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Territories of life as key to global environmental sustainability

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Territories and areas that Indigenous peoples and local communities govern, manage, and conserve (hereafter territories of life) are increasingly recognized by scientists, international agencies, nongovernmental, and grassroot organizations, as central to the future of a healthy and sustainable planet. Hundreds of thousands of such social–ecological systems exist worldwide, covering millions of square kilometers of land and seascapes on all five continents, contributing to the conservation and sustainable use of a significant proportion of the world's biodiversity. Nevertheless, these systems are facing many threats and often have little-to-no formal recognition or support from nation-state governments. In order to address this growing need, this review provides the most complete, recent, and updated global overview of territories of life. The review advocates for a holistic approach of territories of life and identifies key opportunities for researchers to favor action- and policy-oriented research in support of such vital systems for global sustainability.

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What are the territories of life?

Territories of life is a concept developed for over a decade of partnership and negotiations by the Indigenous and non-Indigenous partners of the ICCA Consortium (https://www.iccaconsortium.org/), an organization to which all authors of this text are members, and that has been proposed as a more tangible and inspiring term than the more frequently used *Indigenous peoples and local Communities* (hereafter IPLCs) *Conserved Areas and territories* or its abbreviation 'ICCA'.[1] It is important to note that IPLCs were front and center during the process formulating this new wording. In fact, the ICCA Consortium grew out of a movement in support of IPLCs and composed by many IPLC members pushing for greater equity and inclusivity in conservation during the decades around the turn of the Millennium. This organization was officially established in Switzerland in 2010 as an International Association under the Swiss Civil Code, and it is a civil society organization membership-based and supported by an international

[1] For example, CBD (https://www.cbd.int/doc/publications/cbd-ts-64-en.pdf), the IUCN (https://www.iucn.org/news/protected-areas/201905/iccas-biological-and-cultural-diversity), or the United Nations Development Program (UNDP: https://sgp.undp.org/about-us-157/partnerships/icca-gsi.html)

semivolunteer secretariat based in twenty-two countries. The ICCA Consortium defines territories of life (or ICCAs) as "territories and areas conserved by IPLCs", which share certain commonalities and three key characteristics: (i) a specific community that maintains strong and deep-seated links with a specific territory or area; (ii) this community is a key actor in the process of decision-making relative to the territory or area and its resources; and (iii) this governance system contributes to the responsible and sustainable management of the ecosystems and of the community's tangible and intangible heritage [1]. The concept refers to age-old, widespread, diverse, and dynamic systems that have as many different names as the peoples and communities who sustain them around the world. For example, *wilayah adat*, *kaw*, *himas*, *agdals*, *tagal*, *yerli qorukh*, *faritra ifampivelomana*, *oran*, *ili*, *asang*, *rumak*, *qoroq-e bumi*, *sapari*, *baldíos*, *comunales*, *crofts*, *regole*, *cayolar*, and *aschii* among thousand others. In broader contexts, they may be referred to as, or encapsulated within, concepts with clear political and legal connotations such as *commons*, *ancestral domains*, *country*, *territorios autonomos comunitarios*, *territorios del buen vivir*, or *Locally Managed Marine Areas* (*LMMAs)*. However, as explained by [1] (p5) "For the custodians of such 'territories of life', the connection between their community and territory is much richer than any single word or phrase can express. It is a bond of livelihood, energy and health. It is a source of identity and culture, autonomy and freedom. It is a link among generations, preserving memories from the past and connecting to the desired future. It is the ground on which communities learn, identify values and develop relationships and self-rule. For many, it is also a connection between visible and invisible realities, material and spiritual wealth. With territory and nature go community life and dignity, and self-determination as peoples".

The concept 'territories of life' is by nature generic, and is only intended to provide an 'umbrella' for the sake of intercultural understanding and communication about phenomena that are necessarily place-based and context-specific, each with its own name imbued with unique values and practices, while providing more identifiable meanings than most acronyms can. However, IPLCs are the ones who choose if to use it strategically to advance their self-determined priorities for their people and territories, including in nation-state policy and legal frameworks, both domestically and internationally.

In the worldviews of many IPLCs, biological and cultural diversity are uniquely linked [2]. Their identities, cultures, and ways of life have most often been deeply embedded in their relationships with the environments upon which they depend. For example, Awasis, an Indigenous scholar from the Anishinaabe First Nations of Canada, explains that being Anishnaabe means to be and do simultaneously: "Anishinaabewin is an action, it is embodied gkendaasowin (knowledge) that is lived, experienced, and attained through direct interaction with the land" [3]. These interactions and relationships are historic, and most often inscribed in the biodiversity of ecosystems [4] and ever-evolving into continuous diversification of life and adaptations of sustainable practices [5]. Consequently, Indigenous and local knowledge systems rooted in their collective lands, waters, or territories are equally diverse and exclusive to the Indigenous peoples or local communities who produce and sustain them [6]. Governance institutions embedded in such territories are distinctive, time- and place-based, and generally guided by the holistic values of respect, reciprocity, relationality, and responsibility [3,7–9]. In fact, the cultural grounding and deep connection of IPLCs with their territories and ecosystems has proved to equip them with an array of resilience strategies in the face of social and environmental change [10–13].

Although the term 'IPLCs' is widely used (e.g. when talking about ICCAs), there are important differences between these two human groups that should be respected, and they should not be conflated. Indigenous peoples have internationally recognized rights arising from their self-identification as Indigenous peoples (see the UN Declaration on the Rights of Indigenous Peoples adopted by the UN General Assembly in 2007), while local communities are not yet a clearly defined group under international law. However, a growing body of knowledge, policy, and law recognizes the rights of non-Indigenous communities whose identities, cultures, and ways of life are intimately connected with specific areas and resources. While we fully acknowledge the differences in terms of historical rights and international recognition, in this article, 'IPLCs' are both considered in an effort to put the focus on the stewardship role of both groups within the notion of territories of life, as there are or can be many positive synergies between the two, particularly in the context of their links between cultural diversity and global sustainability.

We fully recognize there are evolving concerns from Indigenous Peoples around the complexities and implications of the use of the term 'IPLCs'[2] [14]. There is also increasing awareness of the need for better recognition of both Indigenous and community governance and management, and their rights to lands and resources, which are often not legally recognized. There are increasing threats to the lands and waters that are under the care of IPLCs and both of these diverse groups require support and appropriate recognition for their self-determined practices. Therefore, considering

[2] CBD, "Compilation of Views Received on use of the term "IPLCs," UNEP, Montreal, 2013

these two groups together in this article, is a means of highlighting an important research gap that, that if addressed well, could support key custodian communities of much of our planet (independently of if Indigenous or not).

Aims

A key aim of this review is to provide the most up-to-date review on the state of territories of life and their values in terms of sustainability. Simultaneously, it aims to identify existing key insights into policy, legal, and institutional developments, along with threats and challenges to both persistence and recognition of territories of life. A review of this scale with the aforementioned diversity of elements in a sole text is not frequent. Moreover, our review makes a special effort to open the scope to highly valuable reports and other gray literature in this arena that are less accessible to the public and less considered in previous reviews. We have taken into account over a dozen titles of this kind. At the same time, readers can access more information through the extra gray literature that can be found mostly in the reports we reference in this article. One more novel aspect of our review is that it highlights the outstanding presence of marine territories of life that are frequently overlooked by researchers and policy/decision-makers alike. Ultimately, the aim of this review is to identify key opportunities for action and policy-oriented research supporting the contributions of territories of life to conservation of global biocultural diversity and sustainability efforts as reflected at the end of the paper.

Methods

Narrative review

This article has chosen a 'narrative review' methodology due to the diversity of territories of life and the interdisciplinary nature of engagement with them in the past decades, as well as the sheer number, type, and language of publications examining these systems directly or indirectly. Narrative reviews describe existing knowledge on a specific idea for examining subjective, dynamic, and situated realities [15]. This type of review is generally used to identify gaps in knowledge and to offer insight for future research and policy action [15,16]. This review uses territories of life as a conceptual framework and the contents are "separated according to dependent or independent variables and their relationships" [16] and has adapted the six-phase narrative review process proposed by Greenhalgh et al. [17]: planning, search, mapping, appraisal, synthesis, and recommendations.

This research conducted searches using 'Web of Knowledge', 'Scopus', 'Google Scholar', as well as gray literature through specifically selected keywords as described below. Simultaneously, Levac et al. [18] recommend including stakeholder consultation as part of such narrative review processes. In this sense, direct quotes and inputs from IPLCs, as well as the consultation step of indirect stakeholder involvement is represented here through the wide networks and well-established relationships of the co-authors with IPLCs, as well as with some of the main international agencies and organizations that support such systems, who together have over two decades of experience in collaborative research and allyship. In fact, the co-authors of this study include honorary members and the global coordinator of the ICCA Consortium who are by profession academics at different research centers, advisors to different international organizations in this field, as well as experts in mapping and registering territories of life in global databases (e.g. https://www.iccaregistry.org/).

To develop the search protocol, keywords were selected based on the three common characteristics of territories of life described in the introduction. Categorization of the literature identified the following main themes in which territories of life have been examined: spatial coverage, natural realms (terrestrial and marine), culture, policy, development, and sustainability. The following sections map evidence related to these themes.

Evidence base for Indigenous peoples' and local communities' contributions to biodiversity and nature conservation at global scale

IPLCs have developed complex and place-based knowledge and governance institutions that enable sustainable use of resources and conservation of much of the world's biocultural diversity [19–21]. Here, we provide some examples. The Kham peoples are situated at the eastern end of the Himalaya between Qinghai-Tibetan plateau and China and they comprise various ethnicities, linguistic ecologies with multiple shamanistic and animistic cultural practices, and lived experiences [19]. The ecospiritual relationships of the *Kham* peoples of southwest China with their sacred natural sites, knowledge of fauna and flora, and governance of natural resources are inherently sustainable and unique [19]. Similarly, the Kitasoo/Xai'xais people of the west coast of Canada consider the ocean sacred and their governance structure is based on their laws of "respect, reciprocity, intergenerational knowledge, and interconnectedness" [20]. The hereditary chiefs of the Kitasoo/Xai'xais people take on the responsibility of caring for land and water and to ensure abundance of species as well as territorial health [20]. While Mwanda-Marungu pastoral commons in Taita hills, southwest Kenya, have been managed sustainably for centuries through customary norms that have proved to continually provide ecosystem services to the local communities, wildlife, and livestock [22]. Although there is a growing evidence base on the conservation contributions of IPLCs in

Figure 1

Spatial representation of the publications reviewed for this article (a total of 166 titles listed in Annex; the reference list provided in the article's Bibliography section (90 titles) is a summary of the most key, instrumental, and recent sources that have had the major role in shaping the paper). Those in purple (106) correspond to IPLC site-based studies and the remaining 60 correspond to non-IPLC site-based studies that nevertheless focused on territories of life (e.g. global reports, policy publications, etc.).

specific territories or areas, there are still few studies with a global scope, and even fewer encompassing the two types together (IPLCs), which the notion of territories of life holistically addresses. In this sense, in an effort to estimate the potential global extent and conservation values of territories of life, the UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) and the ICCA Consortium collaborated on a global spatial analysis [23]. This drew on the best- available data, including from other spatial analyses, such as the companion report by UNEP-WCMC and several other organizations [24], which itself drew heavily on a pre-existing dataset of Indigenous peoples' lands [36] (Figure 1).

This UNEP-WCMC and ICCA Consortium analysis revealed that territories of life could cover at least 28 million km^2, which is over one-fifth (21%) of the world's land surface, and an area approximately the size of the African continent. At the same time, over 17% of the world's land is uniquely covered by potential territories of life, that is, territories of life that lie outside existing state and privately governed protected and conserved areas [23]. In another estimation, WWF et al. [24] report that 43 million km^2 of terrestrial ecosystems (approximately 32% of the world's land) is under the *de facto* or *de jure* governance of IPLCs.

It is important to note that these estimates only cover territories and areas in terrestrial systems. No marine spatial data were used. The engagement of academic research with coastal and marine territories of life is considerably small compared with their terrestrial counterparts. Therefore, there is a relative scarcity of available literature on the spatial coverage of marine and coastal territories of life, as well as their contributions to conservation of biocultural diversity and sustainable use of resources [25,26]. Nevertheless, the approach of LMMAs[3] is a powerful force in the Pacific Islands, Southeast Asia, Latin America, Western Indian Ocean, and East Africa. Despite low government support, the proliferation of LMMAs in the Pacific Islands of Oceania, where community-based protected areas make up 37.5% of protected areas [27], shows the potential of area-based approaches to achieve sustainable management of some of the most biodiverse marine areas on the planet, particularly coral reef ecosystems [28,29]. LMMAs are one example of territories-of-life-based management in the Pacific Islands of which the latest

[3] Areas of nearshore waters and coastal resources that are largely or wholly managed at a local level by the coastal communities, land-owning groups, partner organizations, and/or collaborative government representatives who reside or are based in the immediate area [89].

survey has counted 662 examples covering 1028 communities [30], which are usually based on customary marine tenure or acknowledged Indigenous management rights over nearby coastal areas such as the Fijian traditional fishing grounds, Qoliqoli. Such rights may even be acknowledged in the national constitutions (e.g. Vanuatu). But even where there is legal ambiguity, traditional governance and rights form part of plural legal systems [31]. Consequently, the extent of the planet that is actually governed, managed, and conserved by IPLCs would be in fact even considerably greater than what has been spotted by all these different analyses, and granting so even greater importance to territories of life as key to global environmental sustainability.

In terms of biodiversity value, territories of life could cover at least 33% of Intact Forest Landscapes as defined in footnote[4] and nearly one-third (32%) of areas that are considered key to reversing biodiversity loss, preventing CO_2 emissions from land conversion, and enhancing natural carbon sinks [32]. Given the importance of forests for sustaining livelihoods and climate mitigation, it is crucial to expand support to forested areas conserved by IPLCs [8]. For example, the Garo people of Bangladesh have been applying their ethnobotanical knowledge in agroforestry since time immemorial. Through their agrosilvopastoral[5] system, the Garo produce sustainable crops while maintaining forest cover and health [33]. Similar practices have been observed in the Bedouin of the Negev Arid Highlands. The role of territories of life in mitigating the effects of climate change and monitoring climate drivers that are modifying landscapes and seascapes has also been recorded by multiple scientists [34–38]. The National Adaptation Strategy of Canada [91], includes key opportunities for national, provincial, and nongovernmental actors to invest in co-developed and co-implemented (with Inuit, Métis, and First Nations) climate resiliency programs and nature-based solutions to mitigate the effects of climate change [39]. Simultaneously, IPLCs can also act as important monitors for climate change and thereby contribute directly to conservation. A prime example comes from the Arctic with the Inuit, where they observed the significant changes happening and have contributed significantly to the debate about climate change using indicators as diverse as caribou meat and weather patterns to migrations of various animal species [39]. Other examples exist from mountains of Tajikistan and Indian Himalaya that illustrate the value of Indigenous communities in monitoring climate change and its impacts where a diverse array of monitoring variables from animal migration patterns to vegetation changes are reported providing invaluable records for high-altitude areas (e.g. [40,41,56]) (Figure 2).

Also, the notion of ecosystem services, although it could be considered an anthropocentric western-centered framing [42], is increasingly used to measure the effectiveness of protected and conserved areas, including under different governance and management arrangements. In this context, for example, many rice agroecosystems of the Benguet and Ifugao peoples in Northern Philippines are managed as sacred sites that lay the ground for provisioning (food, income, etc.) and regulating (purification of water and climate regulation) while canalizing meaningful cultural practices (ritual purposes, rice wine-making, holy mass offering, educational information, and preservation of memories). These systems are sustained through traditional watershed management known as '*Muyong* systems' (woodlot planted with trees, which is owned by a clan for generations). The vast contributions of Indigenous ancestral territories to maintaining ecosystem services have been also recorded in the Colombian, Peruvian, and Brazilian Amazon forest, in forested areas of Myanmar (both conserved and degraded), Indigenous territories in northern Australia and Fiji, the Gangetic basin in India, coastal and marine Indigenous territories in Papua New Guinea, and Torres Strait islanders in Australia. These are a few examples where IPLCs sustain ecosystem services that benefit not only themselves but also larger populations on national and global scales [40,41,43–46].

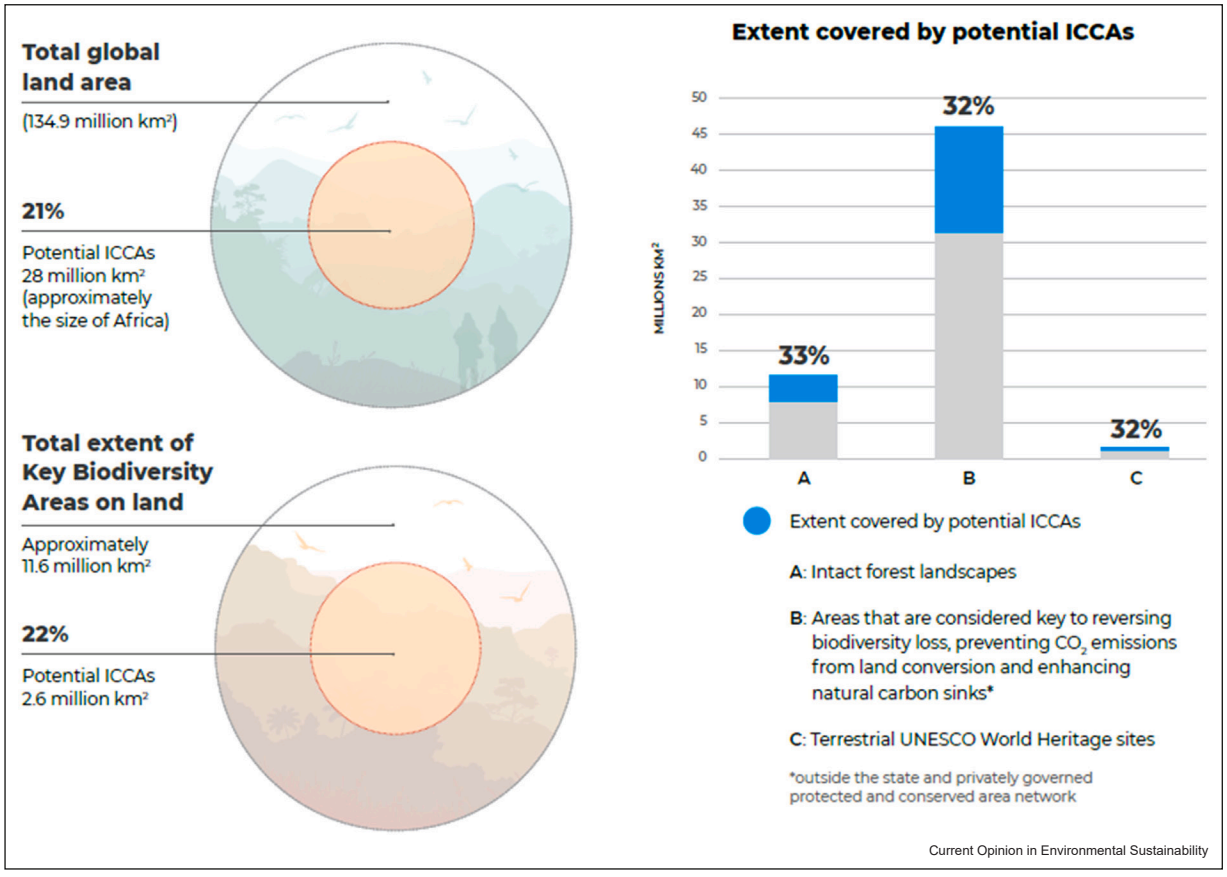
Territories of life are also key in sustaining cultural practices, such as ceremony, language, and Indigenous technologies and knowledge systems [12,13,47]. Many IPLCs consider well-being, mental and physical health, and good living to be a community issue rather than an individual effort [48,49]. Community well-being is intertwined with the health of ecosystems, promotion of traditional practices, rituality, traditional medicines, and diet, among other aspects of living on a given territory [49]. For example, the Mantheding Community in Limpopo Province of South Africa [50] and the Sakha peoples of Yakutia[6] [51], carefully and collectively manage and harvest medicinal plants and assure that their health is guaranteed by maintaining a diet from native crops.

[4] Following the definition of [90], an Intact Forest Landscape is a seamless mosaic of forest and naturally treeless ecosystems with no remotely detected signs of human activity, and a minimum area of 500 km^2. They are large enough to maintain all native biodiversity and are crucial for carbon storage and regulating hydrological regimes, as well as other ecosystem functions [90].

[5] As defined by United Nations Economic and Social Commission for West Asia: Multiple land use including livestock breeding, forestry and cultivation, integrated crops, trees, and pastures/animal systems.

[6] For more information on the health issues of the Sakha peoples, please refer to the publications of Yakut Research Centre for Complex Medical Problems SB RAMS, Yakutsk.

Figure 2



Graphic depiction of some of the key findings of the global spatial analysis conducted by UNEP-WCMC and the ICCA Consortium [23] (The lead author and several other co-authors of this paper are also lead authors and co-authors of this 2021 Territories of Life Report by UNEP-WCMC and ICCA consortium, and are therefore also co-authors of the figure that is now brought into this paper.). The graphs on the left-hand side illustrate the estimation that potential territories of life cover more than one-fifth of the world's land and over one-fifth of the extent of the world's terrestrial Key Biodiversity Areas. The bar graph on the right-hand side shows that potential territories of life cover at least one-third of Intact Forest Landscapes globally and nearly one-third of areas that are considered key to reversing biodiversity loss, preventing CO_2 emissions from land conversion, and enhancing natural carbon sinks.

Variable policy, legal, and institutional recognition statuses of Indigenous peoples' and local communities' contributions to conservation

As local-to-global understanding of the contributions of IPLCs to biological diversity and nature conservation has grown, so too have different forms of recognition and support. This has occurred both in multilateral and international contexts and within domestic contexts in several countries around the world.

Since 2004, the UN Convention on Biological Diversity (CBD) and the International Union for Conservation of Nature (IUCN) have recognized the rights and roles of IPLCs, including territories of life specifically, in several decisions of their respective bodies [14], which has led to several countries (such as Malaysia and Senegal) incorporating such language into national and subnational policy and legal frameworks related to biodiversity and area-based conservation. In the 2011–2020 Strategic Plan for Biodiversity and Aichi Targets and related decisions, CBD Parties adopted and subsequently defined a new term, "other effective area-based conservation measures" (abbreviated as OECMs). OECMs could possibly provide another avenue for recognizing and supporting Indigenous peoples' and local communities' contributions to conservation [14] and for continuing to shift area-based conservation toward genuinely equitable and effective conservation [52]. Some IPLCs in both marine and terrestrial environments have used the concept of OECMs to strengthen ties to their territories as they offer a venue for diversified governance and management as well as decentralized conservation of natural resources recognized within state systems

[53,54]. However, given OECMs were only defined by the CBD in 2018, there is still relatively limited experience in national contexts and there are concerns that some countries might misuse the concept to meet spatial conservation targets without ensuring proper application of the standards and safeguards [52]. There are also concerns about sparse distribution, disconnectedness from officially recognized networks of protected and conserved areas, and vague legal language that may lead to governance disputes [53]. Nonetheless, they remain as an avenue for the recognition of IPLCs' governance. A proposed example is the *section de commune* in France, numbering as many as 40 000. Having a pre-Roman heritage, they took their present form during the Middle Ages when lords ceded land to peasants for management as a common [90]. These collectively managed agricultural and forest lands are often found in protected areas and biodiverse habitats [55]. In one case, governance of a common by a *Commission Syndicale*, in charge of managing forests over centuries, and the presence of a nationally recognized biodiversity zone, clearly demonstrates that when these territories have the right to self-govern, they can effectively manage their resources and so contribute to the Global Biodiversity Framework as an OECM [56]. Multiple marine areas in Indonesia have been identified as potential OECMs, including the Kabu Kaya local communities. The Kabu Kaya have "increased harvest rates of mud crab fisheries and protected their forest through temporary fishery closure [57]".

In the UN CBD process to agree the post-2020 Global Biodiversity Framework, there was a strong push from the Indigenous, youth, women's, and civil society caucuses to include clear recognition of Indigenous peoples' and local communities' rights, including to free, prior, and informed consent, Indigenous and local knowledge, customary sustainable use, equity, and a rights-based approach to implementation of the post-2020 framework.[7] The Kunming-Montreal Global Biodiversity Framework, agreed in December 2022, now recognizes[8] the rights of IPLCs, including their lands and territories, as well as their roles and contributions to conservation. It also recognizes the integrity and distinct nature of Indigenous and traditional territories to conservation beyond the mainstream categories of Protected Areas and OECMs, and the need for access to justice and protection for environmental defenders.

In several countries, IPLCs have advocated for policy, legal and institutional recognition, and support for their rights in general and in the specific context of conservation law and policy. Simultaneously, IPLCs have employed diverse and innovative approaches in recovering and protecting their territories as well as in decolonizing research on conservation governance. In Canada, Indigenous Protected and Conserved Areas and the Indigenous Guardians Initiative are among such programs [58]. For example, the Tongait KakKasuangita SilakKijapvinga — Torngat Mountains National Park, was established with the negotiation and consent of Labrador Inuit, Nunavik Inuit, and in collaboration with Parks Canada, and is managed through a cooperative management board [58]. In the arctic, to fight against historic loss of tenure, working within the Finnish legal context, some *Sámi* and Finnish villages purchase private land and restore community rights enabling them to manage the land for biodiversity protection [59]. In Italy's autonomous region of Aosta, collective pastures and woodlands known as *consortories* were recognized for their role in protecting the environment, culture, and for collective and intergenerational solidarity [60]. The increasingly favorable legal context appears to facilitate the recognition of territories of life in northern Italy [61]. Switzerland also recognizes commons institutions as a balancing act of maintaining decision-making power and in working with the state, and in-between traditional ways of organizing, and taking on new responsibilities related to land management [62]. In Scotland, after historical enclosures of their commons, and in the interest of austerity, the government initiated the Community Empowerment (Scotland) Act 2015, which since 2017, among other things, has created the Community Asset Transfer scheme, allowing communities to buyout publicly owned land to create community woodlands [63]. In Spain, the Valdeavellano de Tera Declaration vigorously called for the recognition of territories of life [64] and Iniciativa Comunales developed an innovative peer-reviewed protocol by local communities for the recognition of such systems in the UN-based ICCA Registry, which has integrated many of the practices led by this NGO. However, recognition of community governance is not the same case for other European countries. For instance, commons are generally legally unrecognized and unprotected in most of the European Union as well as in countries in accession talks, while they are thought to cover over 7% of its territory,[9] with cases in the Balkans where local communities have coproduced some of the largest mountain pastoral ecosystems in Europe, which have been even recognized as part of a UNESCO Biosphere Reserve, and still are turned into military grounds by simple decree law, with no consultations involving local communities, and not even an environmental, socioeconomic, or health public assessment (e.g. https://sinjajevina.org/). Or other

[7] CBD, "Kunming Declaration: Available at: https://www.cbd.int/doc/c/c2db/972a/fb32e0a277bf1ccfff742be5/cop-15–05-add1-en.pdf.

[8] Commitment number 10 and 15, P 4, Kunming Declaration (2021)

[9] Eurostat 2013: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Farm_structure_survey_%E2%80%93_common_land#Statistics_on_common_land

commons in France, which are increasingly appropriated by the state for other purposes [65]. These territories have been threatened since the French revolution, with regularly instated laws that favor private over common property [65] and in 2013, reducing the capacity of communities to self-govern, while placing most of these territories under the supervision of the local authorities, without consultation again, and facilitating their transfer to state control. A coalition of elected officials, legal scholars, activists, and researchers collaborate to change this legal framework to favor commons in France [66].

However, protected areas under cogovernance, shared governance, and governance by IPLCs are expanding worldwide [67]. Indigenous Protected Areas in Australia and granting personhood to rivers in Aotearoa/New Zealand are a few examples of the diversification of conservation governance and management arrangements that are led by Indigenous peoples [68]. The Ngadju Land Claim received state recognition in 2014 after 2 decades of active engagement of the Ngadju peoples with the Australian legal system.[10] "The Traditional Owners of a large part of the Great Western Woodlands, the Ngadju People, retain their knowledge of and connection to the country[11]" and practice traditional fire management within their territories.

In a number of countries in Africa, and even if the many imperfections they have been object of, governments have recognized community contributions to conservation through decentralization and devolution of certain rights, for example, through communal conservancies in Namibia, wildlife conservancies and beach management units in Kenya, Wildlife Management Areas in Tanzania, and Community Forest Management Areas in Zambia [69]. In Latin America, Colombia is among the leading examples with its *resguardo* system and Mexico with its *ejidos*, although these are more generally rooted in land rights and Indigenous rights, than in conservation outcomes as such [70]. The high proportion of community-based (47.6%) and low level of government-managed protected areas (13.4%) in the Pacific Islands is partly attributed to countries explicitly recognizing Indigenous tenure and access rights, or similar hybrid arrangements [27]. All in all, each of these country-specific forms of recognition and support comes with potential benefits and opportunities as well as potential risks, gaps, and drawbacks. But as international recognition of Indigenous peoples' and local communities' contributions to conservation continues to strengthen, it is likely that pressure will increase on nation-state governments to do the same within their respective contexts.

Threats and challenges

At least a quarter of Indigenous peoples' and local communities' lands and territories could face a high level of future development pressure, particularly from commodity-based and extractive industries [24]. Extractive industries threaten many resource-rich territories of life, including on Arctic pastoral ecosystems, tropical forests in South America and Africa, and highly productive coral reef systems [43,71,72]. Competing land use pressures and expropriation from both industrial and conservation sectors have made large parts of territories of life functionally unavailable to their custodians, stemming in large part from lack of or insufficient recognition of their collective and individual rights[12] [73]. Entire territories of life or large parts of them are under the increasing threat of irreversible natural and cultural degradation, for example, industrial agriculture encroaching on the wintering grounds of the Shahsevan Nomadic Tribal Confederacy in Iran and reindeer herders in *Sámi* territory, intensive ranching in the Brazilian Amazon, or industrial logging encroaching on the territories in Gabon [68,71,74–76]. The access to wintering grazing grounds of the nomadic *Sámi* reindeer herding peoples of northern Sweden is heavily disrupted by mining activities. In 2018, 11 mining complexes were actively exporting minerals from the wintering grounds while conducting exploratory studies in other grounds that are part of the *Sámi* territories of life. Both *Sámi* and Finnish village territories in Finland have also been threatened by extractive industries as well as a lack of recognition of communal land tenure [59]. For the coastal Indigenous peoples of northwest America, the considerable decline in Pacific herring populations, has become synonymous with extreme sadness and depression [4]. These Indigenous communities have long-standing reciprocal relationships with herring and the loss of access to this species, due to prohibition of traditional harvest, large-scale commercial fishing, and so on, has resulted in the erosion of their lived cultural experiences. More recently, Indigenous communities have acted to maintain their cultural continuity such as negotiating with governmental organizations and commercial fishing companies, or demanding comanagement of fisheries and Supreme Court cases [4].

At the same time, lack, unclear, inefficient, or insufficient legal recognition of customary rights of IPLCs to their land, freshwater, and sea territories (and access to and use thereof) has led to many disputes with the private and public sectors. For example, Indigenous peoples in West Papua have had long-held strong claims to forests that are subject to fast land use change in favor of expanding oil palm monoculture plantations. Since 2001, two laws (Special Autonomy Law) specifically re-

[10] Government of Australia: https://www.dcceew.gov.au/environment/land/indigenous-protected-areas

[11] https://ngadjuconservation.org/

[12] https://ipbes.net/global-assessment

cognized the governance institutions of Indigenous peoples over "Tanah Adat or Tanah Ulayat (customary land)". At the same time, in 2012, the Constitutional Court of Indonesia of which West Papua makes part, ruled that forests under customary land tenure are no longer under the control of the state. But the insufficient elaboration of customary governance in these laws has led to confusion, land disputes, and misinterpretation by different parties in their implementation [77]. Such land disputes have been recorded in multiple other community-managed forests across the world. Even though Indigenous groups in Bolivia and Ecuador have formal recognition of territory by state, extractive industries continue being a major threat to Indigenous sovereignty and governance over their territories and communities. This is due to lingering colonial structures and conceptions of sovereignty, resource management, ownership, and power imbalance [78]. Clarification of terms related to governance and management of customary lands and waters, and increasing the capacity of state laws and structures to adapt to the many forms of territories of life, is essential for their continued existence and thriving as populations and resource-use pressures continue to grow.

Key opportunities for action- and policy-oriented research

Territories of life are key to equitably governing and sustainably managing biological and cultural diversity for a healthy planet [5,23,24,79]. Researchers in relevant fields may assist communities in a number of key conservation and policy-oriented studies. For instance, research projects that are co-designed and co-created with IPLCs often offer opportunities for communities in their self-determination and self-strengthening processes. It is important to note the growing diversity of such processes on a global scale such as cultural revitalization and Indigenous resurgence, decolonization, and sustainable self-determination [80]. Below are some of the key identified opportunities for action- and policy-oriented research in relation to territories of life that we have been able to distill from our review:

- *Support, share knowledge, and collaborate with IPLCs* in various aspects of documenting their territories of life and biocultural diversity to help toward safeguarding Indigenous languages and cultures [77,81] and to strengthen self-awareness, mutual recognition, and support from other communities, as well as from relevant state authorities, where they wish to seek it [23,24,79].
- *Support communities to employ innovative approaches to documenting their territories and practices* such as through story mapping [82] or through submitting information to global platforms such as the ICCA Registry hosted by UNEP-WCMC. Mapping of biocultural diversity may also be in the service of safeguarding Indigenous languages [81], decolonizing mapping practices, countermapping, and spatial justice [83].
- Create and hold equitable and inclusive spaces for *researchers and scholars from IPLCs* [84] to foster collaboration, colearning, and the reinforcement of community leaders.
- Support IPLCs to develop *adaptable tools to communicate* the diversity and nuances of their territories of life, governance systems, and practices.
- *Explore the holistic views* of many IPLCs, including reducing the dominance of bio-/ecocentric views in conservation [85].
- *Advancing supportive legal, policy, and institutional frameworks* at national and international levels, including the great conventions deciding on global matters, as well as through support from lawyers, legal practitioners, and decision-makers with relevant research and knowledge [86].
- *Advance research on collaborative forms of conservation*, value of Indigenous and local knowledge in sustainable resource management, and sociocultural and economic benefits as well as legalities of cross-natural realm governance and stewardship of territories of life [37,87].
- Providing relevant information and support *tools for IPLCs to advocate* for and secure their rights and territories of life on their own terms (e.g. in legal claims or court cases).
- *Critically assessing* existing and potential forms of nation-state recognition and support for territories of life [10,88].
- *Advancing funding mechanisms* that engage with IPLCs in conservation and sustainability initiatives, with priority given to understanding how to improve direct funding support for territories of life [10].
- Further, the engagement and recognition of the efforts of Indigenous and traditional community members in ecosystem and monitoring such as identification of species with respect to decision-making for nature conservation and contributions to relevant scientific research.

Although territories of life exist all around the world and their contributions to maintaining biological and cultural diversity have been essential for millennia, nuanced understanding of many of their aspects and dynamics is still very limited, while transmission of their values to decision-makers is only in an emergent state, and scientists can do a lot to revert this situation. Territories of life are not only contributing significantly to global sustainability, but they are also under immense pressures from interconnected global social and environmental changes. It is therefore important, necessary, and urgent for the research community to mobilize in solidarity with an active support of IPLCs who are governing,

managing, and sustaining their territories of life and to which our global sustainability is linked.

Data Availability

No data were used for the research described in the article.

Declaration of Competing Interest

The co-authors have no conflict of interest to declare.

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Annex

The reference list provided in the article's Bibliography section is a summary of the most key, instrumental, and recent sources that have had the major role in shaping the paper (90 titles). However, below, we provide as a complement the total list of references consulted for this review (166 titles) and to which the map of Figure 1 makes reference to.

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