**EDITORIAL**

**Weaving the middle spaces between Indigenous and scientific knowledge for biodiversity conservation in Africa**

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**ABSTRACT**

Africa’s unparalleled biodiversity and cultural heritage are closely tied to Indigenous Peoples (IP) and their traditional ecological knowledge systems (TEK), which offers vital insights for conservation and sustainability. This editorial highlights the active role of African IP in biodiversity conservation and food system resilience, emphasising the urgent need to forge equitable partnerships across knowledge systems rather than subordinating TEK to scientific knowledge (SK). TEK, embedded in centuries of observation and cultural practices, informs ecological processes and sustainable resource use. However, climate change, land dispossession, and cultural erosion, among other drivers, threaten these knowledge systems and the communities that uphold them. A collaborative approach that respects Indigenous sovereignty can foster interdisciplinary conservation efforts. This aligns with ongoing efforts at the international scene, such as the Kunming–Montreal Global Biodiversity Framework, which explicitly recognises the rights of IP, as well as those of other local communities in multiple conservation targets, including land rights, traditional knowledge, and access to justice. The challenge remains: how can these international commitments translate into equitable, rights-based conservation on the ground? It is crucial to ensure that conservation policy and practice are consistent with the United Nations Declaration on the Rights of Indigenous Peoples and uphold moral responsibility. Equally important is fostering shared interests between conservationists and IP by engaging in open dialogue about conflicts of interest and building trust with Indigenous communities. By integrating these principles, conservation science can move beyond theoretical commitments to genuine, participatory conservation efforts that respect and sustain IP’s stewardship of nature. The *African Journal of Ecology* is genuinely committed to fostering a dialogue that elevates Indigenous voices and bridges diverse knowledge systems for sustainable resource stewardship.

**Keywords:** Traditional Ecological Knowledge (TEK); biodiversity conservation; sustainable wildlife management; Indigenous rights; interdisciplinary approaches.

**1 | Introduction**

Africa is home to unparalleled biodiversity and an equally rich cultural heritage. Indigenous Peoples (IP) in Africa represent a mosaic of cultures, languages, and histories deeply rooted in specific regions. Indigenous communities, peoples, and nations are those that, having historical continuity with pre-invasion and pre-colonial societies on their territories, identify as distinct from dominant sectors of contemporary societies now prevailing in their territories

(Martínez Cobo, 1983). However, the term remains contested, and even the United Nations advises against rigid definitions, advocating instead for a case-by-case assessment based on common characteristics (UNDESA, 2009). These often include a shared cultural heritage, strong social ties, collective identity, distinct languages or traditions, and a deep-rooted connection to ancestral lands and natural resources. Recognising these characteristics rather than imposing a universal definition allows for a more inclusive and context-sensitive approach to recognising IP’s identities (Brondizio et al., 2019).

Focusing on IP is essential, as their unique cultural heritage, traditional knowledge systems, and deep-rooted connections to ancestral lands make them indispensable stewards of biodiversity and ecosystems. While other local communities also merit attention and support, IP often face unique challenges that threaten their well-being. Addressing their rights and challenges upholds social justice and strengthens broader conservation and sustainability efforts, benefiting local communities and the ecosystems they safeguard.

This editorial explores the critical connection between IP and biodiversity conservation in Africa, highlighting the breadth and depth of environmental knowledge these communities hold and their essential role in sustaining biodiversity over the long term. Passed down through generations, this knowledge provides invaluable insights into species management, habitat restoration, and climate resilience—gaining increasing recognition as a vital complement to scientific approaches. However, some emphasise that this knowledge should be seen as more than a means to fill scientific gaps (Latulippe & Klenk, 2019). Yet, despite their significant contributions, IP perspectives remain largely overlooked or underrepresented in conservation policies and research frameworks (Reyes-García et al., 2021).

Rather than providing an exhaustive review of existing literature, this piece serves as a call to action for conservation researchers, policymakers, and practitioners to recognise and integrate IP knowledge in a meaningful and respectful ways. We advocate for collaborative and interdisciplinary approaches that bridge scientific inquiry with IP worldviews, ensuring that conservation efforts are practical and grounded in ethical engagement and IP self-determination. By fostering new research collaborations and supporting IP-led initiatives, we can create pathways for knowledge exchange that respect local governance systems, promote cultural resilience, and enhance the sustainability of conservation efforts in Africa.

**2 | African Indigenous Peoples: Adaptation and Biodiversity Stewardship**

African IP demonstrate remarkable adaptability across diverse environments, shaping their livelihoods and cultures through sustainable practices. Among humanity's oldest populations, the San (often referred to as “Bushmen”) of Southern Africa rely on deep ecological knowledge for hunting and gathering, with studies highlighting their intricate understanding of flora, fauna, and seasonal cycles (Lee, 1979; Woodburn, 1982; Biesele & Hitchcock, 2013). Similarly, the Nama pastoralists in Namibia, Botswana, and South Africa employ innovative herding techniques suited to arid conditions, contributing to land and resource conservation (Sullivan, 1999).

In East Africa, the Maasai are recognised for their rotational grazing systems, which maintain grassland health and foster wildlife coexistence (Fratkin & Mearns, 2003; Reid, 2012; Lankester & Davis, 2016; Boles et al., 2019). The Ogiek of Kenya’s Mau Forest and the Hadza of Tanzania exemplify sustainable hunting and gathering practices that support ecosystem balance (Blackburn, 2006). In Central Africa’s rainforests, the Baka, Mbuti, Aka, and Batwa Indigenous groups have developed extensive knowledge of biodiversity and ecosystem management, playing key roles in conservation efforts despite ongoing marginalisation (Bahuchet, 2012; Kidd, 2014; Mukasa, 2014; Olivero et al., 2016).

The Tuareg of the Sahara region employ sophisticated desert survival skills, integrating camel herding and trade with water conservation strategies (Keenan, 2005). Meanwhile, the Amazigh (Berbers) of North Africa practice sustainable agriculture, including terraced farming and rotational grazing, preserving fragile ecosystems (Crawford, 2008).

Indigenous communities have long sustained biodiversity through adaptive strategies rooted in deep ecological knowledge (see Brondizio et al. 2022 for a review) . Research consistently demonstrates that Indigenous lands are very often better conserved than non-Indigenous areas, underscoring the importance of recognising and integrating Indigenous ecological knowledge and management strategies into conservation policy and practice (Garnett et al., 2018; Fa et al., 2020; O’Bryan et al., 2021; Estrada et al., 2022; Kennedy et al., 2023; Sze et al., 2024). However, external pressures—including land dispossession, extractive industries, and climate change—increasingly threaten their ways of life and the knowledge systems underpinning effective conservation. Securing land tenure and ensuring Indigenous participation in conservation planning are critical steps in upholding their rights while fostering sustainable biodiversity management (Schmidt-Soltau, 2003; Hodgson, 2011). Sustainable conservation outcomes depend on Indigenous self-determination over land and resources, aligning conservation efforts with locally grounded governance systems.

The adaptability of IP to their environments is a powerful example of how humans can live in balance with nature, offering valuable lessons for addressing global ecological challenges. These communities are often deeply connected to their landscapes, possessing *traditional ecological knowledge* (TEK) that has been refined and passed down through generations (Marten, 2010; Basdew et al., 2017). This knowledge, embedded within cultural traditions, spiritual beliefs, and community practices, has guided the sustainable use of land, wildlife, and other natural resources in many cases. Rooted in centuries of observation, adaptation, and practice, TEK represents a deep understanding of ecological processes and the interdependence between humans and the natural world.

However, while many Indigenous cultural practices contribute positively to conservation, it is important to acknowledge that not all traditional practices are inherently sustainable. There are well-documented cases where customary resource use has led to ecological challenges, particularly in contexts where external pressures, such as market demands or environmental changes, have disrupted traditional management systems. In some instances, unsustainable hunting, habitat modification, or conflicts with wildlife—such as those involving large carnivores—have created conservation dilemmas, often referred to as ‘biocultural conflicts’ (Hens, 2006; Johns et al., 2013; Dickman et al., 2015; Hazzah et al., 2017; Akinola et al., 2020; Torrents-Ticó et al., 2023). Recognising these complexities is essential to developing equitable conservation approaches that respect Indigenous knowledge while addressing sustainability challenges. Moreover, TEK can serve as a foundation for testing explicit ecological hypotheses, much like other forms of field research, offering insights that contribute to conservation science and policy (Luiselli, 2024).

While remoteness has helped preserve Indigenous lands and their ecosystems, it is not a universal feature. Many Indigenous communities also live near urban and peri-urban regions, and increasing infrastructure development is making remote areas more accessible, bringing both opportunities and challenges. The relative inaccessibility of some Indigenous lands has allowed them to play a vital role in biodiversity conservation and cultural preservation. Yet, these areas are increasingly threatened by the growing metabolism of the world’s economy, and its ever-expanding industrial and extractive development pressures (Scheidel et al., 2023; Kennedy et al., 2024). Far from being passive beneficiaries of isolated ecosystems, IP have actively shaped their environments through deliberate and refined management practices, such as rotational grazing, controlled hunting, terracing of steep or erodible slopes, thinning and pruning, and safeguarding sacred groves, which reflect a profound ecological understanding.

Maffi (2001) extensively examined biocultural diversity—the deep interconnection between biological, cultural, and linguistic diversity. She argues that the diversity of life extends beyond species and ecosystems to encompass human cultures and languages, all intricately linked within socio-ecological systems. Her research highlights how Indigenous languages and cultural practices are embedded in specific landscapes, shaping traditional stewardship and conservation efforts. Case studies in Maffi & Woodley (2010) also demonstrate how Indigenous knowledge and languages are fundamental to biodiversity conservation, emphasising that these serve as repositories of environmental wisdom. Integrating Maffi’s insights into Indigenous land distribution underscores the need to protect the ecological integrity of these remote areas and their Indigenous inhabitants' cultural and linguistic heritage. A holistic conservation approach must recognise and support these interwoven systems, ensuring conservation strategies respect and sustain the deep relationships between people and their environments. It is encouraging to see that even well-established, peer-reviewed journals like the *Canadian Journal of Zoology* explicitly acknowledge IP’s scientific contributions. The journal states: "The journal also accepts manuscripts written by (with or for) Indigenous Traditional Knowledge keepers to ensure the protection of Traditional Knowledge with/for/by Indigenous Peoples" (source, last accessed: 1st February 2025). Similarly, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) also highlights the importance of including Indigenous Knowledge in its assessments of the status and trends of the world’s biodiversity (McElwee et al. 2020). This recognition reflects a growing commitment within the scientific community to valuing and safeguarding Indigenous knowledge as a vital component of research and conservation efforts.

**2 | Traditional Ecological Knowledge and Environmental Sustainability**

TEK represents a vast body of environmental understanding, encompassing species composition, ecosystem functions, and sustainable resource use. Unlike a knowledge system that requires validation by SK, TEK offers unique site-specific insights that provide a much richer picture of understanding than relying on one knowledge system (Tengö et al. 2014). Ecological science, through systematic tools such as remote sensing, biodiversity monitoring, and ecosystem modelling, can enhance TEK rather than override it. By adopting a co-production approach, where Indigenous communities and scientists collaborate equally, conservation strategies can integrate diverse perspectives without imposing hierarchical knowledge structures (Sillitoe, 1998; Agrawal, 1995).

Studies incorporating TEK—through interviews with hunters, fishers, and community experts—have demonstrated its reliability in complementing field observations and refining ecological interaction networks (e.g. Luiselli et al., 2021; Dendi et al., 2023). For instance, TEK has significantly contributed to understanding Afrotropical frugivory networks, helping predict ecosystem responses to disturbances such as defaunation (Durand-Bessart et al., 2024). These synergies illustrate that combining knowledge systems enhances ecological understanding while respecting Indigenous epistemologies.

Integrating Western science and Indigenous knowledge, particularly in environmental management, remains widely debated. While co-management initiatives have been pursued to blend these knowledge systems, their outcomes have often fallen short of expectations. A key challenge is the tendency for Indigenous knowledge to be filtered through external scientific paradigms rather than being valued on its own terms (see Ludwig and El-Hani 2020). This dynamic can lead to extractive approaches that undermine Indigenous autonomy and self-determination. Instead, alternative models emphasise the need for Indigenous communities to engage with scientific knowledge selectively, based on their priorities and needs (Mazzocchi, 2018).

Successful integration depends on embracing epistemological pluralism and fostering mutual learning, recognising that different interpretations of reality and knowledge criteria must coexist. Conservation science should move beyond extractive methodologies and adopt participatory approaches that reinforce Indigenous leadership and autonomy, ensuring that knowledge exchange benefits all parties involved (Sillitoe, 1998; McAlvay et al., 2021). Extending this perspective beyond specific case studies can help reimagine the future of knowledge systems, advancing ethical and effective collaborations that respect scientific inquiry and Indigenous ways of knowing.

**4 | Towards Sustainable Stewardship: A Holistic Perspective**

African IP provide crucial lessons for sustainable biodiversity management, yet scaling their practices beyond localised contexts presents challenges. Socioeconomic pressures, political marginalisation, and economic dependencies on the wild meat trade complicate efforts to institutionalise Indigenous conservation strategies. However, successful community-based models, such as Namibia’s conservancies and Kenya’s participatory wildlife management schemes, demonstrate that sustainable governance can thrive when Indigenous leadership is central (Adams & Hutton, 2007; Roe et al., 2009; Galvin et al., 2018).

In December 2022, the Convention on Biological Diversity adopted the Kunming–Montreal Global Biodiversity Framework (CBD, 2022), marking a significant breakthrough in embedding human rights in conservation. Unlike previous intergovernmental biodiversity agreements, this framework explicitly commits to a rights-based approach, with seven of its 23 targets directly recognising the rights of Indigenous Peoples and local communities. These include provisions for territorial recognition, customary sustainable use, collective actions, traditional knowledge, access to justice, and biodiversity-related information (Newing et al., 2023). Translating these commitments into equitable conservation practice requires addressing long-standing power imbalances and ensuring Indigenous self-determination over land and resources (Cariño & Farhan Ferrari, 2021).

Newing & Perram (2019) outline four key actions to advance rights-based conservation: (1) ensuring conservation actions align with international human rights laws and ethical responsibilities, (2) building on shared interests between conservationists and Indigenous communities, (3) fostering open discussions on conflicts of interest, and (4) earning the trust of Indigenous Peoples and local communities. Case studies from diverse regions highlight persistent rights violations and emerging pathways for reconciliation. For example, Indigenous communities in Kenya, Cameroon, Indonesia, and the Colombian Amazon have faced land dispossession due to protected area establishment, often without Free, Prior, and Informed Consent (Andoke Andoke et al., 2023; Barnes et al., 2023; Claridge & Kobei., 2023; Kenrick et al., 2023). However, growing legal advocacy efforts have resulted in landmark rulings, such as the African Court of Human and Peoples’ Rights' 2022 decision recognising the Ogiek’s collective land rights in Kenya (Claridge & Kobei, 2023).

The new Global Biodiversity Framework also underscores the importance of building on common interests. Indigenous Peoples have long served as biodiversity custodians, and effective conservation depends on genuinely valuing and recognising the importance of their traditional knowledge systems and their multiple expressions in land and seascapes worldwide. Vasquez & Sunderland (2023) emphasise how Indigenous land-based knowledge contributes to biodiversity conservation and food security, while case studies demonstrate the success of collaborative conservation efforts built on mutual respect (Aini et al., 2023; Barnes et al., 2023).

Engaging in open discussions about conflicts of interest remains crucial, mainly where histories of rights violations have created mistrust and undermined prospects for genuine collaboration. Innovative tools such as participatory video dialogues in Guyana (Mistry et al., 2023a, 2023b) and Indigenous-led listening events in Cameroon (Emini et al., 2023) offer new avenues for fostering inclusive decision-making. Additionally, mechanisms like the Whakatane Assessment provide structured methodologies for conflict resolution, helping to mediate disputes and strengthen Indigenous agency in conservation (Kenrick et al., 2023).

Earning trust requires sustained commitment from conservation actors, respecting rights and embedding participatory approaches within conservation institutions and policymaking. This means moving beyond extractive methodologies and supporting Indigenous-led conservation efforts prioritising sovereignty, self-determination, and long-term sustainability (Novellino, 2024). Conservation organisations and journals can also amplify IP voices and ensure rights-based principles guide research and practice (Tugendhat et al., 2023).

Achieving equitable conservation will require continuous reflection, adaptation, and genuine power-sharing. As the Kunming–Montreal Global Biodiversity Framework advances, conservation actors must rise to the challenge of transforming commitments into action, ensuring that IP are recognised as leaders and partners in shaping the future of biodiversity conservation.

**5 | Advancing Synergies across Knowledge Systems**

Rather than subordinating TEK to scientific frameworks, meaningful partnerships should facilitate the co-production of knowledge, ensuring that Indigenous methodologies and perspectives actively shape conservation science, policy, and practice (Berkes, 2008; Sillitoe, 1998). While science has achieved a remarkable understanding of nature, granting humans extraordinary technological capabilities, its dominance—mainly through Euro-American global influence—has often marginalised other cultural worldviews, sometimes threatening their foundations. The erosion of traditional ecological knowledge, particularly in Africa, has been well documented, with studies highlighting the loss of plant knowledge among the Maasai in Kenya, the declining transmission of forest knowledge among Indigenous communities, and the intergenerational disappearance of traditional medicinal practices (Bussmann et al., 2018; Carson et al., 2018; Hedges et al., 2020). These trends underscore the urgency of integrating diverse knowledge systems into conservation efforts, not only as alternative information banks but as essential contributions to biodiversity and cultural heritage sustainability. However, the scientific perspective remains one among many, and fostering genuine dialogue between knowledge systems is key to addressing ecological and cultural loss.

Historically, many local knowledge systems were dismissed as “primitive” and needing modernisation, yet extensive evidence across multiple research lines demonstrates their validity and effectiveness in sustainably managing ecological systems (Molnár & Babai, 2021; Torrents-Ticó et al., 2021). A deeper interrogation of science's foundational assumptions is needed beyond merely incorporating Indigenous knowledge into development and conservation, as suggested by Sillitoe (1998). This includes challenging its hegemony, not only over IP communities in Africa, but also within the global discourse on conservation. Strengthening participatory conservation models, recognising Indigenous leadership, and developing legal frameworks for land rights are crucial steps towards more equitable and sustainable approaches to biodiversity conservation—one that truly values the contributions of multiple knowledge traditions rather than positioning them as supplementary to Western science. The issues at stake are significant, and the challenges ahead are both complex and intellectually invigorating, requiring new engagement models across ethnographic and institutional contexts.

The *African Journal of Ecology* is committed to advancing these discussions by fostering interdisciplinary research that bridges TEK and SK while upholding IP’s rights. We are actively exploring the launch of a Special Issue dedicated to participatory and community-led conservation strategies that integrate diverse epistemologies. By embracing a holistic perspective, we can ensure the sustainable stewardship of Africa’s natural resources for future generations. This commitment underscores that effective conservation is best achieved through inclusive, co-developed, and contextually informed approaches.

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**FIGURE 1** The Baka, an Indigenous group of Central Africa's tropical rainforests (southeastern Cameroon, northern Congo, Gabon, and the Central African Republic), are deeply connected to the forest, providing food, medicine, and spiritual sustenance. Traditionally, hunter-gatherers rely on tracking, fishing, and foraging, complemented by rich cultural traditions like songs, dances, and myths. Their spiritual practices centre around *Jengi*, the forest's guardian spirit, reflecting their sustainable and profound relationship with their environment, even as some adapt to changing pressures like deforestation and farming. In this plate: a) a traditional Baka village in South Cameroon; b) Baka family outside their "mongulu" or "mongulu hut." These huts are typically dome-shaped and constructed using natural materials such as branches and large leaves, often from the Marantaceae or similar plants; c) Baka woman preparing a meal. (Photo credits: Eva Avila Martin).

**a)**

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**b)**

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**c)**

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