing evidence of emerging threats and opportunities in a structured and transparent way, using diverse information sources [18]. This supports better coordination of resources, responsive policy, and on-the-ground action to pursue opportunities early and mitigate threats before they fully materialize [19].

Our process for gathering and prioritizing threats and opportunities in community-based conservation sought to maximize globally representative ideas ([Box 1](#)). A three-person facilitation team coordinated the systematic, stepwise consensus-building process [20] by which collaborators analyzed and evolved ideas gathered via an online global survey (see [Figure 1](#) in [Box 2](#)).

Previous environmentally focused horizon scans have informed policy, funding, and decision-making [21]. By highlighting upcoming risks and opportunities in community-based conservation for global policy and local grassroots audiences alike, we aim to encourage proactive strategies and actions to safeguard biodiversity and enhance human well-being.

The top 15 emerging topics in community-based conservation

The prioritized topics fall into six broad themes related to: (i) global biodiversity policy; (ii) human and community rights; (iii) shifting human geography; (iv) inclusion, diversity, equity, and access; (v) conservation finance and income; and (vi) economic reforms ([Figure 1](#)). Many could exert either negative or positive effects on community-based conservation, as evident in the brief descriptions that follow (for further detail and a link to longer descriptions, see SM4 in the supplemental information online). Examples in [Table 1](#) illustrate how each topic may entail implications for conservation actors at local to global scales.

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Global target to conserve 30% of Earth by 2030

Target 3 of the GBF aims to conserve 30% of the planet by 2030 while ensuring equitable governance, respecting IP&LC rights, and accommodating genuinely conservation-compatible sustainable use [16]. This target could expand area-based conservation beyond conventional protected area management and governance categories to recognize, learn from, include, and foster **other effective area-based conservation measures (OECMs)** [26]. Conducive to community-based conservation and IP&LC stewardship, such measures could redefine effectiveness and create opportunities at scale [26], while helping to reinforce IP&LC rights. Although the wording of this target tries to guard against top-down, fortress-style conservation, it may still drive such outcomes to the detriment of IP&LCs and community-based conservation, depending on how the GBF is implemented within national political and policy contexts.

Global ecosystem restoration commitments

The **UN Decade on Ecosystem Restoration** and the US\$12 billion **Global Forest Finance Pledge at UNFCCC** in 2021 have renewed global commitments to restore nature [14,27]. Moreover, UNFCCC now recognizes the centrality of ecosystem restoration for climate-change mitigation and adaptation [14]. Such high-level commitments risk encouraging large, unsustainable initiatives that may help carbon capture, but excuse continued emissions, harm biodiversity, and/or exclude local communities from decision-making [28–30]. Conversely, these commitments can help communities (re)build resilient social–ecological systems if they embrace the rights and autonomy of IP&LCs, **Indigenous and traditional knowledge (ITK)**, adaptive management, and, as encouraged by target 2 of the GBF, focus on ecological integrity and connectivity alongside ecosystem services and functions [16].

Box 1. Ensuring globally representative input and perspectives

Diverse inputs and perspectives are critical to gaining a comprehensive overview; people who think differently (for which demographic, geographic, and occupational diversity serve as good proxies [22,23]) are thought to maximize collective wisdom and objectivity [24]. Many horizon scans elicit inputs primarily from an invited group of ‘experts’. However, who and what defines an expert is contentious, and poses the risk that certain worldviews dominate. Some recent scans have mitigated this by (remotely) soliciting initial ideas from as many different contributors as possible to capture diverse global views [25].

The horizon scan presented here took a two-pronged approach. First, it was guided by a culturally diverse steering committee and working group (the ‘collaborators’) from 24 nations in South, Central, and North America, Southern, Central, and Northern Europe, West, Central, East, and Southern Africa, Western, South, and Southeast Asia, Australia, and the Pacific Islands. The group purposefully comprised approximately equal numbers of women and men at different career stages with varied disciplinary backgrounds (plant, animal, and marine biology, natural resource management, environmental science, environmental policy, social and cultural anthropology, human geography, history, rural and sustainable development), diverse geographic and ecosystem expertise (marine, freshwater, and terrestrial systems, tropical to polar, and across all continents) and distinct roles across community-based conservation (research, practice, policy, and funding).

Second, it used an open online global survey (see SM1 in the supplemental information online) to elicit ideas on emerging threats and opportunities in community-based conservation. The online survey was created in nine languages (Arabic, traditional and simplified Chinese, English, French, German, Hindi, Portuguese, and Spanish), posted on 20 online media forums (subscription lists, websites, etc.), and directly emailed to at least 2189 people worldwide with a known or inferred interest in community-based conservation. Recipients were encouraged to share the survey with others. Participants were asked about: (i) their experience with community-based conservation and vision for success; (ii) observed and anticipated impacts of the COVID-19 pandemic on community-based conservation efforts; and (iii) threats and opportunities they think might hinder or facilitate effective community-based conservation within the next 15 years. Responses, collected from March through May 2021, were anonymous, but respondents could choose to provide a name or organization for public acknowledgement of participation (see SM2 in the supplemental information online). Responses were encouraged from both individuals and groups to, for example, overcome language or literacy barriers by one person facilitating input from team or community members.

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Increased recognition of Indigenous and community rights

Growing emphasis on Indigenous, traditional, and community rights in global environmental policy [31], as exemplified by the US\$1.7 billion pledge for tenure rights at the 2021 UNFCCC [32], aspires to undo historic injustices and recognize the value of IP&LC knowledge and practices in conservation [33]. Likely to further influence funding, legislation, and national policies, it may foster improved environmental justice, given increased mapping of IP&LC rights [34] and possible reinforcement by OECMs. This should increase recognition and support of community-based conservation efforts. However, rights without resources are insufficient [35] and can be undermined by conflict or the widespread rise of authoritarianism [36].

Growing violence against environmental human rights defenders

Threats and violence against **environmental human rights defenders** are rising, with record numbers of murders and attacks in 2020 [37]. Increased attention from donors, international fora, multilateral policy, media, and the public provides momentum to better integrate conservation and human rights efforts. Security concerns can thwart community-based conservation efforts. Existing mechanisms within the UN and EU, and pioneering Latin American legislation, such as the **Escazú Agreement** [38], have the potential to mitigate against violations associated with large extractive industries and conservation elites, but must be implemented effectively.

Unpredictable and irregular human migration

More people than ever before were displaced by conflict, violence, and natural disasters in 2020–2022 [39]. Climate-induced disasters may displace up to 1 billion by 2050, with the poorest disproportionately vulnerable [40]. Mobility can physically create space for conservation or reinvigorate talent pools by diversifying perspectives and experiences, potentially

Glossary

Black, Indigenous, and people of color (BIPOC): term used to acknowledge solidarity among, but also differences in, the injustices faced by various marginalized groups.

Buen Vivir: a departure from the modern development narrative toward a more biocentric, relational, and collective understanding of well-being, where the subject of well-being is not the individual, but their interrelationship with their cultural–natural environment.

Climate-smart approaches (CSA) to agriculture, fisheries, and aquaculture: actions to transform food

systems toward sustainable and climate resilient practices, across agriculture, commercial, and artisanal fisheries, and aquaculture. Objectives encompass sustainably increasing productivity and incomes; adapting and building resilience to climate change impacts and variabilities; and reducing or removing greenhouse gas emissions during harvest, production, and the entire value chain.

Conservation basic income: novel biodiversity conservation funding strategy that goes beyond conventional market-based instruments.

Convention on Biological Diversity (CBD): in force since 1993, the CBD has three main objectives: ‘conservation of biological diversity; sustainable use of the components of biological diversity; fair and equitable sharing of the benefits arising out of the utilization of genetic resources’. This recognizes that biological diversity is about not only plants, animals, microorganisms and their ecosystems, but also people and our need for food security, medicine, fresh air and water, shelter, and a clean and healthy environment. The CBD Conference of the Parties (CoP) governs the Convention and advances its implementation through decisions made at periodic meetings.

Convivial conservation: convivial (literally: ‘living with’) conservation offers a new and integrated approach to understanding and practicing environmental conservation.

Doughnut economics: informed by ecological, feminist, institutional, behavioral, and complexity economics, doughnut economics is centred on progression toward an economy with a strong social foundation and an unbroken ecological ceiling for the sustainability of humanity.

Box 2. Gathering and prioritization ideas on threats and opportunities

The process for identifying priority topics followed methods similar to other horizon scans in conservation (e.g., [21,25]) with the distinction that initial ideas were elicited via a global, open online survey, where participation was not limited to specific invitees (Figure I). In total, 1175 people (555 individuals and 36 groups, which self-reported to encompass another 620 individual respondents) submitted suggestions regarding threats and opportunities emerging in community-based conservation. These respondents originated in 107 nations, including Indigenous nations, and resided in 109 countries. They performed a variety of non-mutually exclusive roles in community-based conservation (48% research, 48% practice, 17% policy, 12% funding, 10% local governance, and 10% other) for initiatives in diverse settings (69% terrestrial, 68% rural, 29% marine, 20% freshwater, 10% urban, and 0.5% other) across all global regions. Most had 7 or more years of experience in community-based conservation (8% <1 year, 12% 1–3 years, 17% 4–6 years, 18% 7–10 years, 13% 11–15 years, 32% >15 years; see SM2 in the supplemental information online). More respondents identified as male (58%) than female (41%); 1% chose ‘other’ gender identification or preferred not to answer. Their knowledge backgrounds ranged from government, protected area management, and biological sciences to farming, forestry, Indigenous and traditional ecological knowledge, anthropology, law, business, education, political science, and tourism. Jointly, these participants submitted ideas for 1483 threats and 1044 opportunities.

A total of 39 collaborators helped consolidate and prioritize these ideas by adapting the Delphi method [20], with at least 14 collaborators actively contributing at each step. The process involved synthesis, shortlisting, in-depth investigation, iterative rounds of debate, and anonymous ranking to identify the top 15 emerging topics expected to shape the future of community-based conservation (Figure I). Coordinators grouped submitted ideas into 261 topics. Collaborators then scored these on a 0–100 scale for novelty, plausibility, impact, pervasiveness, and horizon scan ‘worthiness’, which combines the prior four characteristics via fuzzy logic (further details in SM2 in the supplemental information online). Mean ‘worthiness’ scores (raw and transformed into z-scores to reflect that not all collaborators used the full 0–100 value range) served to identify a shortlist (Box 3). Collaborators then researched shortlisted topics to substantiate or dispute horizon scan ‘worthiness’ in a first round of debate, followed by once more assigning ‘worthiness’ scores, another round of debate, and further scoring. Debates were held anonymously and asynchronously via an online facilitation platform. Contentious topics with highly diverging scores were given particular attention to promote consensus.

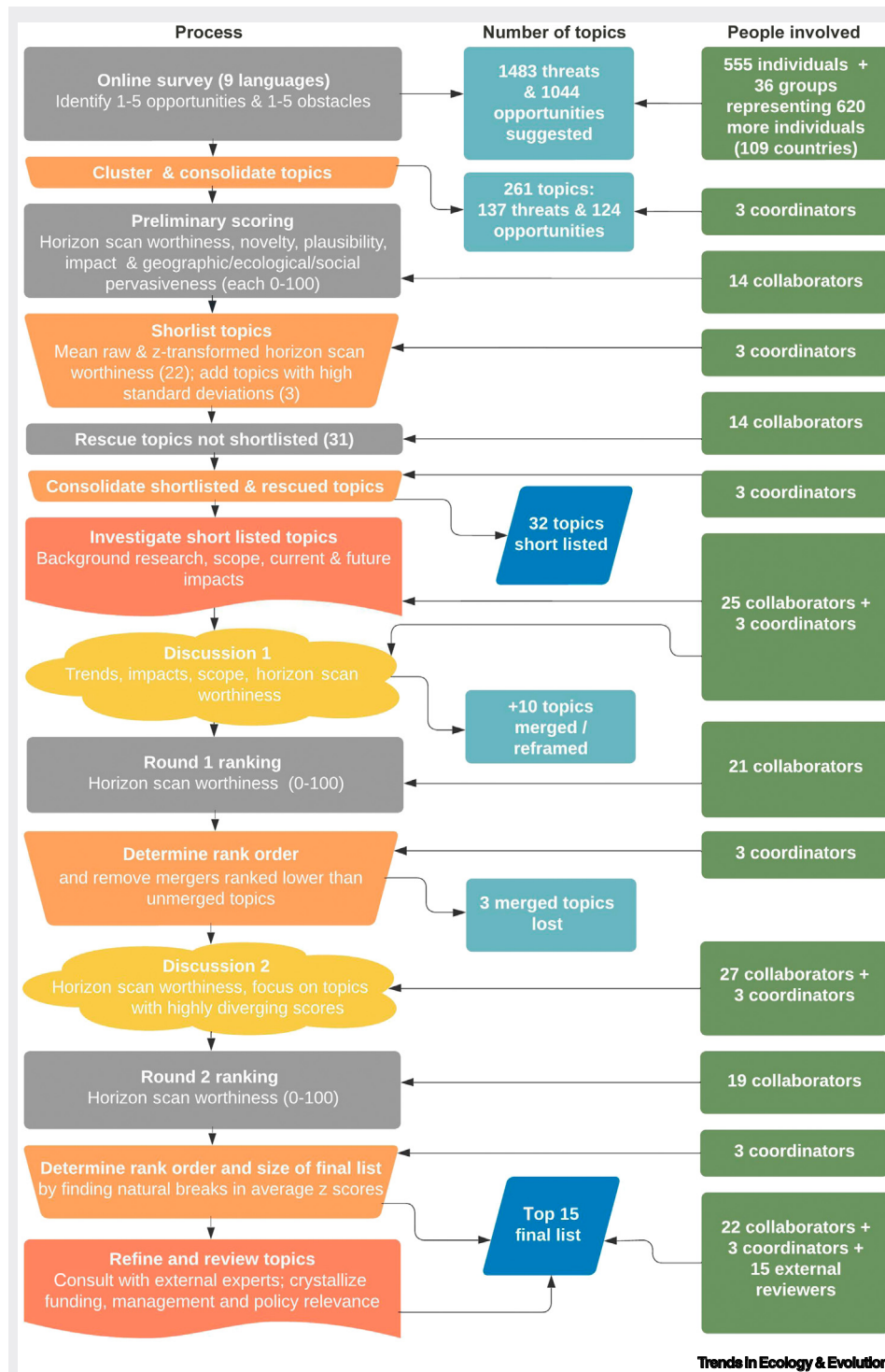


Figure I. The steps and people involved in distilling future threats and opportunities proposed by survey respondents into a priority list of topics deemed highly relevant to the effectiveness of community-based conservation over the next 10–15 years.

Environmental human rights

defenders: the UN General Assembly defines these as: 'Individuals and groups who, in their personal or professional capacity and in a peaceful manner, strive to protect and promote human rights relating to the environment, including water, air, land, flora and fauna'.

Environmental, social, and governance (ESG):

three factors increasingly considered in addition to profits in business to assess corporate sustainability and ethical impact, material risks, and growth opportunities.

Escazú Agreement: a 2021 agreement among Latin American and Caribbean governments as the first environmental treaty of the region, which enshrines the right of every person, present and future, to a healthy environment and sustainable development. It is the first global agreement with provisions on environmental human rights defenders, substantiating the high risks faced by advocates and activists.

Global Biodiversity Framework

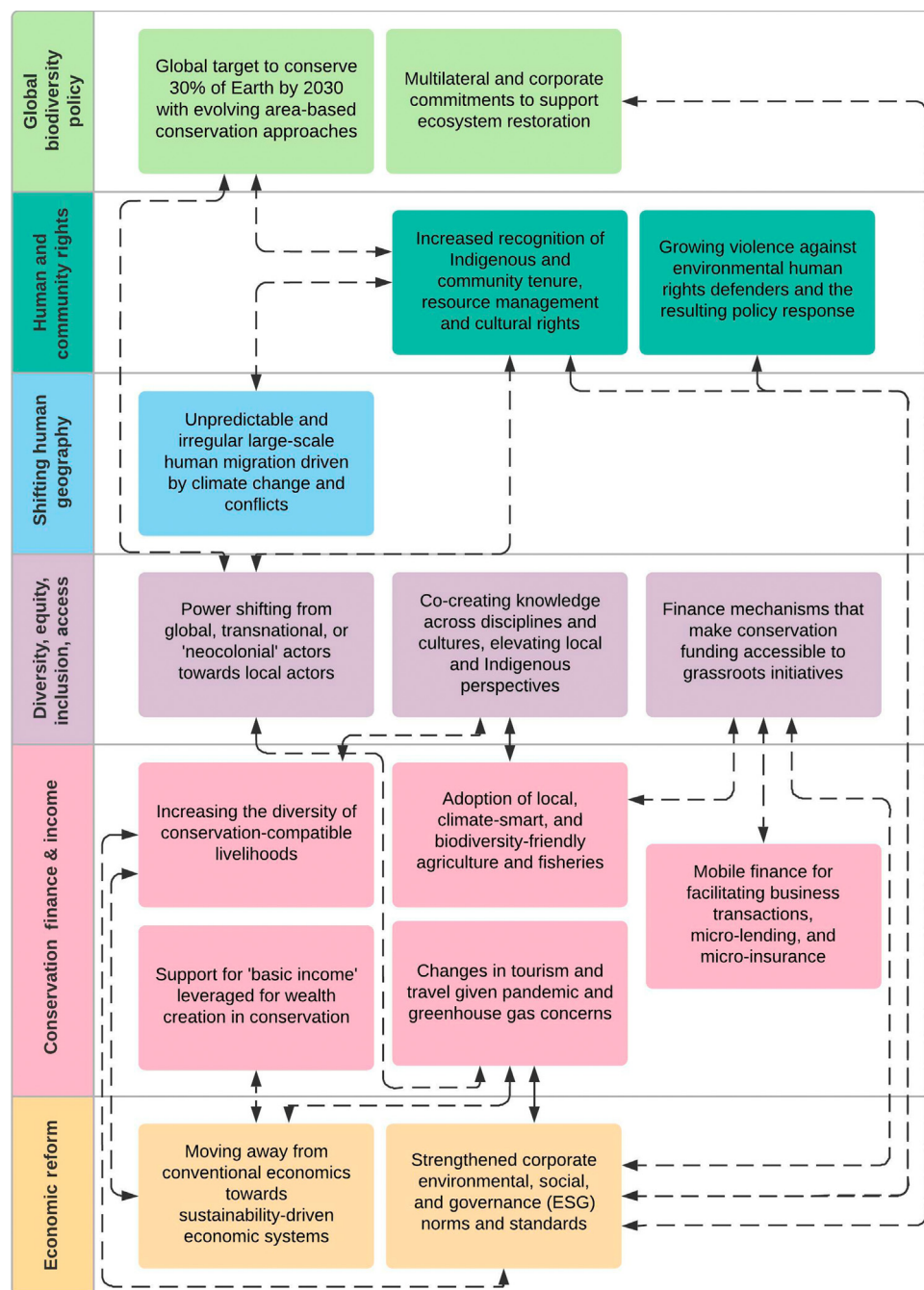
(GBF): at CoP14 of the CBD, a decision was made to adopt a comprehensive and participatory process to create a post-2020 GBF, moving the world toward the 2050 Vision of 'living in harmony with nature'. This landmark document was finalized and adopted at CoP15 as the Kunming–Montreal GBF in December 2022.

Global Forest Finance Pledge at

UNFCCC CoP26: at the UNFCCC CoP26, 130+ leaders, representing more than 90% of the world's forests, committed to collaboratively halting and reversing deforestation and land degradation by 2030. Pledges were made by global leaders, industry, NGOs, and community groups; this included US\$12 billion for forest-related climate finance between 2021 and 2025 from 12 countries collectively.

Indigenous and traditional

knowledge (ITK): knowledge–practice–belief complex encompassing Traditional Ecological Knowledge (TEK) and Indigenous Knowledge (or Native Science). TEK refers to the evolving relationships between living beings (including humans) and their environment, culturally transmitted generation to generation. Indigenous knowledge is the local knowledge held by Indigenous peoples or local knowledge unique to a given culture or society. Indigenous knowledge and TEK are inter-related, but not necessarily the same, concepts.



Trends in Ecology & Evolution

Figure 1. The 15 topics identified as most pertinent to the effectiveness of community-based conservation over the coming 15 years, and their thematic grouping. There is an assumed connection between topics within the same theme. Broken arrows represent a direct connection between topics across themes; additional, subtler connections may exist.

Indigenous peoples and local community (IP&LC): ethnic groups (typically) descended from, and identifying with, the original inhabitants of a given area, as opposed to groups that have more recently settled, occupied, or colonized the area.

Offset: mechanism in which individuals or organizations compensate for their carbon emissions or biodiversity loss they cause by financially supporting carbon capture or biodiversity conservation elsewhere.

Other effective area-based conservation measures (OECMs): the CBD at CoP14 defined this as 'A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in-situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio-economic, and other locally relevant values'.

Paris Agreement: to achieve a climate-neutral world by the mid-21st century, this legally binding international treaty aims to limit global warming to 1.5°C relative to preindustrial levels.

Sustainable Development Goals (SDGs): adopted in 2015, the UN SDGs are global development targets, set to be achieved in all countries by 2030.

UN Decade on Ecosystem

Restoration: joint initiative (2021–2030) of the UN Environment Program and the Food and Agriculture Organization of the UN calling for the global protection and revival of ecosystems for the benefits of people and nature.

UN Framework Convention on Climate Change (UNFCCC): with near-universal membership (197 Parties), the UNFCCC entered into force in 1994 and is the parent treaty of the 2015 Paris Agreement and the 1997 Kyoto Protocol. It aims to stabilize atmospheric greenhouse gas levels to prevent dangerous human–climate interactions, allow ecosystems to adapt naturally, and enable sustainable development.

Unbanked populations: people who do not have an account at a physical or online financial institution. About 1.4 billion adults, mostly in developing economies, remained unbanked globally in 2021.

facilitating community-based conservation. More typically, however, displacements perpetuate conflict and environmental degradation, erode community cohesion, undermine resource-use planning, dilute ITK, and weaken cultural connections to place and nature [41,42].

Table 1. A sample (illustrative rather than exhaustive) of recommendations arising from the priority topics identified by the horizon scan, and the primary audiences that can act on each recommendation^a

Topic (T) and audience (A)	Recommendation
T: Increased recognition of Indigenous and community rights / Power shifting toward local actors A: Organizations, institutions, and governments that work with IP&LCs or impact their rights	Create grievance mechanisms (e.g., via third or multiparty moderated platforms such as TalkToLoop ^l) to ensure accountability (and transparency) with respect to safeguarding rights, plus reporting and addressing abuse of rights
T: Co-creating knowledge across disciplines and cultures A: Individuals, groups, organizations that collaborate with IP&LCs	Follow best practice and legal guidelines for credible, salient, and legitimate knowledge co-creation that values diversity, is safe, ethical, and equitable, and balances inclusion with transaction costs [99]. Examples include the First Nations principles of OCAP® and the CARE Principles for Indigenous Data Governance ^{iv} . This might be supported by, for example, the UN Local Communities and Indigenous Peoples Platform ^v
T: Leveraging 'basic income' A: Development organizations and governments	Thoroughly research and pilot conservation basic income scheme, and then share clearly communicated findings with decision-makers
T: Moving away from conventional economics A: Governments	Develop well-being budgets, such as adopted by New Zealand ^{vi} , and canvas input from communities on valued indicators and underlying elements of well-being, specific to individual contexts
T: Global target to conserve 30% of Earth by 2030 A: Parties to the CBD and legal advisory groups that can support governments in implementing CBD commitments	Ensure that national legislation and policies for implementing the GBF do not disenfranchise IP&LCs or marginalized groups, but instead engage community-led organizations and community leaders in identifying appropriate actions, such as the designation of OECMs. Engagement might be modeled on Guardian Programs, such as the Reef Guardians in Australia ^{vii} or Indigenous Guardians in Canada ^{viii}
T: Diversifying conservation-compatible livelihoods A: Donors and the not-for-profit organizations that guide philanthropists' spending	Scrutinize proposals and audit projects and fund prefeasibility surveys to ensure that support for alternative livelihood options focuses only on those that are both conservation compatible and viable (e.g., those that convincingly pursue a triple bottom line with suitable environmental and social safeguards [100])
T: Mobile finance augmenting economic potential A: Women's organic shea cooperative in Wechiau Community Hippo Sanctuary	In taking control over the local shea butter-processing facility of the community protected area, the coop can consider products in its business planning not only for wholesalers, but also for end-users they might target directly via online sales platforms to reap the benefits of further onsite value addition and removal of intermediaries
T: Conservation finance for grassroots initiatives A: Donors, funding agencies	Create or join networks of likeminded donors (e.g., the Environment + Justice Donor Circle ^x) to share best practices and increase commitments to grassroots groups; pledge support akin to the Climate Funders Justice Pledge ^x , which encourages transparent grants for Black, Indigenous, and people of color (BIPOC) -led groups
T: Strengthened corporate norms and standards A: Investors in sustainable finance and the Global Impact Investing Network ^{xi}	Explore community-based conservation enterprises for potential investment; advise community-based conservation initiatives on types of data and metrics needed, such as IRIS + standards ^{xii} , to evaluate and demonstrate impact and attract impact investing
T: Global ecosystem restoration commitments / Conservation finance for grassroots initiatives A: social enterprise incubators and support organizations (e.g., fundsforNGOs ^{xiii})	Foster match-making mechanisms that allow donors and grantees to find one another, such as the Clearinghouse for Environmental Finance ^{xiv}
T: Strengthened corporate norms and standards	Mandate standardized metrics for ESG reporting that

Table 1. (continued)

Topic (T) and audience (A)	Recommendation
A: International Sustainability Standards Board ^{xv}	Speak to the importance of genuine community involvement and respect for IP&LC rights
T: Moving away from conventional economics A: Organizations that certify others for social and environmental standards, such as B Labs ^{xvi}	Ensure that community initiatives can access self-assessment and certification protocols, and/or provide training/advice/ <i>pro bono</i> services to community-led not-for-profit/profit-for-purpose enterprises in the Global South that are seeking certification

^aRoman superscripts point to websites listed in Resources.

Power shifting toward local actors

Heightened global recognition of continued, historically rooted injustices offers momentum to redress international, national, and local power imbalances and mismatched goals within conservation partnerships [43]. However, mistrust is deep-seated and can spark protests, tensions, and violence between those with and without power [e.g., big, well-funded international nongovernmental organizations (NGOs) vs. local, volunteer-based civil society organizations] [9]. Anticipated growth of marginalized voices in decision-making gives hope that fair, transparent, inclusive governance will advance socially just and culturally sensitive conservation approaches, such as community-based conservation, that avoid elite capture of resulting benefits [35].

Co-creating knowledge across disciplines and cultures

COVID-19 and associated travel constraints highlighted the need for interdisciplinary knowledge and greater reliance on local leadership and community expertise. Although not a new concept [44], knowledge co-creation with local and Indigenous stakeholders, including women, is increasingly valued, but still often underutilized and misunderstood in environmental decision-making [45]. Renewed interest may advance efforts to respectfully interweave knowledge systems, support cultural revival, and recognize Indigenous and Global South researchers and local actors [46], facilitating genuine community-based conservation. Risks include tokenism, misrepresentation, and continued discrimination.

Conservation finance for grassroots initiatives

There is growing interest in dispersing funds to local-level and IP&LC initiatives [47]. Funders, as well as emerging markets and new financing mechanisms, such as carbon finance, biodiversity credits, and debt-for-nature swaps, could be tailored to suit and reach grassroots organizations ([48], but see [49]). Combined with capacity building and strategic support, these could strengthen community-based conservation by aligning decision-making with local level resources [47]. However, given that grassroots access remains rare [50], top-down imposition of locally inappropriate conservation measures remains a risk.

Diversifying conservation-compatible livelihoods

The stark economic downturn since 2020 has highlighted the urgency of sustainably diversifying income and livelihoods for community-based conservation [51]. Options for conservation compatible livelihoods are expanding [52] given growing online connectivity [53], increased environmental and social responsibility in businesses [54], investment in sustainable enterprises [55], and conservation finance mechanisms (e.g., environmental impact bonds) [47] or basic income schemes [56]. Adaptation to local contexts and careful evaluation via developing interdisciplinary metrics, including culturally based indicators [57], are key for proof-of-concept to encourage wider adoption.

Locally based climate-smart agriculture and fisheries

Climate-smart approaches (CSA) to agriculture, aquaculture, and fisheries, aimed at enhancing the sustainability and climate resiliency of food production systems [58,59], draw upon not only ITK, but increasingly also remote sensing, robotics, and artificial intelligence [60,61]. An over-reliance on technological innovation can make CSA inaccessible or socially inappropriate. Moreover, it may undermine possible co-benefits to community-based conservation, such as revived application of ITK, reduced biodiversity impacts, and improved livelihood resilience [61,62]. Therefore, continued rollout of CSA requires forward-thinking and inclusive policy, legislation, and capacity-building tailored to diverse contexts and stakeholders.

Mobile finance augmenting economic potential

Continued growth in mobile financial services has overcome cost, geographic, and identity-verification barriers to provide previously **‘unbanked’ populations** with basic transaction accounts, savings, credit, and insurance, which they previously lacked access to [63]. Benefits for community-based conservation include increased financial and market literacy, pay-as-you-go access to critical services (e.g., health, education, and utilities), expanded business opportunities, and improved financial resilience [64–66]. However, unequal, gender-biased access could deepen the digital divide [67]. Moreover, digital transaction records raise concerns over privacy and misuse by corporations (predatory advertising) or fraudsters [65].

Leveraging ‘basic income’

The COVID-19 pandemic has accelerated implementation of cash transfers comparable to temporary basic income [68–70]. Prior pilot schemes indicate that basic income improves health, education, and income-generating capacity [71,72]. A **‘conservation basic income’** for communities connected to areas of conservation interest could support the environmental and socio-economic goals of community-based conservation by reducing reliance on resource extraction, balancing opportunity costs, and empowering social innovation [56,72]. Conditions (even implicit ones [73]), safeguards, financing, and complementary conservation measures require careful consideration.

Changes in tourism and travel patterns

Dramatically reduced tourism in 2020–2021 in light of COVID-19 highlighted the social and environmental impacts of the sector, both positive (e.g., people’s presence deterring poachers or income) and negative (e.g., garbage, disturbance, or unemployment causing overexploitation), inspiring momentum for reform toward more purposeful, sustainable, and regenerative tourism [74–76]. Community-based conservation initiatives might in future benefit from atypical tourism, such as agritourism, cultural immersion, wellness stays, digital nomadism, and virtual tours [76–78]. Nonetheless, avoiding heavy dependence on tourism-derived income is key to resilient jobs and operational budgets, especially because concern over greenhouse gas emissions may reshape travel [79].

Moving away from conventional economics

COVID-19-induced social and economic upheaval initially amplified calls for economic reform [80], or at least green economic recovery. However, green growth may insufficiently mitigate climate and biodiversity crises unless social, ecological, and intergenerational outcomes are prominent in evaluating wealth [81]. There are growing efforts to identify more comprehensive indicators of well-being [57]. Community-based conservation, already pursuing holistic conceptions of what constitutes ‘wealth’, can both guide and benefit from wider adoption of transformative, sufficiency-focused frameworks, such as **doughnut economics**, **convivial conservation**, and **Buen Vivir**, each of which take into account both environmental and human needs [82–85].

Strengthened corporate norms and standards

Private sector partnerships for community-based conservation initiatives may grow as regulators, investors, and consumers pressure corporations to improve their **environmental, social, and governance (ESG)** outcomes [55,86,87]. Environmental reporting increasingly includes biodiversity impacts [88,89], and efforts to standardize metrics will help minimize greenwashing [90], but must allow for contextually tailored safeguards reflective of local sociocultural conditions. Communities could benefit through fair pricing, provision of amenities, and conservation support if corporate ESG efforts avoid large-scale, flawed **offset** projects that ignore local people and/or biodiversity.

Shortlisted topics that did not make the top 15 are summarized in [Box 3](#), alongside information on how each group of topics (top 15, shortlist, and longlist) distinguished itself in terms of novelty, plausibility, impact, and pervasiveness.

Horizon scanning insights

Implications for policy, funding, and management

The topics identified, and their emerging or future impacts on community-based conservation, have diverse implications for current and potential future stakeholders. Depending on what

Box 3. Shortlisted topics

The following topics were shortlisted, investigated, and debated, but did not make the top priority list. When two topics were deemed inter-related, they were considered both individually and jointly.

- Ideologies that clash with local realities restrict or divert available funding (e.g., when animal rights groups oppose all consumptive use of wildlife).
- Impacts from the COVID-19 pandemic reinforce feedback cycles between poverty, biodiversity loss, conflict, and disenfranchisement.
- Blanket trade regulations on wildlife and natural products hamper income opportunities for community-based conservation initiatives.
- Ecological and socioeconomic implications of facilitating market expansion, digitally or otherwise, for sustainable products from community-based conservation initiatives.
- The digital divide widens as internet access and technological literacy innovates information sharing and engagement.
- Schemes to accrue conservation funds based on, for example, royalties for use of nature-based imagery, branding, and marketing.
- Retargeting and reforming international cooperation and foreign aid to support conservation finance.
- Community-partnered, culturally appropriate, renewable and green energy technologies, such as floating photovoltaics.
- Capitalizing on synergies and complementarities of community-based conservation with emerging global social change movements.
- Coordinated responses to, and impact tracing of, corrupt practices (including land grabbing) that affect communities.
- Pandemic mitigation measures and risk of zoonotic disease transmission impede community-based conservation operations.
- Pandemic-induced awareness of zoonotic disease promoting conservation.
- Awareness of gender, gender identity, and their cultural context as critical considerations in conservation and development interventions.
- Increased recognition of the concept and effectiveness of community-based conservation models motivating growing implementation.
- Uniting individual and shared interests for social mobilization around collective goals, despite individualism.
- Increasing recognition of the rights of nature (e.g., when rivers are assigned legal personhood) and legal recourse for environmental damage.
- Insecure land tenure and resource management rights at national and local levels.

Although selected among the original 261 topics based on horizon scan 'worthiness' scores, shortlisted topics also scored higher on novelty (Student's t -test = -8.24 , d.f. = 1127, $P < 0.001$) and stood out when novelty, plausibility, impact, and pervasiveness scores were summarized as additive (Student's t -test = -3.89 , d.f. = 1135, $P < 0.001$) or geometric means (Student's t -test = -4.96 , d.f. = 1175, $P < 0.001$). In turn, the top 15 topics scored higher than these shortlisted topics in impact (Student's t -test = -3.39 , d.f. = 635, $P < 0.001$), pervasiveness (Student's t -test = -3.33 , d.f. = 631, $P < 0.001$), additive (Student's t -test = -4.00 , d.f. = 631, $P < 0.001$), and geometric means (Student's t -test = -3.60 , d.f. = 649, $P < 0.001$).

trajectory each topic follows, outcomes for community-based conservation and global targets under the CBD, UNFCCC, and SDGs could be detrimental or favorable. The foresight that this horizon scan offers regarding emerging threats and opportunities provides a powerful opportunity to proactively address risks and promote actions that steer topics along a positive trajectory.

In the immediate, five of the top 15 topics have direct relevance to the Kunming–Montreal GBF targets. The topics on global ecosystem restoration commitments and on conserving 30% of Earth by 2030 offer insights relevant to GBF targets 2 and 3 on restoration and the global 30 × 30 target, respectively. The topic on CSA relates to target 10 on sustainable agriculture; strengthened corporate norms and standards to target 15 on improving the environmental and social performance of businesses and financial institutions; and increased recognition of Indigenous and community rights is relevant to targets 1 (spatial conservation planning), 3 (protecting 30% of Earth), 5 (stemming overexploitation), 8 (minimizing climate change impacts), 9 (sustainable use), and 21 (involvement through free, prior, and informed consent) [16].

Insights generated by the top 15 topics are also relevant well beyond multilateral biodiversity policies. Table 1 provides a sample of audiences for horizon scan findings. The diversity of audiences emphasizes how unconventional stakeholders may become important participants in, or champions for, community-based conservation. For many conservation actors, organizations, such as the International Sustainability Standards Board or the Global Impact Investing Network, are unlikely to have previously come to mind as potential partners. We acknowledge that audiences in Table 1 primarily reflect organizations acting at a broader than local scale, because many of the top 15 topics relate to issues beyond the control of individual communities. Nonetheless, the topics entail lessons pertinent to communities; collaborators are working on disseminating grassroots-relevant insights via appropriate channels.

Synergies and conflicts between topics

Many of the top 15 topics share current or projected future linkages (Figure 1). Therefore, the trajectory of one can affect others. For example, a solution to support conservation finance for grassroots initiatives via tailored, accessible funding mechanisms could aid transparent and grassroots-accountable implementation of ecosystem restoration commitments and SDGs. Similarly, strengthened recognition of IP&LC rights means that, more than ever, conservation interventions of any kind are expected to carefully consider rights and social justice. This can promote co-creation of knowledge across disciplines and cultures. It is also shaping policy instruments, with, for example, the text for at least six of the 21 targets proposed for the GBF making reference to recognition or, participation by, and rights for, Indigenous people.

Conversely, if recognition of IP&LC rights is hampered by the current era of global democratic roll-back and growth in top-down-heavy national governance, any gains from decolonizing conservation and creating greater local and grassroots autonomy may also be lost, undermining the trend of power shifting from global toward local actors.

Convergent findings

We are unaware of any prior horizon scans specifically on community-based conservation, but recent scans in related fields independently (and unbeknown to our collaborators) highlighted several topics shortlisted or prioritized here. For example, both our shortlist and the 2023 annual horizon scan of global biological conservation issues [21] feature innovative, decentralized energy solutions, such as power generation through floating solar panels or microhydro operated by Indigenous peoples¹. Our shortlisted topic on internet access and technological literacy made the top list in a 2020 forest and forest livelihoods horizon scan [91]. A horizon scan on challenges

and solutions for sustainable rangelands in Australia identified the need for diversifying livelihoods and meaningful cultural knowledge exchange, both among our top 15 [92].

Such overlap lends credence to the value of the horizon scanning process for detecting weak signals. At the same time, each horizon scan focuses on a specific context. Thus, discrepancies are expected and highlight nuanced differences in the context-specific relevance of any signal.

Challenges and contentions

We defined novelty based on personal familiarity plus a sense of who else may have heard about a topic. Collaborators struggled at times to balance novelty with the more familiar risk assessment criteria of plausibility, impact, and pervasiveness, which can be particularly hard to judge for newly emerging topics or those undergoing a step-change in relevance or impact. For that reason, some of the most vigorous debates (and highest standard deviations in scores) centered on topics least known to collaborators. Examples include leveraging ‘basic income’, which made the top 15, and increasing recognition of the rights of nature, which did not. Notably, economic and legal expertise, which might have reduced uncertainty on these topics, was under-represented in the collaboration. However, significant distinctions between long-listed, shortlisted, and ultimately prioritized topics in the additive and geometric means across novelty, plausibility, impact, and pervasiveness, suggest that collaborators managed to successfully capture all four facets in their intuitive horizon scan ‘worthiness’ scores.

Horizon scans can vary considerably in scope, scale, and complexity [93]. Although conservation generally is an interdisciplinary field, community-based conservation is particularly multifaceted given its goal of benefitting both nature and people and consequent position at the juncture of development and conservation. This is reflected in the diverse nature of priority topics identified (Figure 1), and undoubtedly added to the vigor of debate, with tensions perceived by some collaborators between topics on rights and social change versus topics focused on technical and financial advances.

At times, discussions among collaborators were side-tracked by debates over whether identified trends were good versus bad, when the ultimate goal was to highlight changes regardless of their desirability. Similarly, questions arose over for whom or for what we were assessing impact, and whether impacts on biodiversity outcomes were equal to impacts on people. Such conundrums emphasize that conservation, and community-based conservation in particular, is inseparable from ethical considerations for which there are no universally agreed norms [94,95].

Concluding remarks

In pursuing both biodiversity conservation and human well-being, community-based conservation embraces the perspective that economy, society, and the environment are nested rather than intersecting spheres. Society cannot exist without the environment, and the economy represents a subset of social interactions [96,97]. It is this perspective that makes community-based conservation a potentially powerful approach for addressing current global, interconnected crises.

This horizon scan has yielded suggestions for how to strengthen community-based conservation as an approach, given emerging opportunities and risks. Implementation may require additional investigations (see Outstanding questions). Proof of widespread impact will only be seen if community-based conservation approaches can be effectively scaled organizationally and geographically [2,98]. There is immense potential, especially if certain conditions take hold, such as if support from private enterprise and ESG materializes with appropriate standards and

Outstanding questions

Are there learnings from community-based conservation that can be applied to other contexts?

How can community-based conservation initiatives increase their impact from local to national, and national to regional scales?

How can relevant Indigenous and traditional knowledge and practices be integrated into formal conservation approaches and policies?

How can community-to-community knowledge exchange be better facilitated, particularly between regions?

How quickly and effectively can community-based conservation initiatives build resilience in the face of extreme climate events and other disruptive social, political, and cultural changes?

How can community-based conservation withstand and thrive amid rising authoritarianism, violence against environmental human rights defenders, and violent conflicts more broadly?

Specifically, how can cultural values and guardianship be secured in extreme conflict situations involving external actors on traditional lands?

How can we hold Parties accountable to international multilateral conventions affecting community-based conservation by following through on commitments?

How can nations shift from gross domestic product to more holistic indicators for defining and measuring well-being to facilitate balanced recognition of the socioeconomic and biological goals of community-based conservation?

How can we overcome the common perspective that community-based conservation involves trade-offs between nature and livelihoods, when it ideally creates a positive feedback loop instead?

How can we help communities feel socioeconomic benefits related to conservation efforts more quickly?

safeguards; if community-led projects reap direct financing as opposed to receiving minimal funds with high transaction and intermediary costs [47]; if rights-based perspectives continue to permeate conservation from high-level policy discourse down to grassroots implementation; and if greener economic models emerge to put sustainability at the forefront of decision-making.

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None declared by authors.

Supplemental information

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Resources

- ⁱwww.rightenergypartnership-indigenous.org/
- ⁱⁱwww.talktoloop.org/
- ⁱⁱⁱ<https://fnigc.ca/ocap-training/>
- ^{iv}www.gida-global.org/care
- ^v<https://lcipp.unfccc.int/>
- ^{vi}<https://internationalbudget.org/publications/new-zealands-well-being-budget-a-new-model-for-managing-public-finances/>
- ^{vii}www.gbrrmpa.gov.au/our-work/our-programs-and-projects/reef-guardians
- ^{viii}www.ilinationhood.ca/guardians
- ^{ix}www.libertyhill.org/form/environment-justice-donor-circle/
- ^xwww.climate.donorsofcolor.org/
- ^{xi}<https://thegiin.org/>
- ^{xii}<https://iris.thegiin.org/metrics/>
- ^{xiii}www.fundsformgos.org/
- ^{xiv}<https://ordspub.epa.gov/ords/wfc/f?p=165:1>
- ^{xv}www.ifrs.org/groups/international-sustainability-standards-board
- ^{xvi}www.bcorporation.net/en-us/

References

1. Charles, A., ed (2021) *Communities, conservation and livelihoods: IUCN and Halifax, Canada: Community Conservation Research Network*, IUCN and Community Conservation Research Network
2. Mahajan, S.L. *et al.* (2021) A theory-based framework for understanding the establishment, persistence, and diffusion of community-based conservation. *Conserv. Sci. Pract.* 3, e299
3. Jupiter, S.D. *et al.* (2014) Locally-managed marine areas: multiple objectives and diverse strategies. *Pac. Conserv. Biol.* 20, 165–179
4. Guibrunet, L. *et al.* (2021) Beyond participation: how to achieve the recognition of local communities' value-systems in conservation? Some insights from Mexico. *People Nat.* 3, 528–541
5. Ruano-Chamorro, C. *et al.* (2022) Advancing procedural justice in conservation. *Conserv. Lett.* 15, e12861
6. Brooks, J.S. (2017) Design features and project age contribute to joint success in social, ecological, and economic outcomes of community-based conservation projects. *Conserv. Lett.* 10, 23–32
7. Salerno, J.D. *et al.* (2021) Adaptation and evolution of institutions and governance in community-based conservation. *Conserv. Sci. Pract.* 3, e355
8. Galvin, K.A. *et al.* (2018) African community-based conservation: a systematic review of social and ecological outcomes. *Ecol. Soc.* 23, 39
9. Ramutsindela, M. *et al.* (2022) Conservation and violence in Africa. In *The Violence of Conservation in Africa* (Ramutsindela, M. *et al.*, eds), pp. 2–21, Edward Elgar Publishing
10. Matusse, A. (2022) Protecting (with) Mount Mabo: is another form of nature conservation possible? In *The Violence of*

- Conservation in Africa (Ramutsindela, M. et al., eds), pp. 187–201, Edward Elgar Publishing
11. Nelson, F. et al. (2021) Progress or regression? Institutional evolutions of community-based conservation in eastern and southern Africa. *Conserv. Sci. Pract.* 3, 9
 12. Tauli-Corpuz, V. et al. (2020) Cornered by PAs: adopting rights-based approaches to enable cost-effective conservation and climate action. *World Dev.* 130, 104923
 13. Garnett, S.T. et al. (2018) A spatial overview of the global importance of Indigenous lands for conservation. *Nat. Sustain.* 1, 369–374
 14. Depledge, J. et al. (2022) Glass half full or glass half empty? The 2021 Glasgow Climate Conference. *Clim. Policy* 22, 147–157
 15. Ceballos, G. et al. (2020) Vertebrates on the brink as indicators of biological annihilation and the sixth mass extinction. *Proc. Natl. Acad. Sci. U. S. A.* 117, 13596–13602
 16. Convention on Biological Diversity (2022) *Decision Adopted by the Conference of the Parties to the Convention on Biological Diversity. 15/4. Kunming-Montreal Global Biodiversity Framework*, Convention on Biological Diversity
 17. United Nations (2022) *The Sustainable Development Goals Report 2022*, United Nations Publications
 18. Wintle, B.C. et al. (2020) Scanning horizons in research, policy and practice. In *Conservation Research, Policy and Practice* (Sutherland, W.J. et al., eds), pp. 29–47, Cambridge University Press
 19. Könnölä, T. et al. (2012) Facing the future: Scanning, synthesizing and sense-making in horizon scanning. *Sci. Public Policy* 39, 222–231
 20. Mukherjee, N. et al. (2015) The Delphi technique in ecology and biological conservation: applications and guidelines. *Methods Ecol. Evol.* 6, 1097–1109
 21. Sutherland, W.J. et al. (2022) A global biological conservation horizon scan of issues for 2023. *Trends Ecol. Evol.* 38, 96–107
 22. Freeman, R.B. and Huang, W. (2015) Collaborating with people like me: ethnic coauthorship within the United States. *Labour Econ.* 33, S289–S318
 23. Luque-Lora, R. et al. (2022) A global analysis of factors predicting conservationists' values. *People Nat.* 4, 1339–1351
 24. Aggarwal, I. et al. (2019) The impact of cognitive style diversity on implicit learning in teams. *Front. Psychol.* 10, 112
 25. Esmail, N. et al. (2020) Emerging illegal wildlife trade issues: a global horizon scan. *Conserv. Lett.* 13, e12715
 26. Gurney, G.G. et al. (2021) Biodiversity needs every tool in the box: use OECMs. *Nature* 595, 646–649
 27. Edris, S.A. and Abhilash, P.C. (2021) Need of transdisciplinary research for accelerating land restoration during the UN Decade on Ecosystem Restoration. *Restor. Ecol.* 29, e13531
 28. Herr, D. et al. (2019) An analysis of the potential positive and negative livelihood impacts of coastal carbon offset projects. *J. Environ. Manag.* 235, 463–479
 29. Blicharska, M. et al. (2022) Operationalisation of ecological compensation – obstacles and ways forward. *J. Environ. Manag.* 304, 114277
 30. Sigman, E. (2021) The dilemma of scale: competing imperatives for global restoration. *Restor. Ecol.* 29, e13408
 31. Knox, J. (2018) *Framework Principles on Human Rights and the Environment 2018*, United Nations Publishing
 32. UN Climate Change Conference UK (2021) *COP26 IPLC Forest Tenure Joint Donors Statement*, UK Government and United Nations Climate Change
 33. Domínguez, L. and Luoma, C. (2020) Decolonising conservation policy: how colonial land and conservation ideologies persist and perpetuate indigenous injustices at the expense of the environment. *Land* 9, 65
 34. Alden Wily, L. (2018) Collective land ownership in the 21st century: overview of global trends. *Land* 7, 68
 35. Tegegne, Y.T. et al. (2021) REDD+ and equity outcomes: two cases from Cameroon. *Environ. Sci. Policy* 124, 324–335
 36. The Economist Intelligence Unit (2022) *Democracy Index 2021 The China Challenge*, Economist Intelligence Unit
 37. Bille Larsen, P. et al. (2021) Understanding and responding to the environmental human rights defenders crisis: the case for conservation action. *Conserv. Lett.* 14, e12777
 38. López-Cubillos, S. et al. (2022) The landmark Escazú Agreement: an opportunity to integrate democracy, human rights, and transboundary conservation. *Conserv. Lett.* 15, e12838
 39. Sciubba, J.D. (2022) *8 Billion and Counting: How Sex, Death, and Migration Shape Our World*, W.W. Norton & Co
 40. Ferris, E. (2020) Research on climate change and migration where are we and where are we going? *Migr. Stud.* 8, 612–625
 41. Albert, S. et al. (2018) Heading for the hills: climate-driven community relocations in the Solomon Islands and Alaska provide insight for a 1.5°C future. *Reg. Environ. Chang.* 18, 2261–2272
 42. Middleton, J. et al. (2020) Indigenous mental health in a changing climate: a systematic scoping review of the global literature. *Environ. Res. Lett.* 15, 053001
 43. Cornelius, N. (2021) From slavery and colonialism to Black Lives Matter: new mood music or more fundamental change? *Equality, Diver. Inclusion: Int. J.* 40, 8–20
 44. Agrawal, A. (1995) Dismantling the divide between indigenous and scientific knowledge. *Dev. Change* 26, 413–439
 45. Wheeler, H.C. et al. (2020) The need for transformative changes in the use of Indigenous knowledge along with science for environmental decision-making in the Arctic. *People Nat.* 2, 544–556
 46. Stefanoudis, P.V. et al. (2021) Turning the tide of parachute science. *Curr. Biol.* 31, R184–R185
 47. Holland, E. et al. (2022) *Money where it Matters for People, Nature and Climate: Driving Change through Support for Local Level Decision Making over Resources and Finance*, IIED
 48. Heard, R. and Villat, J. (2020) *Diversifying Local Livelihoods while Sustaining Wildlife*, Luc Hoffmann Institute
 49. Standing, A. (2022) *Debt-for-Nature Swaps and the Oceans: The Belize Blue Bond*, CFFA-CAPE
 50. Rainforest Foundation Norway (2021) *Falling Short: Donor Funding for Indigenous Peoples and Local Communities to Secure Tenure Rights and Manage Forests in Tropical Countries (2011–2020)*, Rainforest Foundation Norway
 51. Egger, D. et al. (2021) Falling living standards during the COVID-19 crisis: quantitative evidence from nine developing countries. *Sci. Adv.* 7, eabe0997
 52. Hendriks, S.L. (2022) Sustainable small-scale fisheries can help people and the planet. *Nature* 606, 650–652
 53. Kemp, S. (2022) *Digital 2022: April Global Statshot Report*, DataReportal
 54. Mattison, R. and de Longevialle, B. (2022) *Key trends that will drive the ESG agenda in 2022*, SP Global
 55. Bass, R. et al. (2021) *COMPASS: The Methodology for Comparing and Assessing Impact – Investor Guide*, The GIIN
 56. E. de Lange, et al. A Global Conservation Basic Income to Safeguard Biodiversity, *Nature Sustain.*, in press.
 57. Sterling, E.J. et al. (2020) Creating a space for place and multi-dimensional well-being: lessons learned from localizing the SDGs. *Sustain. Sci.* 15, 1129–1147
 58. Das, U. and Ansari, M.A. (2021) The nexus of climate change, sustainable agriculture and farm livelihood: contextualizing climate smart agriculture. *Clim. Res.* 84, 23–40
 59. Galappaththi, E.K. et al. (2021) Adapting to climate change in small-scale fisheries: Insights from indigenous communities in the global north and south. *Environ. Sci. Policy* 116, 160–170
 60. GGGI (2021) *Compendium of Practices in Climate-Smart Agriculture and Solar Irrigation*, The Global Green Growth Institute
 61. Uddin, M. et al. (2022) Legal and ethical aspects of deploying artificial intelligence in climate-smart agriculture. *AI Soc.* Published online April 28, 2022. <https://doi.org/10.1007/s00146-022-01421-2>
 62. Ogunyola, A. et al. (2022) Smallholder farmers' engagement with climate smart agriculture in Africa: role of local knowledge and upscaling. *Clim. Policy* 22, 411–426
 63. Andersson-Majang, S. and Naghavi, N. (2021) *The State of the Industry Report on Mobile Money 2021*, GSM Association
 64. Wang, J. et al. (2022) The impact of mobile finance use on livelihoods of farmers in Rural China. *Emerg. Mark. Financ. Trade* 58, 2867–2879
 65. Pazarbasioglu, C. et al. (2020) *Digital Financial Services*, The World Bank Group
 66. Chiwaula, L. et al. (2020) *Combining Financial-Literacy Training and Text-Message Reminders to Influence Mobile-Money Use and Financial Behavior among Members of Village Savings and Loan Associations: Experimental Evidence from Malawi*, Partnership for Economic Policy

67. Bamford, R. *et al.* (2021) *The Progressive Case for Universal Internet Access How to Close the Digital Divide by 2030*, Tony Blair Institute for Global Change
68. Molina, G.G. and Ortiz-Juarez, E. (2020) *Temporary Basic Income: Protecting Poor and Vulnerable People in Developing Countries*, UNDP
69. Montoya-Aguirre, M. *et al.* (2021) *Protecting Women's Livelihoods in Times of Pandemic: Temporary Basic Income and the Road to Gender Equality*, UNDP
70. Arnold, C. (2020) Pandemic speeds largest test yet of universal basic income. *Nature* 583, 502–503
71. Banerjee, A. *et al.* (2019) Universal basic income in the developing world. *Annu. Rev. Econom.* 11, 959–983
72. Fletcher, R. and Büscher, B. (2020) Conservation basic income: a non-market mechanism to support convivial conservation. *Biol. Conserv.* 244, 108520
73. Pellerano, L. and Barca, V. (2017) The conditions for conditionality in cash transfers: does one size fit all? In *What Works for Africa's Poorest: Programmes and Policies for the Extreme Poor* (Lawson, D. *et al.*, eds), pp. 223–242, Practical Action Publishing
74. Phua, C. *et al.* (2021) Marine protected and conserved areas in the time of COVID. *PARKS* 27, 85–102
75. World Tourism Travel Council (2021) *Economic Impact & Trends 2021*, World Tourism & Travel Council
76. Spence, A. (2021) *The Future of Nature-Based Tourism: Impacts of COVID-19 and Paths to Sustainability*, Luc Hoffmann Institute
77. Bellato, L. *et al.* (2022) Regenerative tourism: a conceptual framework leveraging theory and practice. *Tour. Geogr.* Published online March 2, 2022. <https://doi.org/10.1080/14616688.2022.2044376>
78. Embling, D. and Southan, J. (2020) *Travel after 2020: What Will Tourism Look Like in Our New Reality?*, Euronews in collaboration with Globetrender
79. Jurjonas, M. and Aldana, L. (2020) The Flyer's dilemma and the Logger's case for climate justice. *World Dev. Perspect.* 20, 100263
80. OECD (2020) *Building Back Better: A Sustainable, Resilient Recovery after COVID-19*, Organisation for Economic Co-operation and Development
81. Taherzadeh, O. (2021) Promise of a green economic recovery post-Covid: trojan horse or turning point? *Glob. Sustain.* 4, e2
82. Kaul, S. *et al.* (2022) Alternatives to sustainable development: what can we learn from the pluriverse in practice? *Sustain. Sci.* 17, 1149–1158
83. Raworth, K. (2017) A doughnut for the Anthropocene: humanity's compass in the 21st century. *Lancet* 1, e48–e49
84. Acosta, A. and Martínez Abarca, M. (2018) *Buen Vivir: an alternative perspective from the peoples of the Global South to the crisis of capitalist modernity*. In *The Climate Crisis: South African and Global Eco-Socialist Alternatives* (Satgar, V., ed.), pp. 131–147, Wits University Press
85. Büscher, B. and Fletcher, R. (2019) Towards convivial conservation. *Conserv. Soc.* 17, 283–296
86. European Commission (2021) *Commission Delegated Regulation (EU) 2021/2178*, European Commission
87. Whelan, T. and Kronthal-Sacco, R. (2019) Actually, consumers do buy sustainable products. Published online June 19, 2019. https://www.stern.nyu.edu/sites/default/files/assets/documents/HBR_Consumers%20Do%20Buy%20Sustainable%20Products_June%202019.pdf
88. Climate Disclosure Standards Board (2021) *Application Guidance for Biodiversity-Related Disclosures*, Climate Disclosure Standards Board and CPD Worldwide
89. Taskforce on Nature-related Financial Disclosures (2022) *The TNFD Nature-Related Risk & Opportunity Management and Disclosure Framework Beta v0.1*, TNFD
90. IFRS (2021) *IFRS Foundation Announces International Sustainability Standards Board, Consolidation with CDSB and VRF, and Publication of Prototype Disclosure Requirements*, IFRS
91. Oldekop, J.A. *et al.* (2020) Forest-linked livelihoods in a globalized world. *Nat. Plants* 6, 1400–1407
92. Nielsen, U. *et al.* (2020) Challenges, solutions and research priorities for sustainable rangelands. *Rangel. J.* 42, 359–373
93. Esmail, N. *et al.* (2022) Framing the problem and identifying potential solutions. In *Transforming Conservation: A Practical Guide to Evidence and Decision Making* (Sutherland, W.J., ed.), pp. 197–234, Open Books
94. Vucetich, J.A. *et al.* (2021) Finding purpose in the conservation of biodiversity by the commingling of science and ethics. *Animals* 11, 837
95. Sandbrook, C. *et al.* (2019) The global conservation movement is diverse but not divided. *Nat. Sustain.* 2, 316–323
96. Colding, J. and Barthel, S. (2019) Exploring the social-ecological systems discourse 20 years later. *Ecol. Soc.* 24, 2
97. Giddings, B. *et al.* (2002) Environment, economy and society: fitting them together into sustainable development. *Sustain. Dev.* 10, 187–196
98. Mills, M. *et al.* (2019) How conservation initiatives go to scale. *Nat. Sustain.* 2, 935–940
99. Coggan, A. *et al.* (2021) Co-creating knowledge in environmental policy development. An analysis of knowledge co-creation in the review of the significant residual impact guidelines for environmental offsets in Queensland, Australia. *Environ. Challenges* 4, 100138
100. Anderson, J.L. *et al.* (2015) The fishery performance indicators: a management tool for triple bottom line outcomes. *PLoS ONE* 10, e0122809