PARKS

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IUCN WCPA WORLD COMMISSION ON PROTECTED AREAS

IUCN PROTECTED AREA DEFINITION, MANAGEMENT CATEGORIES AND GOVERNANCE TYPES

IUCN defines a protected area as:
A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.

The definition is expanded by six management categories (one with a sub-division), summarized below.

Ia Strict nature reserve: Strictly protected for biodiversity and also possibly geological/ geomorphological features, where human visitation, use and impacts are controlled and limited to ensure protection of the conservation values.

Ib Wilderness area: Usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, protected and managed to preserve their natural condition.

II National park: Large natural or near-natural areas protecting large-scale ecological processes with characteristic species and ecosystems, which also have environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.

III Natural monument or feature: Areas set aside to protect a specific natural monument, which can be a landform, sea mount, marine cavern, geological feature such as a cave, or a living feature such as an ancient grove.

IV Habitat/species management area: Areas to protect particular species or habitats, where management reflects this priority. Many will need regular, active interventions to meet the needs of particular species or habitats, but this is not a requirement of the category.

V Protected landscape or seascape: Where the interaction of people and nature over time has produced a distinct character with significant ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.

VI Protected areas with sustainable use of natural resources: Areas which conserve ecosystems, together with associated cultural values and traditional natural resource management systems. Generally large, mainly in a natural condition, with a proportion under sustainable natural resource management and where low-level non- industrial natural resource use compatible with nature conservation is seen as one of the main aims.

The category should be based around the primary management objective(s), which should apply to at least three-quarters of the protected area – the 75 per cent rule.

The management categories are applied with a typology of governance types – a description of who holds authority and responsibility for the protected area.

IUCN defines four governance types.

Governance by government: Federal or national ministry/agency in charge; sub-national ministry/agency in charge; government-delegated management (e.g. to NGO)

Shared governance: Collaborative management (various degrees of influence); joint management (pluralist management board); transboundary management (various levels across international borders)

Private governance: By individual owner; by non-profit organisations (NGOs, universities, cooperatives); by for- profit organsations (individuals or corporate)

Governance by Indigenous Peoples and local communities: Indigenous Peoples' conserved areas and territories; community conserved areas – declared and run by local communities.

For more information on the IUCN definition, categories and governance type see the 2008 *Guidelines for applying protected area management categories* **which can be downloaded at: www.iucn.org/pa_categories**

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PARKS is published to strengthen international collaboration in protected and conserved areas development and management by:

- exchanging information on practical management issues, especially learning from case studies of applied ideas;
- serving as a global forum for discussing new and emerging issues that relate to protected and conserved areas;
- promoting understanding of the values and benefits derived from protected and conserved areas to communities, visitors, business and others;
- ensuring that protected areas fulfil their primary role in nature conservation while addressing critical issues such as ecologically sustainable development, social justice and climate change adaptation and mitigation;
- changing and improving protected and conserved areas support and behaviour through use of information provided in the journal; and
- promoting IUCN's work on protected and conserved areas.

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EDITORIAL: EXTINCTION OF EXPERIENCE: ONE STEP FOR PREVENTION.

Dr. Margaret F. Kinnaird

Managing Editor

Bio: Margaret Kinnaird worked for the Wildlife Conservation Society from 1991 to 2015 and led WWF-International's Wildlife Practice from 2016 to 2024. She has authored 2 books, over 150 scientific and popular articles. She serves on the boards of Save the Rhino, Inc. and Wildlife Direct and is a member of the IUCN World Commission on Protected Areas.

When I was a Master's student, I spent months isolated on an island in the Galapagos studying the behaviour of an endemic mockingbird. Later, for my PhD, I spent several years in the riverine forests of eastern Kenya studying the demography of a rare primate. My ecologist colleagues at the time were tagging penguins in Peru, catching frogs in Costa Rica or slogging through flooded forests of Venezuela and Brazil after monkeys. Some of us were in foreign lands, some in our own countries – but we all stayed for extended periods without leaving our field sites. We made cool discoveries, added to the collective knowledge of natural history and in many cases, provided insights into the management of the areas where we studied.

This sort of time commitment to studying the natural world is increasingly an outlier. And it's not just biologists who are spending less time in nature, this is true across multiple field-based disciplines and perhaps most disconcertingly, in school rooms across the globe, particularly in the global south. I think it's a trend we need to be concerned about.

That's why I was struck by a recent blog in Mongabay by Rhett Butler where he reflects on the 'extinction of experience', a concept put forward decades ago by lepidopterist Robert M. Pyle and expounded upon by Masashi Soga and Kevin J. Gaston in 2016. It refers to our declining interaction with nature - from backyard explorations of children to ecologists and protected area managers. The essence of the concept is that the more we are estranged from nature, the less we will know or care about its disappearance. This creates a feedback loop that accelerates biodiversity loss.

Soga and Gaston put forward all sorts of reasons for this trend – which has only deepened in the past 10 years. Field expeditions are expensive and funding is increasingly tight and limited. Many researchers are raising families making long expeditions difficult, and some are concerned with reducing the carbon footprint of long-haul flights. Schools, especially urban ones, struggle to find nearby natural places to take children. Even schools on the periphery of protected areas struggle to find the resources (entrance fees and transport) for their pupils to enjoy nature.

Plus, we now have lots of technology at our fingertips - drones, DNA sampling, camera traps, remote-sensing technology, and increasingly AI - that reduce or eliminate time needed in the wild. The technologies are non-invasive, allow us to analyse vast data sets and acquire deeper insights than were ever possible before. These are good things and I've heartily embraced and promoted a number of these approaches among my own students.

But at the same time, these technologies distance us from the very places we need to understand. In his blog, Butler underscores Soga and Gaston's call for balance. Embrace the technology but don't risk the loss of on-the-ground ecological discovery. Without this balance, we'll never break the feedback loop that drives biodiversity loss.

I believe that one of the best ways to interrupt this feedback loop is by making our parks and protected areas more available to the public – especially children in the surrounding communities that have looked at intimidating boundary signs and fence posts for years while wondering what was inside. Allowing youth to exercise their curiosity and acquire a sense of wonder for nature is vital for fostering future environmental

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Children learning at the Wildlife Direct Field Camp, Nairobi, Kenya © Wildlife Direct

stewards. As Arvind Kumar (2023) of IUCN's Commission on Environmental, Economic and Social Policy (CEESP) writes:

In today's world, young people's contribution is significant in combating climate change as they bring unique perspectives and innovative ideas. Their inclusion, particularly in policy-making, brings a much-needed long-term perspective that is often overlooked. They can also play a crucial role in promoting policies that consider the interests of future generations, thus ensuring that development objectives are aligned with environmental sustainability. Additionally, they can act as essential watchdogs, scrutinizing government activities, ensuring they meet their environmental commitments, and pushing for enhanced transparency and inclusivity. On the action side, youths are in a unique position to drive tangible changes at the grassroots level. Their familiarity with technology helps them to leverage digital tools in taking initiatives, running environmental campaigns, and monitoring of local ecosystems. They can also play a vital role in engaging the community, and nurturing a collective sense of responsibility towards nature conservation.

A number of local and national NGOs are working hard to engage youth through field labs, internships and various training opportunities. The looks of wonder and amazement that I've seen on the faces of children visiting these field sites are as heart-warming as they are encouraging. However, all these educational efforts face the usual challenges - limited finances, high park or conservancy fees, or policies that lack inclusion. We desperately need to reduce these challenges, especially in the global south. Opening the gates and providing free access to our parks and protected areas to youth and education groups would be an excellent first step. Large international NGOs, governments and businesses should provide more financial support for resourcing field labs, purchasing equipment and yes, investing in technology. And let's not forget the need for university and post-graduate level research support – some of these children will be the next generation of ecologists heading into the field and, hopefully, staying for an extended period of time.

Caring begins with experience; let's not let it go the way of the dodo.

Butler, R.A. (2025). Ecologists are spending less time in the field. That could be a problem. Mongabay, Founder's briefs, 21 April.

Kumar, A. (2023). Youth as agents of change for a sustainable future. IUCN/CEESP blog 07 August.

Soga, M. & Gaston, K.J. (2016). Extinction of experience: the loss of human–nature interactions. Frontiers in Ecology and the Environment. https://doi.org/10.1002/fee.1225.

Barrintonia asiatica flowers © Margaret Kinnaird

GREEN CITY, HUGE INEQUALITIES: CLIMATE JUSTICE AND ACCESS TO PARKS IN RIO DE JANEIRO

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ABSTRACT

This study examines the spatial distribution of parks in the city of Rio de Janeiro, assessing whether these areas are located in regions of varying socio-environmental vulnerability. Employing a qualitative, associative methodology – including literature review and case study – the research analyses the Social Development Index, ethnic composition, the Normalised Difference Vegetation Index and park locations. Findings reveal a pattern of climate injustice, with green spaces predominantly concentrated in less vulnerable, wealthier areas with lower proportions of Black residents. Although recent initiatives have begun to expand and revitalise parks and protected areas in more vulnerable neighbourhoods, significant disparities persist. The study highlights the need for a participatory process and further research on specific parks, their community engagement, and their integration with local environments.

Key words: socioenvironmental vulnerability, territorial distribution, green spaces

INTRODUCTION

Rio de Janeiro's climate agenda, based on its recent Master Plan (Rio de Janeiro, 2024c), emphasises projects aimed at the expansion of parks. It is supported by a regulatory framework for the implementation of green spaces, especially given the city's vulnerability to climate events such as floods (Manes et al., 2024). The Parques Cariocas project is one such initiative, aiming to revitalise municipal parks in one of the largest urban green space redevelopment programmes worldwide (Rio de Janeiro, 2024b). Additionally, the recently enacted Municipal Law No. 8465/2024 establishes sustainable mechanisms for stormwater management to control floods and inundations, applying the concept of a 'Sponge City' within the municipality (Rio de Janeiro, 2024d).

However, green area distribution remains unequal, predominantly benefiting privileged groups while vulnerable populations lack access (Panagopoulos, 2019). In Rio de Janeiro, green spaces are concentrated in areas with higher Social Development Indexes, particularly in the South Zone (Pistón et al., 2022).

In this context, this study aims to assess whether parks are equitably distributed across Rio, vis-à-vis the socio-environmental vulnerability of its population. For the purposes of this study, the term 'parks' refers specifically to Protected and Conserved Areas (PCAs), as defined by the IUCN, that have been officially designated by the municipal government of Rio de Janeiro as either 'urban parks' or 'natural parks'. These classifications are based on local administrative criteria and reflect areas intended for public use, ecological preservation and recreational functions within the city's administrative regions.

METHOD

We used a phased approach to our research. First, we conducted a literature review of climate injustice in the implementation of parks. Our search included Scopus, Web of Science, SciELO and CAPES Portal (digital publications) databases, and used the following parameters: infrastructure AND green AND ("environmental justice" OR "climate justice"); "parks" AND ("environmental justice" OR "climate justice"); "nature-based solutions" AND ("environmental justice" OR "climate justice"). The same terms were searched in

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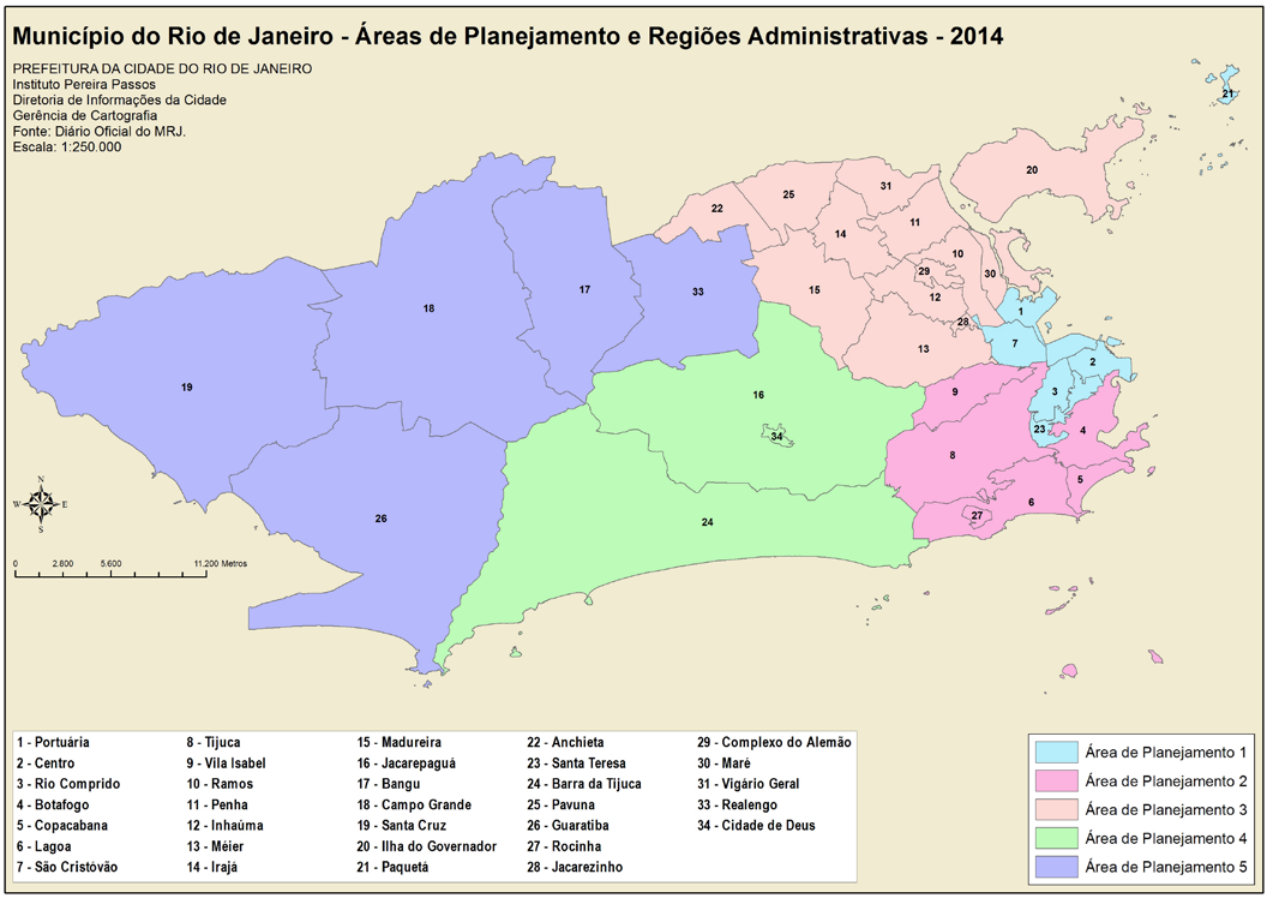

Figure 1. Map of planning areas and administrative regions of Rio de Janeiro. *Source: Rio de Janeiro (2014)*

Portuguese and Spanish. Next, we focused on Rio de Janeiro, identifying socio-environmentally vulnerable areas using ethnicity and the Social Development Index (SDI), both extracted from the Data Rio database. This data was cross-referenced, with the Normalised Difference Vegetation Index (NDVI) to the locations of the city's parks. The methodology applied consisted of assigning specific weights to the mentioned attributes and then calculating a weighted average of the selected attributes to obtain an overall assessment (Sanchéz, 2008). Based on this overall assessment, a summary map was created showing the location of parks and socio-environmental inequality in the city.

RESULTS

Parks and green spaces: globally fragmented spaces

Langhans et al. (2023) highlight that historically marginalised groups, including low-income populations, Indigenous Peoples and Black communities, have significantly less access to nature and its benefits. National data collected by the Brazilian Institute of Geography and Statistics (IBGE) in 2010 and analysed by Souza and Amorim (2013) show regional disparities in tree coverage near buildings and public spaces: the North and Northeast lack surrounding trees by 62.5 per cent and 38.2 per cent, respectively, compared to only 26.2 per cent in the Southeast. Panagopoulos (2019) reviews evidence of persistent inequality in green space distribution between affluent and poorer districts, as well as among the elderly, who tend to live in spaces with fewer green areas. Yan, Jin and Zhang (2024) further note that public facilities such as parks are predominantly located in affluent areas, while industrial zones and high-density housing are concentrated in neighbourhoods inhabited by people of colour and low-income individuals. Consequently, vulnerable populations are more exposed to climate events such as floods (Ximenes & Maglio, 2022), while adaptive solutions such as afforestation and green space expansion tend to be found in areas with more privileged populations, perpetuating climate injustice (Costa & Bôas, 2022).

Rio de Janeiro and the occupation of urban space

Rio de Janeiro, Brazil's second-largest city and a global megalopolis (Fernandez, 2022), has over 6 million residents (IBGE, 2022). Located in Southeast Brazil, it spans 1,200.33 km², with 640.34 km² of urbanised area (IBGE, 2019; 2024). The municipality is divided into 32 administrative regions and five planning areas, based on

Entrance to the Parque Natural da Cidade (Rio de Janeiro), with the Favela Vila Parque da Cidade in the background'. © Alexandre Dantas, 2025

environmental, historical and land-use criteria (Rio de Janeiro, 2024a): Central Zone (AP1), South Zone and Greater Tijuca (AP2), North Zone (AP3), Barra da Tijuca and Jacarepaguá lowlands (AP4), and West Zone, including Guaratiba, Campo Grande and Santa Cruz (AP5). A reference map from City Hall (Rio de Janeiro, 2014) illustrates these divisions (Figure 1).

Urbanisation and nature have long been intertwined in Rio de Janeiro, as noted by travellers and writers since the 18th century (Fernandez, 2022). In the 19th century, extensive vegetation was replaced by coffee plantations, leading to water shortages (Sales et al., 2024). This prompted debates on preserving springs and forest remnants, culminating in the planned reforestation of Tijuca and Paineiras Forests beginning in 1862 (Sales et al., 2024). Influenced by European models, the Tijuca Forest was conceived to reflect ideals of Brazilian prosperity and modernity (Sales et al., 2024).

Concurrently, Rio's political prominence spurred the creation of parks, gardens and squares, following French afforestation standards (Sales et al., 2024). During the 1940s and 1950s, industrialisation, immigration, and architectural transformation led to the development of leisure spaces such as Avenida Presidente Vargas, Praça General Osório, Canal do Jardim de Alah and Praça Saens Peña (Ferreira et al., 2021).

Subsequent decades (1960s–1990s) saw rapid urban expansion, road construction and unregulated housing growth, marked by environmental contradictions and the displacement of low-income populations to hillsides and riverbanks, often through forced evictions linked to land privatisation (Fernandez, 2022). Between 1984 and 2020, the metropolitan urban area nearly doubled, while vegetation cover declined by 13 per cent, particularly in the Pedra Branca and Tijuca Massifs (Miranda et al., 2022). According to Bessa and colleagues (2015), the city's hilly terrain – historically occupied by favelas and low-income populations – reflects a segregationist urban development model. Rocinha favela exemplifies this pattern, with dense, impermeable surfaces and high vulnerability to floods and landslides (Ronchi & Arcidiacono, 2019).

Urbanisation has also disrupted hydrological systems, notably in the Mangue Canal, Acari River Basin, Sepetiba Basin and Jacarepaguá Lagoon Complex (Castro et al., 2023; Costa et al., 2018; De Deus & Oscar Junior, 2020; Guimarães & Miguez, 2020).

Overall, the city's urbanisation reveals a persistent tension between nature and urban growth, with green areas embedded in the urban fabric and vice versa, shaped by unregulated expansion. This dynamic reinforces socio-environmental disparities across the city (Nunes et al., 2020).

Socio-environmental vulnerability and territorial distribution of Rio's parks

Analysing urban land use in Rio de Janeiro allows for a deeper examination of socio-environmental data in relation to the distribution of parks across the city's administrative regions. The collected social and environmental data were translated into maps to visually support the analysis, and the following section explains this mapping process.

The selected social indicators were the SDI and ethnic composition. The SDI indicators are based on eight variables from the 2010 IBGE census, as the 2022 data remains incomplete and unpublished at the regional level (Rio de Janeiro, 2024a). These variables include access to water, sewage, and waste collection; average number of bathrooms per resident; illiteracy rate among 10–14 year olds; and average household income based on minimum wages. SDI values were categorised into three ranges: low (≤ 0.55), medium (0.56–0.65) and high (≥ 0.66). AP5 (West Zone) consistently shows the lowest SDI, while AP2 (South Zone) and AP4 (West Zone) generally present high SDI scores. AP1 (Central Zone) and AP3 (North Zone) predominantly fall within the

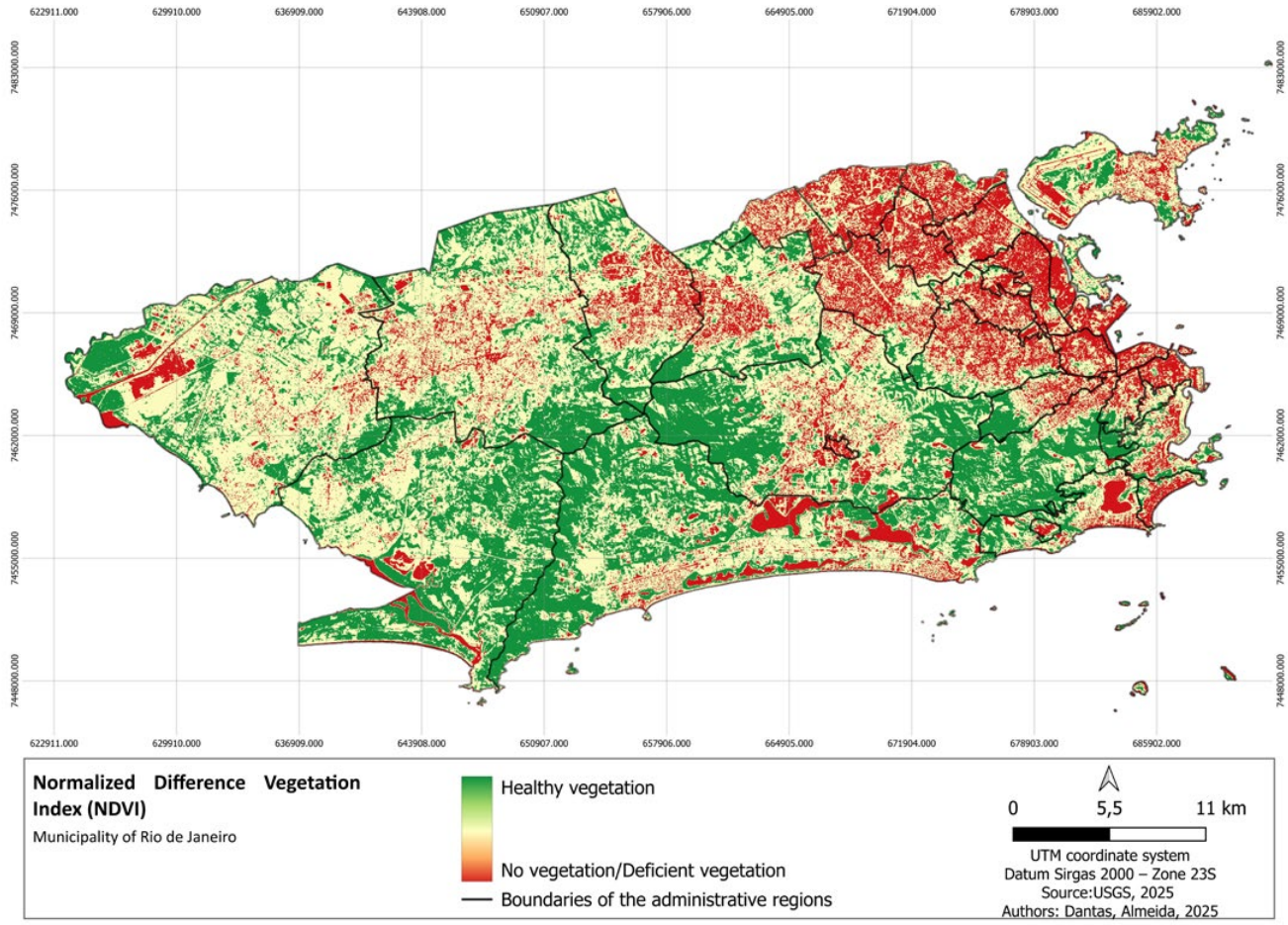

Figure 2. Vegetation map based on NDVI by administrative region. S*ource: prepared by the authors (2025), based on USGS (2025)*

medium SDI range. It is important to note that the vulnerabilities mapped in the 2010 census remain persistent over time. Recent technical notes from Pereira Passos Institute (Cavallieri & Lopes, 2024) and reports from the 'Territórios Sociais program' (Rio de Janeiro & ONU-Habitat, 2025) confirm that the same neighbourhoods identified as socially fragile in 2010 continue to exhibit low SDI values and high levels of deprivation.

Ethnicity data were drawn from the 2022 IBGE census (Rio de Janeiro, 2025a). The analysis was conducted by administrative region, based on the proportion of Black and brown residents relative to the total population. Three categories were defined: high concentration (above 50 per cent), medium (30–49 per cent) and low (below 29 per cent). Notably, areas with the highest proportions of Black and brown populations correspond to those with the lowest SDI, as illustrated in Figure 3. The regions with the highest concentrations were Cidade de Deus (75 per cent), Complexo do Alemão (72 per cent) and Jacarezinho (70 per cent), while the lowest were Copacabana (28 per cent), Botafogo (26 per cent) and Lagoa (21 per cent).

Environmental data analysed across Rio de Janeiro's municipal territory included the spatial distribution of green areas via the NDVI and the location of PCAs. NDVI, derived from satellite-based remote sensing, measures vegetation density and health by comparing red and infrared light absorption. Healthy vegetation absorbs more red light and reflects more infrared, appearing green on the map (Figure 2). In contrast, urbanised zones, water bodies and exposed soil reflect less infrared and appear red. Yellow areas indicate sparse tree cover with limited biodiversity potential.

Vegetation quality analysis reveals that the North Zone is predominantly classified as "no vegetation/deficient vegetation" with limited green areas near the Tijuca Massif and isolated green/yellow zones such as the linear Madureira Park. Healthy vegetation is concentrated in the Maciços regions, primarily within the South Zone (AP2) and Barra da Tijuca/Jacarepaguá (AP4). The West Zone (AP5), the city's largest planning area (an administrative division of the city to structure urban planning and guide public policies), also exhibits extensive areas of low or absent vegetation, particularly in its central region and around Sepetiba Bay.

Table 1. Attribute notes. *Source: prepared by the authors, 2025*

Black population	
High concentration	Note 3
Medium concentration	Note 2
Low concentration	Note 1

SDI	
Low	Note 3
Medium	Note 2
High	Note 1

NDVI	
No vegetation/deficient vegetation	Note 3
Low tree cover/biodiversity	Note 2
Healthy vegetation	Note 1

Table 2. Socio-environmental vulnerability scores by administrative region. *Source: prepared by the authors, 2025*

Administrative region	Ethnicity	SDI	NDVI	Total
I Portuária	3	3	3	***9***
II Centro	2	2	3	***7***
III Rio Comprido	2	2	2	***6***
IV Botafogo	1	1	2	***4***
V Copacabana	1	1	3	***5***
VI Lagoa	1	1	2	***4***
VII São Cristovão	3	2	3	***8***
VIII Tijuca	2	1	1	***4***
IX Vila Isabel	2	2	2	***6***
X Ramos	3	2	3	***8***
XI Penha	3	2	3	***8***
XII Inhaúma	3	2	3	***8***
XIII Meier	2	2	2	***6***
XIV Irajá	3	2	3	***8***
XV Madureira	3	2	3	***8***
XVI Jacarepaguá	3	2	2	***7***
XVII Bangu	3	3	2	***8***
XVIII Campo Grande	3	3	2	***8***
XIX Santa Cruz	3	3	2	***8***
XX Ilha do Governador	2	2	2	***6***
XXI Paquetá	3	2	2	***7***
XXII Anchieta	3	2	2	***7***
XXIII Santa Teresa	3	2	1	***6***
XXIV Barra da Tijuca	2	1	2	***5***
XXV Pavuna	3	3	3	***9***
XXVI Guaratiba	3	3	1	***7***
XXVII Rocinha	3	3	2	***8***
XXVIII Jacarezinho	3	3	3	***9***
XXIX Complexo do Alemão	3	3	3	***9***
XXX Maré	3	3	3	***9***
XXXI Vigário General	3	3	3	***9***
XXXIII Realengo	3	2	2	***8***
XXXIV Cidade de Deus	3	3	3	***9***

The collected socio-environmental data were aggregated using equal weighting for each attribute, following a simple additive formula (Sanchéz, 2008). Three attributes – NDVI, SDI and ethnicity – were evaluated in relation to PCAs' locations. Each was assigned a score from zero to three, reflecting its contribution to socio-environmental vulnerability (Table 1). Final scores were calculated by summing the individual attribute scores, with equal relevance across all indicators. These scores were then distributed across the city's administrative regions to assess spatial variation.

Based on the defined score ranges, attribute weights and selected data, final scores were assigned to each administrative region of Rio de Janeiro. NDVI, being continuous data, is not uniformly distributed across regions. To address this, representative vegetation quality values were extracted from QGIS spreadsheets, accounting for each region's territorial extent. The resulting scores reflect the aggregated socio-environmental conditions per region, combining NDVI, SDI and ethnic composition (Table 2).

Finally, the analysis focused on PCAs, as defined by the IUCN, specifically those designated by the municipal government as 'urban parks' or 'natural parks'. In Rio de Janeiro's planning framework, 'urban parks' are public green areas within the consolidated urban fabric, primarily intended for recreation, leisure and provision of ecosystem services, but they are not legally recognised as conservation units. By contrast, 'natural parks' are formally classified as Conservation Units under the National System of Conservation Units (Law 9.985/2000), with the main purpose of preserving ecosystems, promoting environmental education, and allowing controlled public use (Brazil, 2000; Rio de Janeiro, 2024c). Thus, only natural parks hold the legal status of protected areas, while urban parks remain instruments of urban planning

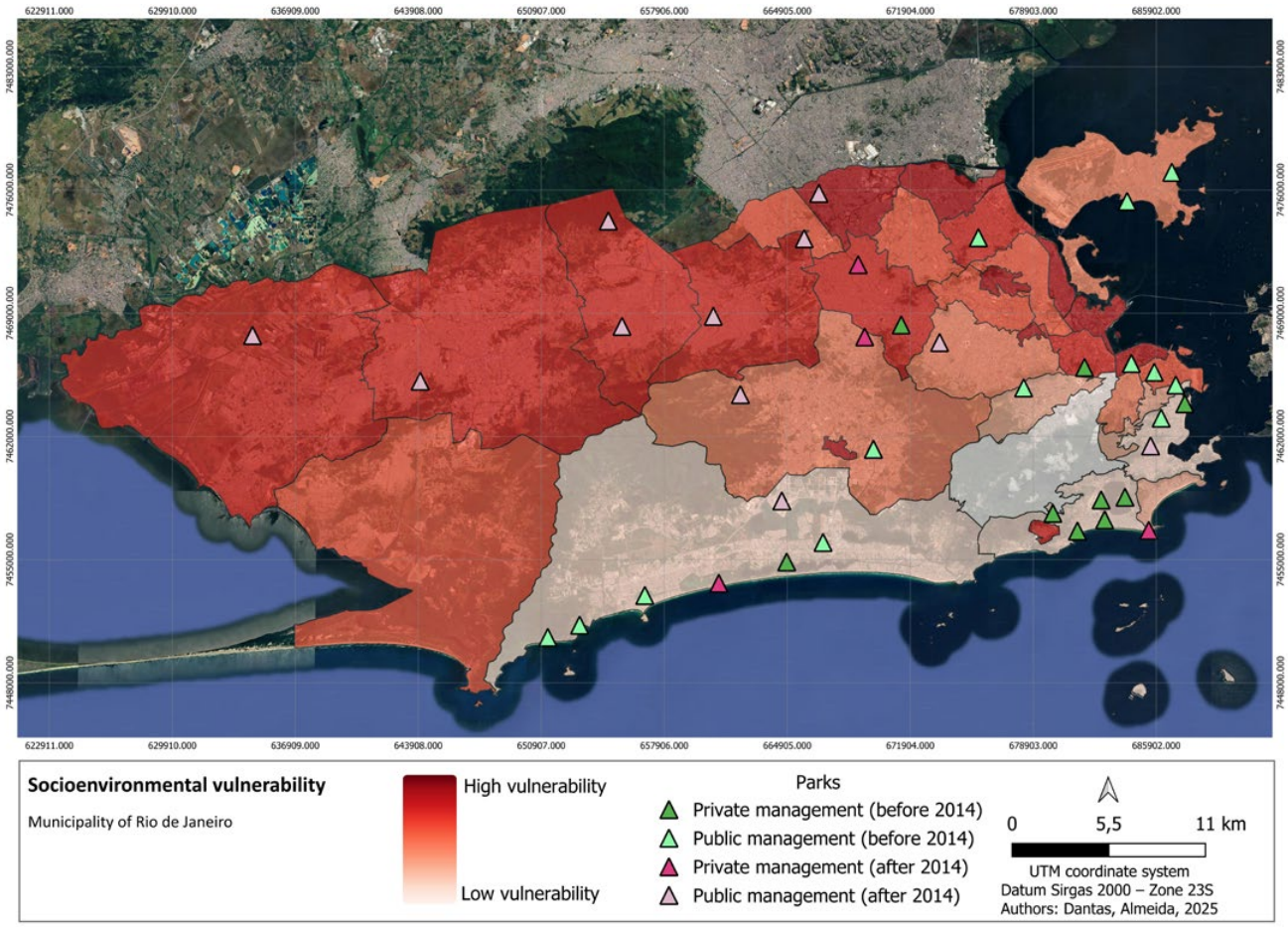

Figure 3. Map of socio-environmental vulnerability and location of parks by administrative region.
Source: prepared by the authors, 2025

and social well-being without equivalent legal safeguards (Cavallieri & Lopes, 2024; Rio de Janeiro, 2025b).

Park locations were identified using municipal records and news sources (Rio de Janeiro, 2024b), as well as official documentation from the Parques Cariocas project, which outlines existing parks, planned delivery of new parks, and public-private concession models (Rio de Janeiro, 2025b). They were categorised into four groups: (i) parks created or last renovated before 2014 and currently undergoing transfer to private management; (ii) those from the same period remaining under public management; (iii) parks created or renovated after 2014 and transferring to private management; and (iv) those post-2014 remaining under public management.

These parks are predominantly concentrated in the South and Central Zones, particularly older parks such as Passeio Público (1779) and Campo de Santana (1880). In contrast, while fewer PCAs are in areas with lower SDI, recent efforts have expanded PCA coverage in AP5 and AP3, with new publicly managed parks such as Parque Oeste and Parque Realengo Susana Naspolini.

Based on the compiled data and park locations, a summary map (Figure 3) was generated using a red gradient to visualise socio-environmental vulnerability. Darker shades represent regions with higher vulnerability, while lighter shades indicate areas with lower vulnerability.

The summary map reveals key patterns in the spatial distribution of parks (PCAs): (i) extensive areas of socio-environmental vulnerability lack any designated parks, notably in Barra de Guaratiba and communities such as Cidade de Deus, Complexo do Alemão, Maré, Jacarezinho and Rocinha; (ii) the oldest and most densely clustered parks are located in areas of lowest vulnerability; (iii) recent efforts have led to the creation and renovation of parks in high-vulnerability zones, suggesting potential progress; and (iv) despite these initiatives, the overall distribution remains disproportionate, especially given the vast territorial extent of the city's most vulnerable regions.

DISCUSSION

The distribution of parks and green spaces in major cities has gained importance amid escalating environmental and social crises, particularly from a climate justice perspective. Green infrastructure, including parks, plays a critical role in mitigating climate change, delivering ecosystem services, enhancing environmental quality, and fostering collective well-being (Graça & Telles, 2020). However, unequal access to these amenities reinforces historical disparities, perpetuating climate injustice that disproportionately affects vulnerable populations (Langhans et al., 2023). In this context, the case of Rio de Janeiro illustrates how uneven access to green spaces intensifies urban socio-environmental inequalities.

Higher-income neighbourhoods with better quality infrastructure generally contain larger parks and greater urban vegetation, while peripheral areas inhabited by socially vulnerable groups face a significant deficit of such spaces. This unequal distribution reinforces the notion of urban climate injustice, as populations lacking access to green areas are disproportionately exposed to adverse climate impacts, including heat island effects, flooding and poor air quality (Costa & Bôas, 2022). The absence of parks also restricts opportunities for leisure, health and community engagement, perpetuating historical exclusions.

Results for Rio de Janeiro confirm this pattern: extensive high-vulnerability areas, such as Barra de Guaratiba, remain without parks, whereas older and larger parks are concentrated in less vulnerable regions, including the South Zone, Barra da Tijuca and the city centre. Although recent initiatives have sought to create and revitalise parks in vulnerable areas, their distribution remains disproportionate to both the territorial extent and the needs of the resident population.

The uneven distribution of green spaces is a central driver of climate injustice in Rio de Janeiro. By denying vulnerable communities the benefits of parks, such as thermal regulation, water absorption, improved air quality and social interaction, public authorities reinforce existing inequalities and limit these populations' capacity to adapt to climate impacts.

Recent initiatives to expand park projects in previously neglected areas, particularly in the North and West Zones, represent important but insufficient progress. While the implementation of new parks and the restoration of degraded areas signal a shift towards recognising the right to access city amenities and nature as universal, the territorial expansion of parks remains limited and fragmented, falling short of current demand.

Ensuring the active participation of vulnerable populations in all stages of park planning, management and maintenance is essential (Fors et al., 2021; Oscilowicz et al., 2023). Social inclusion must be understood not only as an ethical principle but as a prerequisite for the effectiveness and sustainability of green infrastructure policies. Evidence shows that participatory processes foster stronger community ownership, stimulate innovation, and ensure that interventions address local needs (Zuniga-Teran & Gerlak, 2019). In Rio de Janeiro, community engagement in park development is a critical step towards reversing climate injustice and building more equitable and resilient cities, as illustrated by the Parque Realengo initiative (Casa Fluminense, 2024). This local experience resonates with broader international movements, such as the National Park City Journey project. The project demonstrates how collective action and grassroots engagement can transform urban landscapes into healthier, greener and more inclusive environments (National Park City Foundation, n.d.).

CONCLUSIONS

An analysis of the distribution of PCAs classified by the municipality as parks in Rio de Janeiro shows that, despite recent advances in public policies aimed at expanding and revitalising green spaces in vulnerable regions, socio-environmental inequality persists. The data indicate that older and larger PCAs remain concentrated in privileged areas, while vast high-vulnerability regions continue to lack these spaces, which are essential for climate adaptation and collective well-being. This scenario underscores the need for more effective and integrated policies capable of promoting territorial equity and ensuring that the benefits of green infrastructure reach all communities, particularly those historically excluded.

In this context, it is crucial that public authorities prioritise the active participation of vulnerable populations in all stages of parks projects, from design to management and maintenance. Social inclusion and the strengthening of participatory governance are not only ethical imperatives but also necessary conditions for reversing climate injustice and fostering more resilient and equitable cities. Future research and initiatives should monitor the impacts of new PCAs in vulnerable areas, with continuous monitoring and community engagement serving as central pillars for successful implementation.

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RESUMEN

Este estudio examina la distribución espacial de los parques en la ciudad de Río de Janeiro, evaluando si estas áreas se implementan en regiones con diferentes niveles de vulnerabilidad socioambiental. Empleando una metodología cualitativa y asociativa - incluyendo revisión bibliográfica y estudio de caso - la investigación analiza el Índice de Desarrollo Social, la composición étnica, el Índice de Vegetación de Diferencia Normalizada y la ubicación de los parques. Los hallazgos revelan un patrón de injusticia climática, con espacios verdes predominantemente concentrados en zonas menos vulnerables, más ricas y con menor proporción de residentes negros. Aunque iniciativas recientes han comenzado a expandir y revitalizar parques y áreas protegidas en barrios más vulnerables, persisten disparidades significativas. El estudio destaca la necesidad de procesos participativos y de investigaciones adicionales sobre parques específicos, su vinculación con la comunidad y su integración con los entornos locales.

RÉSUMÉ

Cette étude examine la répartition spatiale des parcs dans la ville de Rio de Janeiro, en évaluant si ces espaces sont implantés dans des régions présentant différents niveaux de vulnérabilité socio-environnementale. En adoptant une méthodologie qualitative et associative - incluant une revue de littérature et une étude de cas - la recherche analyse l'Indice de Développement Social, la composition ethnique, l'Indice de Végétation par Différence Normalisée et la localisation des parcs. Les résultats révèlent un schéma d'injustice climatique, avec des espaces verts principalement concentrés dans des zones moins vulnérables, plus aisées et comportant une proportion plus faible de résidents noirs. Bien que des initiatives récentes aient commencé à étendre et revitaliser les parcs et les zones protégées dans les quartiers plus vulnérables, des disparités importantes subsistent. L'étude souligne la nécessité de processus participatifs et de recherches approfondies sur les parcs spécifiques, leur engagement communautaire et leur intégration dans les environnements locaux.

STRENGTHENING NATIONAL WILDLIFE ENFORCEMENT NETWORKS: THE ROLE OF LAO PDR PROTECTED AREA PERSONNEL

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The roles of protected area law enforcement personnel are largely confined to protected areas and their buffer zones, with strong emphasis on core responsibilities for wildlife protection. Little attention is given to a potential role in strengthening wildlife crime enforcement within subnational or provincial landscapes, particularly through cooperation with provincial law enforcement bodies. This paper examines wildlife crime cases encountered in Nam Et-Phou Louey National Park, northern Lao PDR, then considers the roles of law enforcement agencies in wildlife crime suppression at a provincial level. Three pilot Provincial-Wildlife Enforcement Networks (P-WENs) are showing the way forward in this regard. The establishment and function of these P-WENs are discussed, with particular emphasis given to their strengthening through involvement of protected area enforcement officials and the prosecutors' office. Dedicated task forces at the national level are also identified as an important component of tackling wildlife and forest crime. Evidence from Thailand and Nepal supports the potential effectiveness of wildlife crime enforcement if the Lao protected area agency plays a prominent role in the functioning of both subnational P-WENs and national level task forces. These examples provide useful embryonic models for developing effective multi-level arrangements within and between ASEAN member states and beyond.

Keywords: Forest Crime, Illegal Wildlife Trade, Interagency Law Enforcement, Task Forces

INTRODUCTION

The protected area literature on wildlife crime has largely concentrated on enforcement by relevant protected area personnel (Critchlow et al., 2017; Moreto & Charlton, 2021; Moreto et al., 2022; Rizzolo et al., 2021). Little attention has been given to their potential roles in strengthening wildlife crime enforcement across wider landscapes, particularly through cooperation with provincial law enforcement bodies. This paper offers a case study of illegal wildlife trade in the Lao People's Democratic Republic (Lao PDR). We briefly introduce wildlife crime within the country, then summarise the recent history of compliance issues, government responses and shortcomings of current governance arrangements. We examine wildlife crime cases encountered in Nam Et-Phou Louey National Park, northern Lao PDR, and the wider role of park enforcement staff at the provincial level. Potential governance innovations to improve suppression and prosecution of wildlife crime are discussed, with prominence given to roles for protected area personnel. Organisational reform is proposed involving an interrelated network of task forces and working groups at national and sub-national/provincial levels. We conclude with recommendations for addressing wildlife crime in Lao PDR and other Association of Southeast Asian Nations (ASEAN) countries.

Data supporting our analyses were compiled using published and unpublished sources as well as the authors' observations and collective experiences over several decades of working on wildlife crime issues in Lao PDR. Cases encountered in Nam Et-Phou Louey National Protected Area during the period 2017 to 2021 were collated from the SMART database which is maintained by law enforcement staff with technical support provided by the Wildlife Conservation Society. Cases focused on CITES listed species and nationally protected wildlife. Data relating to Lao wildlife crimes encountered by the national law enforcement agencies outside protected areas were provided by the Department of Forest Inspection (DOFI).

Nam Et-Phou Louey rangers on patrol © Khamphui Invixay, WCS Lao PDR

Asian Golden Cat (*Catopuma temminckii*) confiscated in Nam Et-Phou Louey National Park © Jay White, WCS Lao PDR

The results of an ivory seizure from a trader in Luang Prabang © Mike Brocklehurst

Wildlife crime in Lao PDR: CITES compliance issues and governance responses

Wildlife crime in Lao PDR occurs within the country's protected areas as well as other forest/habitat management types, including watersheds, community forests, plantation forests and wetlands. Crimes occurring outside protected areas involve wildlife species that have been removed from their natural habitat within the country or have been imported into the country either as live animals or animal parts. The number of serious wildlife crime cases that result in prosecutions appears to be comparatively small. Constraints to effective prosecutions include social perceptions on the consumption of wildlife (Saysamone et al., 2022; Schweikhard et al., 2019), cronyism (Global Organized Crime Index, 2021), limited human resources and capacities in natural resource management (Environmental Investigation Agency, 2017), lack of incentives for law enforcement personnel and limited transparency in processing cases (WWF & WJC, 2022).

Lao PDR has been in the spotlight as a transit country for illegal wildlife trade, reflecting its strategic position in regional trafficking routes. Over the last decade, the landlocked nation has been the focus of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) compliance concerns by the CITES Standing Committee, pursuant to Article XIII of the Convention that addresses compliance and enforcement. Compliance matters raised by the Committee in relation to Lao PDR's responsibilities include (i) the management of exports of Thailand Rosewood (*Dalbergia cochinchinensis*); (ii) national

Multi-agency training in wildlife crime investigations © Mike Brocklehurst

legislation; (iii) its CITES authorities; (iv) compliance and law enforcement; (v) monitoring of wildlife farms and related trade; and (vi) public awareness and outreach campaigns (CITES, 2018). On 21 November 2023, the CITES Secretariat issued a Notification to the Parties No. 2023/127 regarding Article XIII which called for Lao to suppress transnational wildlife trade for commercial purposes in all CITES-listed species (CITES, 2023).

The CITES Standing Committee requested Lao PDR to overhaul its national laws for implementation of the Convention. In response, Lao PDR prepared a comprehensive Wildlife Legality Compendium to serve as the legal reference on wildlife-related laws and policy documents (Smith & Soukhaseum, 2018). In 2017, Decree No. 118/PO on the revised Penal Code was promulgated (President's Office, 2017). A year later, the government demonstrated strong political commitment to tackle illegal wildlife crime by issuing the Prime Minister's Order on strengthening strictness of the management and inspection of prohibited wild fauna and flora (Prime Minister's Office, 2018). In 2022, the Lao Government passed Decree 299 which enforces CITES protocols for regulating international trade in endangered species of wild flora and fauna, effective from 5 June 2024. Lao also committed to enhanced collaboration between the Police Department for Combating Natural Resource and Environmental Crime (DCNEC) and DOFI, whereby the DCNEC supports wildlife and forest crime cases. Despite these initiatives, it remains unclear whether CITES compliance has been strengthened in practice.

Internationally, Lao PDR has been guided by regional governance approaches to address wildlife crime. In 2005, Southeast Asia was the first region to establish a regional wildlife enforcement network, namely the Association of Southeast Asian Nations - Wildlife Enforcement Network (ASEAN-WEN). Despite this milestone achievement on transnational cooperation, holistic institutional arrangements for effective wildlife and forest crime enforcement within each member of the ASEAN region are generally poor. The problem has been exacerbated by many intergovernmental organisations and international NGOs focusing on transnational wildlife crime at the expense of national and subnational wildlife crime-fighting efforts.

The International Consortium on Combating Wildlife Crime (ICCWC) prepared Guidelines for Wildlife Enforcement Networks (WENs) (ICCWC, 2020). These guidelines, officially endorsed by the CITES Secretariat (CITES, 2020), defined WENs as:

- regional or subregional networks;
- involving multiple national agencies responsible for wildlife law enforcement;
- focusing on supporting and strengthening regional enforcement; and
- providing a platform enabling collaboration and communication between member states, regional, subregional and global enforcement and support bodies and other networks.

The ICCWC guidelines state that the WENs' mandate encompasses both wildlife and forest crime. Much of the focus of the Consortium is on regional and international cooperation. The dominant international discourse on wildlife crime suppression has been directed towards high-profile transnational crime activities conducted by international law enforcement agencies, international NGOs and international finance institutions. There has been little attention given to understanding how international institutional mechanics might better

Lao Customs officers with a seizure of ivory at Wattay airport © Mike Brocklehurst

contribute to effectively functioning WENs within a country such as Lao PDR, and how dedicated task forces and working groups, as well as subnational WENs, may contribute to strengthening the transparent functioning of national-level WENs. In this context, Parr (2011) argued that it was imperative to conduct institutional mapping of human resource needs; organisational structures and reporting systems among relevant agencies; strategic locations for stationing enforcement resources; understanding the role of individuals within protected areas in supporting subnational enforcement networks; and projected training requirements and time frames.

The second Lao Environment and Social Project

Under the World Bank-funded Second Lao Environment and Social Project (LENS 2), government departments and agencies in Lao PDR implemented environmental 'subprojects' during January 2016 – December 2022. Subprojects were undertaken by DOFI, Lao Customs Department (LCD), DCNEC and the Provincial Offices of Forest Inspection (POFI) in Bolikhamxay, Houaphan and Khammouane Provinces. Subprojects were also implemented in selected protected areas, notably Nam Et-Phou Louey National Park and Nakai-Nam Theun National Park. Both protected areas ran substantial law enforcement programmes during the LENS 2 Project period.

In Nam Et-Phou Louey National Park, border security areas were monitored by army border patrols. In the total protection zone (core zone), joint patrols were undertaken by the eight national park enforcement teams. Rapid response teams were established to tackle the most serious wildlife and forest crime events in the national park landscape. During the LENS 2 Project, the Nam Et-Phou Louey National Park Management Office generated a list of 20 wildlife crime cases that occurred within the national park between June 2017 and February 2021. Seventeen cases involved species listed as Category I (fully protected) under the Lao Wildlife and Aquatic Law, while 16 cases involved CITES Appendix I species (the most endangered among listed animals and plants). Four of the cases are summarised in Table 1 of the Supplementary Online Materials. All cases were referred to the POFI for investigation (19 in Houaphan Province and one in Luang Prabang Province). Houaphan POFI investigated three of the cases, and declined to investigate the remaining 16 cases. The single case submitted to Luang Prabang POFI was not investigated.

From 13 to 19 July 2021, the Minister of Agriculture and Forestry mobilised a DOFI investigation team under Ministry of Agriculture and Forestry (MAF) Decision No. 0161/MAF dated 9 July 2021, conducting a follow-up assessment in Nam Et-Phou Louey National Park to understand breakdowns in interagency cooperation. The assessment team evaluated the wildlife crime cases reported by the National Park Office, and the collaboration between the Nam Et-Phou Louey National Park Office, the Hiem District Agriculture and Forestry Office, the Wildlife Conservation Society and related sectoral organisations. The findings demonstrated clear weaknesses in processing wildlife crime cases between the involved parties.

The LENS 2 project demonstrated the effectiveness of national park personnel's efforts to detect wildlife crime, including parks enforcement personnel as members of

provincial WENs to provide technical assistance to train personnel from other law enforcement agencies, especially as they have a vested interest in meaningful prosecutions.

Outside protected areas, the location of wildlife crimes are a key factor in determining which law enforcement agencies are empowered to act, which agencies lead the wildlife crime suppression and which agencies play supporting technical and enforcement roles. Brocklehurst (2022a) conducted an analysis of key wildlife investigation and prosecution cases in Lao PDR, showed that wildlife crimes encountered in transboundary security border areas fell under the jurisdiction of the Lao Army, through the Decree on National Defence Strategic Zone 2011. Examples of crime cases reported by the army are given in Table 2 of the Supplementary Online Materials. The Law on Customs (National Assembly, 2020) mandates the Lao Customs Department (LCD) to play a role in suppressing illegal wildlife crime at international entry points. Several major wildlife seizures were conducted by the LCD at Wattay International Airport in Vientiane, Luang Prabang International Airport and the international border land and bridge crossings. The LCD protocol was to conduct the initial investigation then hand over the cases to the relevant agencies. The cases at the international airports and international borders during June 2017 until June 2021 are summarised in Table 3 of the Supplementary Online Materials. Seizures concerning national significant wildlife crime during the period 2017–2021 are summarised in Table 4 of the Supplementary Online Materials. Wildlife seizures targeting the ivory trade during the period 2017–2021 are summarised in Table 5 of the Supplementary Online Materials.

The analysis highlights persistent systemic weaknesses in law enforcement responses to wildlife crime. Misidentification of species demonstrates gaps in technical capacity, while the prosecution of serious cases at district rather than provincial or national level reflects an under-prioritisation of these offences. Weak evidence collection, inconsistent penalties and unresolved cases all point to deficiencies in investigative and judicial processes. Historically, wildlife crime has been regarded as a low-level offence, typically addressed through education or the imposition of a modest fine. Such approaches tend to focus on lower-level actors such as couriers or traders, rather than pursuing higher-level entities or organised networks that drive the trade. Failure to escalate cases and apply proportionate penalties undermines deterrence, allows key actors to remain untouched, and perpetuates the perception that wildlife crime is not a serious organised crime issue.

Embedding national parks enforcement staff in provincial wildlife enforcement networks

In September 2019, an analysis of the Provincial Wildlife Enforcement Network agreements from Bokeo, Bolikhamxay, Khammouane, Luang Namtha and Savannakhet Provinces revealed that these provincial agreements provided little guidance on how relevant law enforcement agencies might cooperate within their respective provincial landscapes. Consequently, in March 2020 an outline of an Operational Guideline was prepared for the Khammouane Provincial Wildlife Enforcement Network (P-WEN) to develop more detailed operational guidelines. This draft Regulation was modified and adopted. The Regulation comprised: (i) general provisions; (ii) the P-WEN chair and membership; (iii) the P-WEN Co-ordination Committee; (iv) ad-hoc P-WEN teams; (v) the working relations between the Khammouane P-WEN and the national, provincial and district levels; (vi) the operational areas within the province; (vii) P-WEN planning; (viii) joint agency activities and investigations including inspections and patrols; (ix) informant networks; (x) communication; and (xi) co-ordination meetings and reporting.

The Khammouane P-WEN Guideline states that the P-WEN had operational jurisdiction within all areas of the province. These operational areas comprised the following localities:

- protected areas including Nakai-Nam Theun National Park, Hin Nam No National Park, Phou Hin Poun National Protected Area and their buffer zone communities; and Khoun Xe Nongma Provincial Protected Area;
- production forests including Dong Phousoi and Nakathing Production Forest Areas;
- Nam-In Phouhinleckfai Provincial Protection Forest;
- village forests within the component 10 districts;
- international border checkpoints including Thakhek Third Friendship Bridge, Cha Lo international border, and traditional border checkpoints;
- major transport routes such as Route 13 (132 km) and Route 12 (89 km);
- international borders with Thailand along the Mekong River and with Vietnam in Nakai and Boualapha Districts;
- wildlife restaurants in Thakhek and other locations;
- wildlife farms; and
- wildlife traders in Thakhek and other locations.

On 15 September 2020, Khammouane Provincial Agriculture and Forestry Office (PAFO) prepared a

provincial regulation prescribing the activities of the P-WEN Co-ordination Committee (Khammouane Provincial Agriculture and Forestry Office, 2020). In December 2020, Bolikhamxay prepared a similar regulation on interagency law enforcement cooperation (Bolikhamxay Province, 2020). Based on these pilot regulations, the Ministry of Agriculture and Forestry issued Notice No. 2252/MAF to all Provincial Forest Inspection Units to improve and/or establish an Advisory Committee and Coordination Committee for their respective P-WENs. For example, Houaphan POFI consequently prepared enabling Regulation No. 1426/PAFO.HP specifying the activities of their P-WEN Co-ordination Committee (Provincial Office of Forest Inspection, Houaphan Province, 2021). On 15–16 March 2022, a workshop was convened to review the implementation of P-WEN regulations within the three pilot provinces and identify further revisions. The workshop concluded that the responsibilities of each stakeholder should be more clearly defined, with the Deputy Governor acting as P-WEN chair to supervise the interagency cooperation, and that National Park Management Offices should also be members of the P-WEN Committees.

Development of dedicated wildlife and forest crime task forces

Wildlife and forest crime cases can be classified according to (i) the category of wildlife crime; (ii) the location of the wildlife crime; and (iii) the responsible law enforcement agencies. Examples of the types and locations of wildlife crime, as well as the responsible agencies, are given in the Supplementary Online Materials tables. In 2022, the concept of establishing distinct task forces to respond to each of the major wildlife crimes was developed. However, to maintain control over the wildlife crime agenda, DOFI rejected the concept of promoting interagency task forces within the country. Nonetheless, as it is inevitable that task force investigations will intersect, communication and collaboration between task forces is essential. The following proposed national-level task forces and working groups were described in a draft Lao-WEN Cooperation Framework (Brocklehurst, 2022b).

National Wildlife Crime Task Force. This task force should provide an immediate response to high profile wildlife crimes involving the killing or capture of Category I listed species (fully protected under the Lao Wildlife and Aquatic Law). High profile crimes include killing Asian Elephant (*Elephas maximus*), and targeting of species such as bears for the bile trade and Asian Golden Cats (*Catopuma temminckii*) for the bone trade. Three examples of nationally significant wildlife crime in Lao PDR are given in Supplementary Online Materials Table 4. If investigations identify a transnational component, the task force should collaborate with the transnational task force. As wildlife crime cases involving live animals are time-sensitive, the task force should work closely with the Online and Captive Wildlife Working Groups (see below) by providing logistical support.

National Forest Crime Task Force. A National Forest Crime Task Force should be established with support from the Operational Logging and Degradation Monitoring Initiative. This initiative uses cloud-based satellite image analysis, Geographic Information Systems software and smartphone apps to enable rapid detection and response to illegal logging and other forest degradation events, thereby enabling staff to respond within days of their occurrence. The task force would coordinate enforcement personnel who could then confiscate logs as well as arrest and prosecute offenders.

Transnational Wildlife Crime Working Groups. These working groups would operate informally at each of the international airports, and the international border crossings. These site-specific working groups could be guided by a national-level transnational working group.

Ivory Trade Task Force. The ivory trade in Lao PDR is closely linked to Chinese traders and Vietnamese suppliers (examples are given in Supplementary Online Materials Table 5). The trade includes retail and wholesale trade, transnational and organised crime, tourism, logistic and transport companies and the use of e-commerce sites such as WeChat. A specialist task force with Chinese language capability and international cooperation capacity is needed. A high level of political support would be required as many traders are situated in Special Economic Zones and areas of sensitivity such as San Jiang Market. Other non-ivory wildlife products are also traded by the same networks.

Online Wildlife Crime Working Group. The trade of wildlife, wildlife products and forest products on social media, especially Facebook, occurs in all provinces and would require the establishment of a specialist task force to address the issue. The task force would be responsible for monitoring trading groups, identifying offenders, conducting initial investigations and providing support to provincial authorities in conducting operations. Many of the offences involve live wildlife and thus require close collaboration with NGOs and rescue centres.

Captive Wildlife Working Group. Wildlife collections, farms, zoos, and the exotic pet industry are present in most provinces and are often closely interconnected. These entities are known to acquire

Lao WEN officials investigating a rhino horn seizure at Wattay airport © Mike Brocklehurst

protected wildlife from the wild, 'launder' wild-caught animals as captive-bred, and use fraudulent CITES permits. The illegal trade in Long-tailed Macaques (*Macaca fascicularis*) for farming and medical research is currently a significant concern. The captive wildlife trade frequently intersects with transnational crime, online trade, and hunting in protected areas. This specialised task force would work closely with DOFI which is responsible for licensing and monitoring these entities, and with wildlife rescue centres to ensure humane and timely care for seized animals. Criminal activities linked to transnational crime should be referred to the transnational task force for further investigation.

Conservation Awareness Working Group. This working group should identify and prioritise different target audiences with the aims of preventing and mitigating wildlife and forest crime. It should coordinate closely with conservation NGOs working in this field as well as participating in wildlife campaigns with targeted messaging. Such messaging should be informed by how insights from behavioural change science might be deployed to influence social norms and consumer demand for illegal wildlife products.

Figure 1 shows relationships between the proposed national and provincial-level task forces and working groups for improving the effectiveness of the Lao Wildlife Enforcement Network.

The breakdown of the wildlife crime cases encountered by the different law enforcement agencies during June 2017 – June 2021 lends weight to the merits of establishing dedicated interagency task forces, working groups and P-WENs as per Figure 1 to tackle specific crime issues. The institutional capacities required are determined by the locations of the crimes, the types of crimes as well as the participating law enforcement agencies most appropriately mandated to address specific crimes. Task forces denote a strong dependence on field action. Working groups denote a more analytic enforcement approach. Note the number of wildlife and forest crime task forces and working groups is not fixed, and can be increased or decreased according to the wildlife and forest crime trends over time.

Several Asian countries have established similar interagency national task forces (committees) at the national level mandated to implement and enforce wildlife laws and other associated regulations relevant to combating wildlife trafficking. Nepal, for example, has had some success in combating poaching and illegal wildlife trade through multi-level cooperation involving wildlife crime-control committees, government conservation agencies, customs, police, the army, and investigative authorities (Martin et al., 2013). In Thailand, the Thai-Wildlife Enforcement Network (Thai-WEN) was established under the Wild Animal Conservation and Protection Act 2019, through MONRE Order No. 387/2554. Under this umbrella body, Thailand has set up several specialised task forces (ASEAN Secretariat, 2022). In 2024, the authors were made aware of the functioning of specialised task forces within the country. These comprised:

- a national wildlife crime task force called 'Tiger King' (Phaya Sua) to investigate and suppress wildlife offences inside protected areas nationwide under the supervision of the Department of National Parks, Wildlife and Plant Conservation (DNP) and regularly supported by the Environmental Police;
- a national timber task force called 'Forest Tigers' (Payak Prai) to investigate illegal trafficking under the supervision of the DNP and regularly supported by the Environmental Police;
- a national task force on marine and mangroves called 'White Shark' under the Department of Fisheries;
- a national task force on illegal fishing boats, port entries and import/export procedures for aquatic wildlife under the Department of Fisheries; and
- an online trade task force called 'Wild Hawk' to investigate offences relating to both animals and plants.

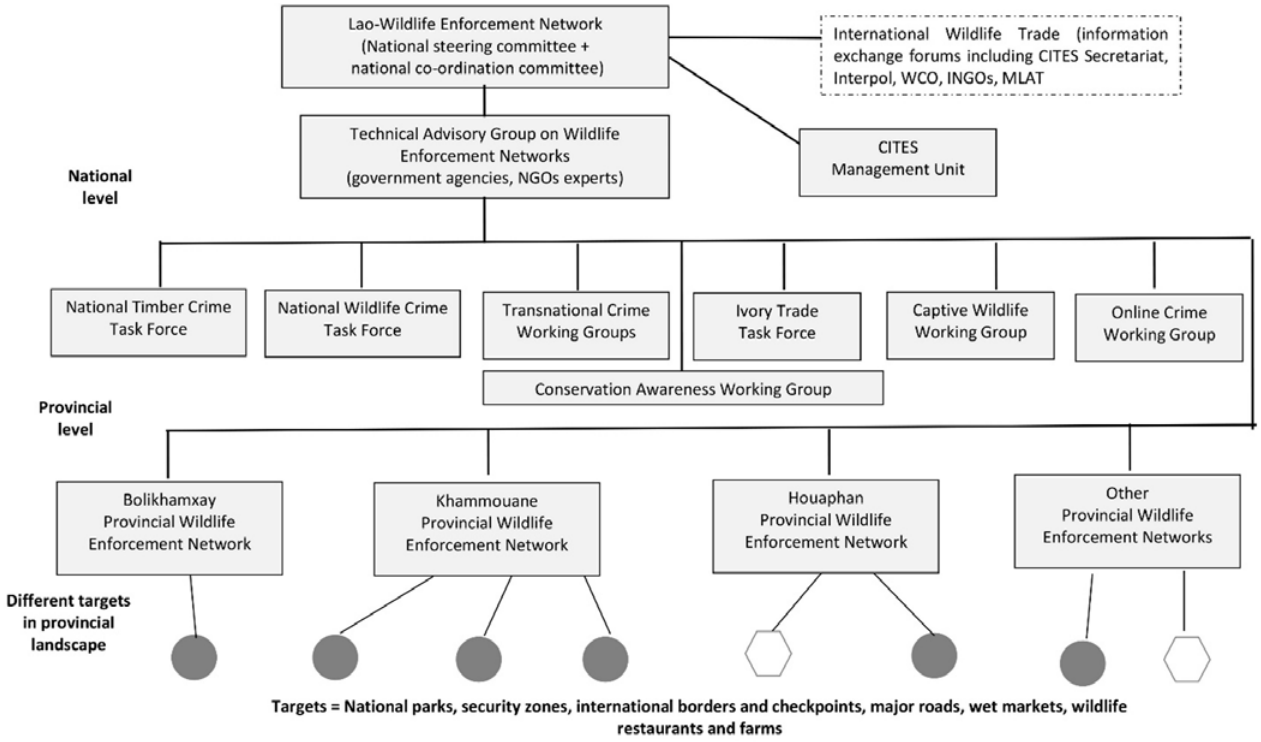

Figure 1. Proposed multi-level arrangements to strengthen functioning of the Lao Wildlife Enforcement Network

These task forces are supported by a national wildlife intelligence data centre.

The establishment of dedicated task forces and working groups is not confined to the illegal wildlife crime and the Wildlife Enforcement Network agenda. Dedicated working groups have been established within the national parks in Lao PDR to tackle major emerging threats to natural resources. In Nam Et-Phou Louey National Park, the Governor of Houaphanh Province established a dedicated task force to resolve land speculation linked to cattle and livestock raising along the Phati Road inside the Total Protection Zone of Nam Et-Phou Louey National Park (Governor of Houaphanh Province, 2020). In Nakai-Nam Theun National Park a dedicated committee was established to monitor gold-mining activities in four villages in Khamkeut District, Bolikhamxay Province.

The establishment and functioning of such task forces is a promising approach for the Lao-WEN to delegate enforcement responses to the respective law enforcement agencies. Senior representatives from these different task forces should then be members of the national Lao-WEN forum. These task force representatives should provide succinct summary reports of their activities and major crime cases to the Lao-WEN during regular quarterly meetings. These task force reports would provide a basis for convening regular meetings of the Lao-WEN itself.

Each of the interagency task forces and the P-WENs should prepare regular reports of their interagency law enforcements efforts. They should introduce compartmentalised, holistic, transparent reporting, and deliver effective prosecutions. These reports – which constitute important verification and tracking documents – can assist in monitoring trends in wildlife crimes targeting endangered fauna and flora from the nation's forest habitats. These reports can also assist in monitoring trends in wildlife crimes targeting transnational endangered fauna and flora.

The adoption of formal institutional arrangements will require some sizable human resource commitments by the Environmental Police Department and the DOFI. In November 2020, the results of the ICCWC Analytic Toolkit assessment were endorsed by the Minister of Agriculture and Forestry through Decision 0752/MAF (MAF, 2020). The assessment recommended an evaluation of the current structure of Lao-WEN and consideration of establishing specialised investigative teams. These teams would focus on domestic offences, led by DOFI, and on transnational crimes, led by the General Police Department, with the aim of enhancing effectiveness. For many of the national task forces, it makes sense for the Environmental Police Department to play a leading role, with its strong legal mandate and respected legal position in Lao society.

Benefits of involving protected area enforcement personnel in provincial wildlife enforcement networks

Wildlife Conservation Society data show that from 2015 to 2022 the crime detection effort in Nam-Et Phou Loey National Park included over 70,000 km of foot patrols. The park generated a total of 20 serious wildlife crime cases during the period June 2017 and February 2021. Seventeen of these wildlife crime cases involved species which were listed as Category I under Lao Law and 16 cases involved CITES Appendix I species. These serious wildlife crime cases constituted over 50 per cent of the wildlife crime cases found in the respective provinces. In 2022, Nakai-Nam Theun National Park had 42 operating patrol teams comprising four combined army and national park staff patrolling the international border areas, 20 village patrol teams, three reservoir teams and eight mobile patrol teams involving police (Parr & Sylavong, 2022).

These examples indicate that protected area personnel have the expertise and motivation to effectively identify instances of wildlife crime. Law enforcement personnel from protected areas have greater opportunity for dedicated careers in wildlife protection than their counterparts in other agencies. Some have received more stable funding over the years due to the commitment and fundraising of supporting NGOs. Generally, protected area agencies can command larger enforcement budgets than their forest agency counterparts. Protected area personnel have superior knowledge about target taxonomic groups, their levels of abundance or rareness and the laws pertaining to their protection. For example, in Nam Et-Phou Louey National Park annual training courses on wildlife identification and legal matters have been provided by the Wildlife Conservation Society. They have capacity building skills and ongoing working relationships with other law enforcement agencies, notably the police and army. Law enforcement personnel at Nam Et-Phou Louey National Park have expressed their keen interest in being appointed members of the P-WEN during a gap analysis assessment conducted in December 2022 by the Protected Area Management Division, Department of Forestry (Parr et al., 2022). These attributes make them a potentially significant contributor among the concerned law enforcement agencies operating within provincial landscapes.

The expertise and motivation of national park law enforcement staff provide a strong basis for senior law enforcement personnel from protected areas to become active members of Provincial WENs. Such involvement is likely to strengthen multi-agency commitment to investigative and judicial processes and elevate the priority given to prosecuting wildlife crime at the provincial and national levels.

With the supervision of wildlife and forest crime suppression clarified, it becomes easier for NGOs and funding bodies to deliver targeted tailor-made training modules to the working groups and task forces. This permits a strengthening of working relationships among representatives from relevant agencies, thereby enhancing cooperative law enforcement. It also makes sense that national park enforcement personnel become active trainers for the P-WENs.

CONCLUSION AND RECOMMENDATIONS

In the previous section, we outlined the professional capacity and expertise of the protected area personnel and their potential to become significant partners in the P-WEN forums. This finding was based upon their comparatively higher levels of financial support; their history of dedicated training in wildlife species identification and law enforcement involving technical support; their intensive law enforcement patrolling regimes; their in-the-field training of law enforcement counterparts (particularly the police and army); the volume of serious wildlife crimes encountered annually; and their conservation commitment to see their wildlife cases being effectively processed and prosecuted. However, their mandate is often taken to be restricted to protection within the protected areas themselves. This perception means that insufficient attention has been given to the roles protected area personnel can play in the identification and prosecution of wildlife crime in Lao provinces, as well as in transferring skills and motivation to the other law enforcement agencies operating at a landscape level. We suggest that the following four measures would help redress this oversight.

Institutional arrangements. The Lao-WEN should formally establish the highest priority, national task forces through regulations. The Lao-WEN should monitor the effective functioning of these crucial law enforcement bodies on a regular basis. The Lao-WEN, bilateral donors as well as conservation non-government organisations working in protected areas should ensure the involvement of enforcement staff from protected areas in the effective functioning of the Provincial Wildlife Enforcement Networks. The Lao-WEN Coordination Committee should be revised to include senior representatives from the national wildlife and forest crime task forces as well as the departmental representatives supervising the 17 Provincial Wildlife Enforcement Networks.

Training. Tailor-made, targeted training should be provided to the respective national task forces as well as the Provincial Wildlife Enforcement Networks. The training should include modules on facilitation skills for senior members of the P-WEN committees; conservation legislation; conducting joint investigations; and in-country study tours to protected areas to promote conservation ethics.

Reporting. The Lao-WEN should approve standardised, succinct reporting formats (as verification documents) for the wildlife and forest crime task forces, with emphasis on the CITES Appendix I listed species and the Category I listed species under the Lao Wildlife and Aquatic Law.

Information sharing. The Lao-WEN should establish a centralised shared database to improve information sharing across all task forces and P-WENs.

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RÉSUMÉ

Les rôles du personnel chargé de l'application de la loi dans les zones protégées se limitent en grande partie aux zones protégées et à leurs zones tampons, l'accent étant mis sur les responsabilités fondamentales en matière de protection de la faune sauvage. Peu d'attention est accordée au rôle potentiel dans le renforcement de la lutte contre la criminalité liée aux espèces sauvages au niveau provincial, en particulier par le biais de la coopération avec les organismes provinciaux chargés de l'application de la loi. Le présent document examine les cas de criminalité liée aux espèces sauvages rencontrés dans le parc national de Nam Et-Phou Louey, dans le nord de la République démocratique populaire lao, puis examine le rôle des organismes chargés de l'application de la loi dans la répression de la criminalité liée aux espèces sauvages au niveau provincial. Trois réseaux pilotes provinciaux chargés de l'application de la loi relative aux espèces sauvages (P-WEN) montrent la voie à suivre à cet égard. La création et le fonctionnement de ces P-WEN sont examinés, l'accent étant mis en particulier sur leur renforcement grâce à la participation des agents chargés de l'application de la loi dans les zones protégées et du parquet. Des groupes de travail spécialisés au niveau national sont également identifiés comme un élément important de la lutte contre la criminalité liée aux espèces sauvages et aux forêts. Les données provenant de Thaïlande et du Népal confirment l'efficacité potentielle de la lutte contre la criminalité liée aux espèces sauvages si l'agence laotienne chargée des zones protégées joue un rôle de premier plan dans le fonctionnement des P-WEN au niveau infranational et des groupes de travail au niveau national. Ces exemples constituent des modèles utiles pour l'élaboration de dispositifs efficaces à plusieurs niveaux au sein et entre les États membres de l'ASEAN et au-delà.

RESUMEN

Las funciones del personal encargado de hacer cumplir la ley en las áreas protegidas se limitan en gran medida a las áreas protegidas y sus zonas de amortiguación, con un fuerte énfasis en las responsabilidades fundamentales de protección de la vida silvestre. Se presta poca atención a su posible papel en el fortalecimiento de la lucha contra los delitos contra la vida silvestre en los territorios provinciales, en particular mediante la cooperación con los organismos provinciales encargados de hacer cumplir la ley. En este documento se examinan los casos de delitos contra la fauna silvestre registrados en el Parque Nacional Nam Et-Phou Louey, en el norte de la República Democrática Popular Lao, y se analiza la función de los organismos encargados de hacer cumplir la ley en la represión de los delitos contra la fauna silvestre a nivel provincial. Tres redes piloto provinciales de aplicación de la ley en materia de fauna silvestre (P-WEN) están mostrando el camino a seguir en este sentido. Se examina el establecimiento y el funcionamiento de estas P-WEN, haciendo especial hincapié en su fortalecimiento mediante la participación de los funcionarios encargados de hacer cumplir la ley en las áreas protegidas y la fiscalía. Los grupos de trabajo especializados a nivel nacional también se identifican como un componente importante para hacer frente a los delitos contra la fauna y los bosques. Las pruebas procedentes de Tailandia y Nepal respaldan la eficacia potencial de la aplicación de la ley contra los delitos contra la fauna silvestre si el organismo de áreas protegidas de Laos desempeña un papel destacado en el funcionamiento tanto de las P-WEN subnacionales como de los grupos de trabajo a nivel nacional. Estos ejemplos proporcionan modelos útiles para desarrollar acuerdos eficaces a varios niveles dentro y entre los Estados miembros de la ASEAN y más allá.

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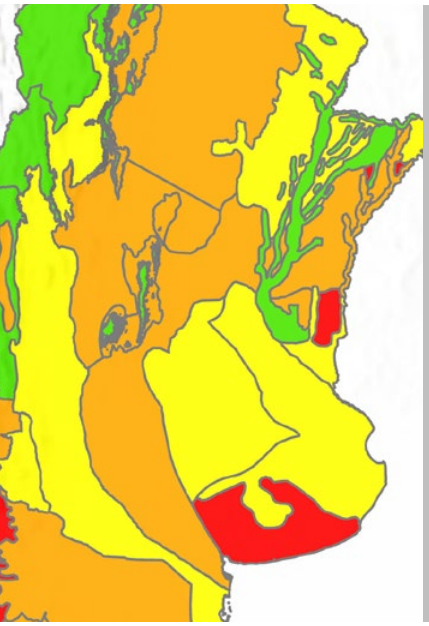

GLOBAL BIODIVERSITY FRAMEWORK'S TARGET 3: BIOGEOGRAPHIC CONSERVATION GAPS IN ARGENTINA'S PROTECTED AREAS TERRESTRIAL SYSTEM

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ABSTRACT

Biodiversity loss demands conservation strategies that integrate evolutionary and ecological processes. Target 3 of the Kunming–Montreal Global Biodiversity Framework calls for conserving 30 per cent of terrestrial areas by 2030, emphasising ecological representativeness and areas of high conservation value. Using a biogeographical framework, we assessed Argentina's terrestrial protected area system through spatial analyses of coverage, representativeness and inclusion of Key Biodiversity Areas (KBAs). Argentina currently protects 11.06 per cent of its territory, well below the global target, with highly uneven representation across biogeographical provinces and districts, including critical gaps (<5 per cent coverage). Only 42 per cent of KBAs are protected, and their full inclusion would raise coverage to just 17.86 per cent. Achieving Target 3 will require not only expanding protected areas but also identifying other effective area-based conservation measures (OECMs), private conservation initiatives, and ecological connectivity across human-modified landscapes.

Keywords: biodiversity, KBA, OECM, private protected areas, SIFAP

INTRODUCTION

Land-use change, overexploitation, pollution, invasive species and climate change are the main direct drivers of environmental degradation and biodiversity loss (IPBES, 2021; Montoya-Sánchez et al., 2023). Their combined effects may be pushing ecosystems towards critical tipping points, contributing to a biodiversity crisis characterised by extinction rates comparable to a sixth mass extinction (Richardson et al., 2023; Rockström et al., 2009; Walter et al., 2019). This accelerated loss is particularly concerning given the fundamental role of biodiversity in sustaining ecosystem services (ES) and nature's contributions to people (NCP), which are essential for life on Earth (Díaz et al., 2018; Folke, 2004). In response, Rockström et al. (2009, 2023) propose safe and just Earth System Boundaries, noting that seven of eight boundaries have already been transgressed globally and suggesting that maintaining 50–60 per cent of the world's terrestrial surface as largely intact natural areas is necessary to sustain ES or NCP. Consistent with this perspective, the Kunming–Montreal Global Biodiversity Framework (KMGBF), adopted in 2022 (CBD, 2022), establishes a set of goals and targets to halt and reverse biodiversity loss. In particular, Target 3 calls for the conservation and effective management of at least 30 per cent of terrestrial, inland water and marine areas by 2030 through ecologically representative, well-connected systems of protected and conserved areas, including other effective area based conservation measures (OECM), prioritising areas of particular importance for biodiversity and ensuring equitable governance arrangements that respect the rights and livelihoods of local communities (CBD, 2022; Watson et al., 2023), a commitment that applies to Argentina as a Party to the Convention, approved through National Law No. 24.375/94.

The KMGBF aims to guide and promote, at all levels, the review and updating of policies, objectives and targets, as well as to facilitate their monitoring in a more transparent and accountable manner (Watson, 2023). In this context, Target 3 goes beyond a purely spatial goal, integrating ecological, management, governance and

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social equity dimensions, which implies that its implementation requires analytical approaches that transcend the mere quantification of protected area coverage (Geldmann, 2026). Nevertheless, the identification of specific territories remains essential, as it provides the basis for more detailed, context-specific analyses required to design effective conservation measures that are both ecologically sound and socially appropriate, ensuring tangible benefits for society and the long-term viability of conservation actions. In this regard, Argentina represents a case of particular interest due to its high biogeographical diversity and the complexity of its environmental governance system. Advancing towards spatially explicit assessments of its federal terrestrial conservation system is therefore important for evaluating progress towards Target 3 of the KMGBF. Analysing the extent of protected areas, their ecological representativeness and the inclusion of areas of particular importance for biodiversity enables the identification of conservation gaps and priority areas, providing a basis for the development of more informed conservation strategies in the national context.

In Argentina, several regionalisation schemes have historically been developed to characterise natural environments (Burkart et al., 1999; Cabrera, 1976; Morello et al., 2012; Oyarzábal et al., 2018), generally based on similarities in geomorphology, hydrology, soils, climate and broad biodiversity patterns. Consequently, conservation strategies have largely relied on species-based hotspots and ecoregional approaches (Brown et al., 2006; Nanni et al., 2020). In this study, we adopt the evolutionary biogeographical regionalisation of Argentina proposed by Arana et al. (2021), which emphasises the relationship between organisms and their environment by grouping biotas according to their common origin and reflecting their phylogenetic relationships.

This scheme delineates Argentina into 16 biogeographic provinces (BP), each comprising a set of biogeographic districts (BD), with a total of 41 across the country; both scales are defined by their endemisms representing the evolutionary history of geobiotas. Importantly, it enables analyses at a finer spatial resolution within bioregions, capturing intra-regional variation that is often overlooked in broader ecoregional frameworks (e.g. Burkart et al., 1999). It also differs from other high-resolution regionalisations, such as Oyarzábal et al. (2018), which, although providing fine spatial detail, are primarily physiognomic and do not explicitly incorporate an evolutionary component. This evolution-based biogeographic perspective contributes to addressing the representativeness component of Target 3, enabling the recognition of natural biotic units that support realistic spatial delineation and the integration of ecological and evolutionary processes relevant to ecosystem functionality and stability, thereby contributing to the maintenance of ecosystem services (Arana et al., 2021, 2017; Martínez-Aquino et al., 2007). In relation to the identification of areas of particular importance for biodiversity, traditional approaches have primarily relied on species richness, combined with measures of irreplaceability and threat, leading to the widespread use of biodiversity hotspots to guide decision-making (Lim et al., 2023; Marchese, 2015; Walter et al., 2019). More recently, this approach has evolved towards more comprehensive frameworks through the adoption of standardised and scientifically robust criteria for identifying Key Biodiversity Areas (KBAs), defined as sites critical for the global persistence of biodiversity (IUCN, 2016, UNEP-WCMC & IUCN 2024). The Global KBA Standard incorporates dimensions beyond species richness, including threat status, geographically restricted biodiversity, ecological integrity, biological processes and irreplaceability, thereby recognising biodiversity as a multidimensional concept that requires the integration of ecological and evolutionary attributes in conservation planning. As such, KBAs provide an operational framework for identifying areas of particular importance for biodiversity UNEP-WCMC & IUCN 2024; Plumptre et al., 2024).

On this basis, this study proposes a multi-scale spatial analysis as a central tool to guide territorial decision-making, providing a spatially explicit basis for identifying priority areas. Three spatial components are analysed: (i) the percentage of national territory under protected areas including international designations and its contribution to the target; (ii) ecological representativeness, assessed through a gap analysis based on a biogeographical approach; and (iii) the extent of areas of particular importance for biodiversity and their inclusion within protected areas.

METHODS

An exhaustive update of the cartographic information on Argentina's federal system of terrestrial protected area (PA) was carried out through the compilation, verification and screening of data obtained from multiple official sources (Supplementary Online Material: Table 1)), complemented by direct consultations with provincial administrations and conservation organisations. This process was essential due to the inconsistencies detected among sources, including missing polygons, unreported overlaps and discrepancies in the boundaries of the same PA. Based on this review, a unified and updated spatial database was developed, classifying PA according to their jurisdiction as follows: (i) national areas, including military reserves; (ii) provincial areas officially

recognised and included in Argentina's Federal System of Protected Areas (SIFAP by its acronym in Spanish); and (iii) private protected areas (PPA) were compiled following Bauni et al. (2023), including not only the 62 sites officially recognised by SIFAP but also all areas with available cartographic references, regardless of formal recognition and (iv) terrestrial portions of internationally designated areas (IDA, Ramsar Sites, World Heritage Sites and Biosphere Reserves) were included; although considered protected areas by SIFAP, they were treated here as a distinct conservation instrument

Although Target 3 of the KMGBF recognises Other Effective Area-based Conservation Measures (OECMs) as contributors to conserved areas (CDB, 2022), they were not included in this analysis due to the absence of formally recognised OECMs and a consolidated national inventory with precise spatial delineation in Argentina (UNEP-WCMC 2026).

Spatial analyses were conducted using ArcGIS Pro version 3.3.2 (Esri, 2024), and all spatial layers were projected using the South America Albers Equal Area Conic Projection. The extent of PA coverage was calculated for each biogeographic province (BP) and biogeographic district (BD) following Arana et al. (2021) (Supplementary Online Material: Figure 1, Table 2). Overlaps among conservation designations (e.g. National Park coinciding spatially with a Ramsar Site) were quantified and subtracted from final calculations to avoid double counting.

For PPA for which only point-location data were available, they were assigned to the natural region declared by the landowner, or, if not specified, to the region in which the point was located. To analyse areas of particular importance for biodiversity, the percentage of KBAs (BirdLife International, n.d.) covered by protected and conserved areas was estimated as a component indicator for Target 3 (UNEP-WCMC & IUCN (2024)) (Supplementary Online Material: Table 3). Also, the percentage of each BD extent covered by KBA was calculated. To assess the adequacy of coverage, the UNEP-WCMC & IUCN (2024) scale was adapted to classify protection levels as insufficient (<5 per cent), moderate (5–17 per cent), acceptable (17–29.9 per cent) and optimal (≥30 per cent). Finally, based on the results, a set of priority areas for conservation was identified integrating information on coverage, biogeographical representativeness and the presence of KBA within a GIS-based framework, allowing these priorities to be spatially explicit and useful for delineating conservation strategies.

RESULTS

Current extent of terrestrial protected area coverage in Argentina

According to the data compiled up to November 2025, Argentina currently has a total of 634 PA and 45 IDA. Together, these conservation instruments cover 38,385,422 ha, equivalent to 13.7 per cent of the national terrestrial territory. However, 19.45 per cent of this area

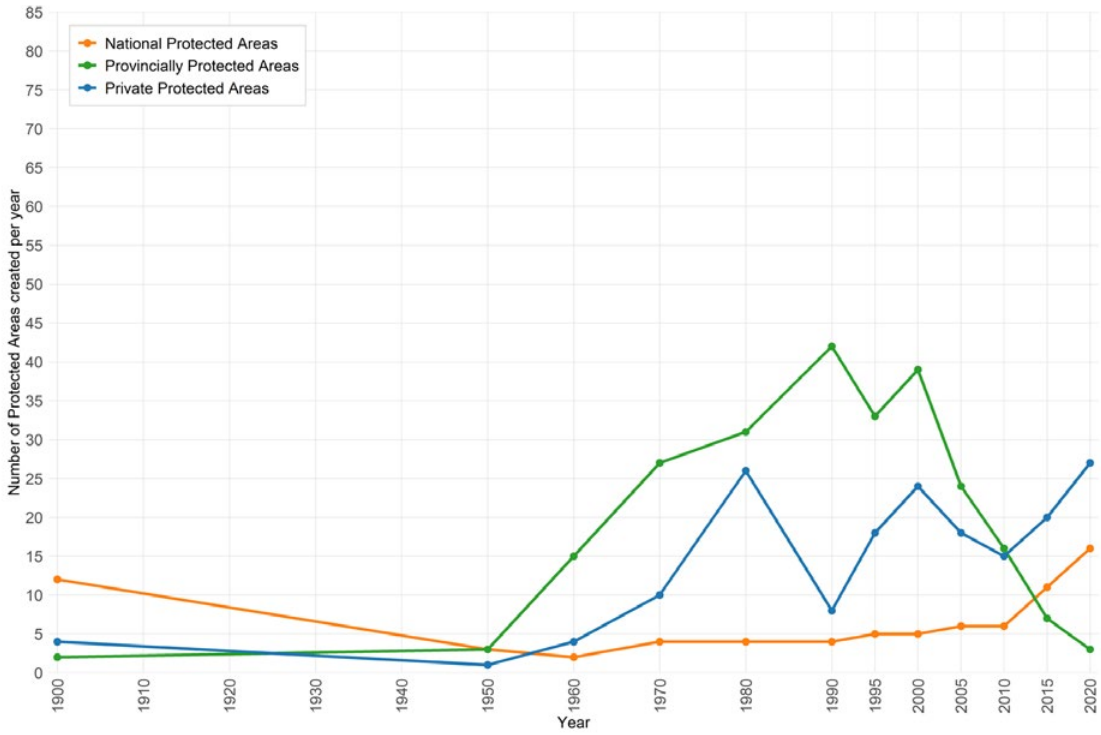

Figure 1. Number of protected areas of different jurisdiction and domain created per year

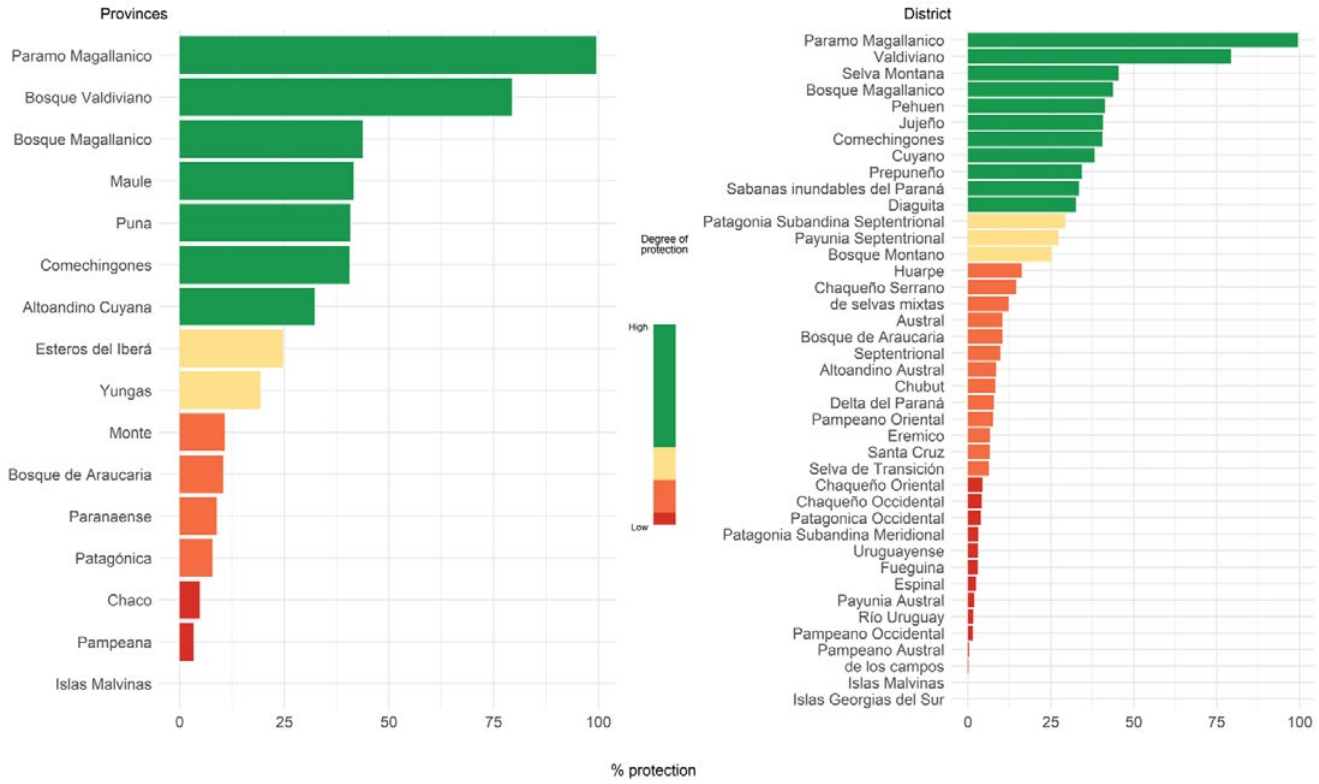

Figure 2. Percentage of protected land area of the Provinces and Biogeographic Districts of Argentina

overlaps with other area-based conservation instruments; once these overlaps were removed, the net protected and conserved area was reduced to 11.06 per cent. From a jurisdictional perspective, provincial PA account for more than 75 per cent of the protected land area, followed by national PA (Supplementary Online Material: Table 1, Figure 1, Table 3). Temporal analysis reveals a marked increase in the creation of PA during the 1990s, both at national and provincial levels. PPAs represent approximately four per cent of the total, showing steady growth since the 1980s, with peaks in the early 2000s and the 2020s (Figure 1).

Biogeographical representativeness of the SIFAP

Biogeographical representativeness within SIFAP shows marked spatial variation. In several cases, PA coverage is adequate at the scale of BP, while significant gaps persist at the BD level. For example, within the Esteros del Iberá BP, a wetland-dominated region, overall PA coverage reaches approximately 25 per cent; however, specific wetland districts such as Delta del Paraná and Río Uruguay remain below 10 per cent. The opposite pattern is observed in the Monte Province, a desert and arid shrubland region, where overall PA coverage is slightly above 10 per cent, while the Prepuna district exceeds 30 per cent. Within the Patagónica BP, a cold temperate steppe region, total PA coverage reaches 7.86 per cent, while districts such as Subandina Septentrional and Payunia Septentrional (volcanic desert) approach 30 per cent. The Yungas BP, a subtropical montane forest region, shows a heterogeneous pattern at the BD level, with Selva Montana exceeding 40 per cent coverage, Bosque Montano exceeding 25 per cent, and Selva de Transición remaining below 10 per cent (Figure 2; Supplementary Online Material: Table 3). At the other end of the spectrum, BPs with less than 5 per cent PA coverage include the Chaco, the Pampeana, and the Islas Malvinas, representing subtropical dry woodlands, temperate grasslands, and subantarctic grasslands, respectively. At the district scale, critically low values occur in De los Campos (subtropical grasslands), Patagonia Occidental and Patagonia Subandina Meridional (steppe–forest ecotones), Fueguino (subantarctic forest–tundra mosaic), and Payunia Austral.

Regarding conservation instruments, most districts exhibit high levels of PA coverage; however, Valdiviano, Selva Montana and Patagonia Subandina Septentrional, representing temperate rainforest, subtropical montane rainforest, and sub-Andean steppe ecosystems, respectively, have more than 25 per cent of their land area protected exclusively through IDA. These are followed by Bosque Montano (subtropical montane forest), with over 15 per cent coverage, and the Jujeño (high-altitude arid shrubland) and Sabanas Inundables del Paraná (seasonally flooded savanna) districts, both exceeding 10 per cent. With respect to PPA, the Huarpe district (arid shrubland) stands out, with more than 5 per cent of its area under this conservation instruments (Figure 2; Supplementary Online Material: Table 3).

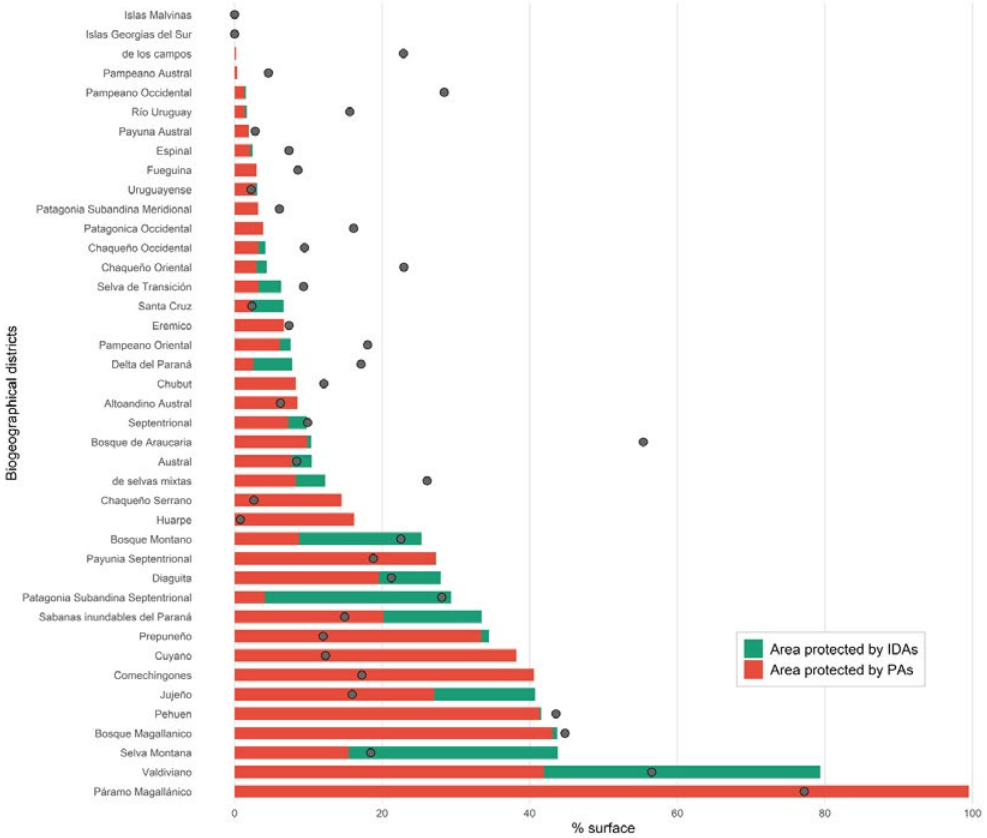

Figure 3: Percentage of Biogeographic District land area covered by KBAs (points) and percentage of KBA land area protected by PAs and by IDAs (bars)

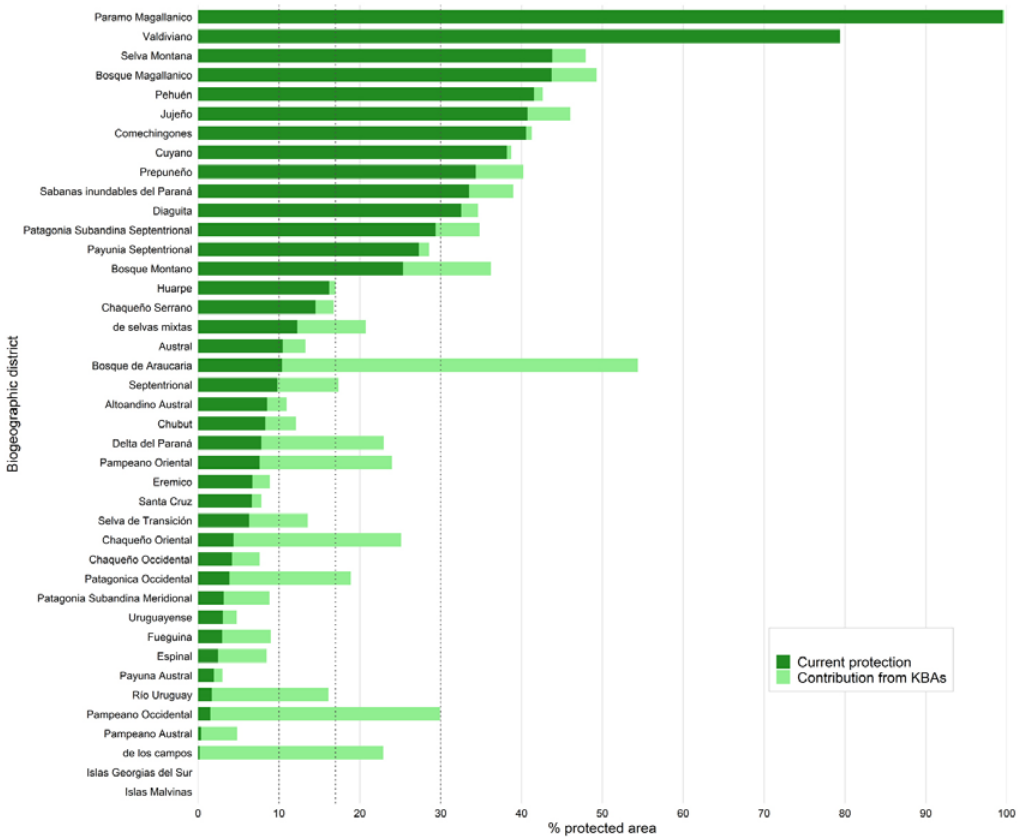

Figure 4: Contribution to the protection percentage, at the biogeographic district level, incorporating the KBAs identified under some conservation category.

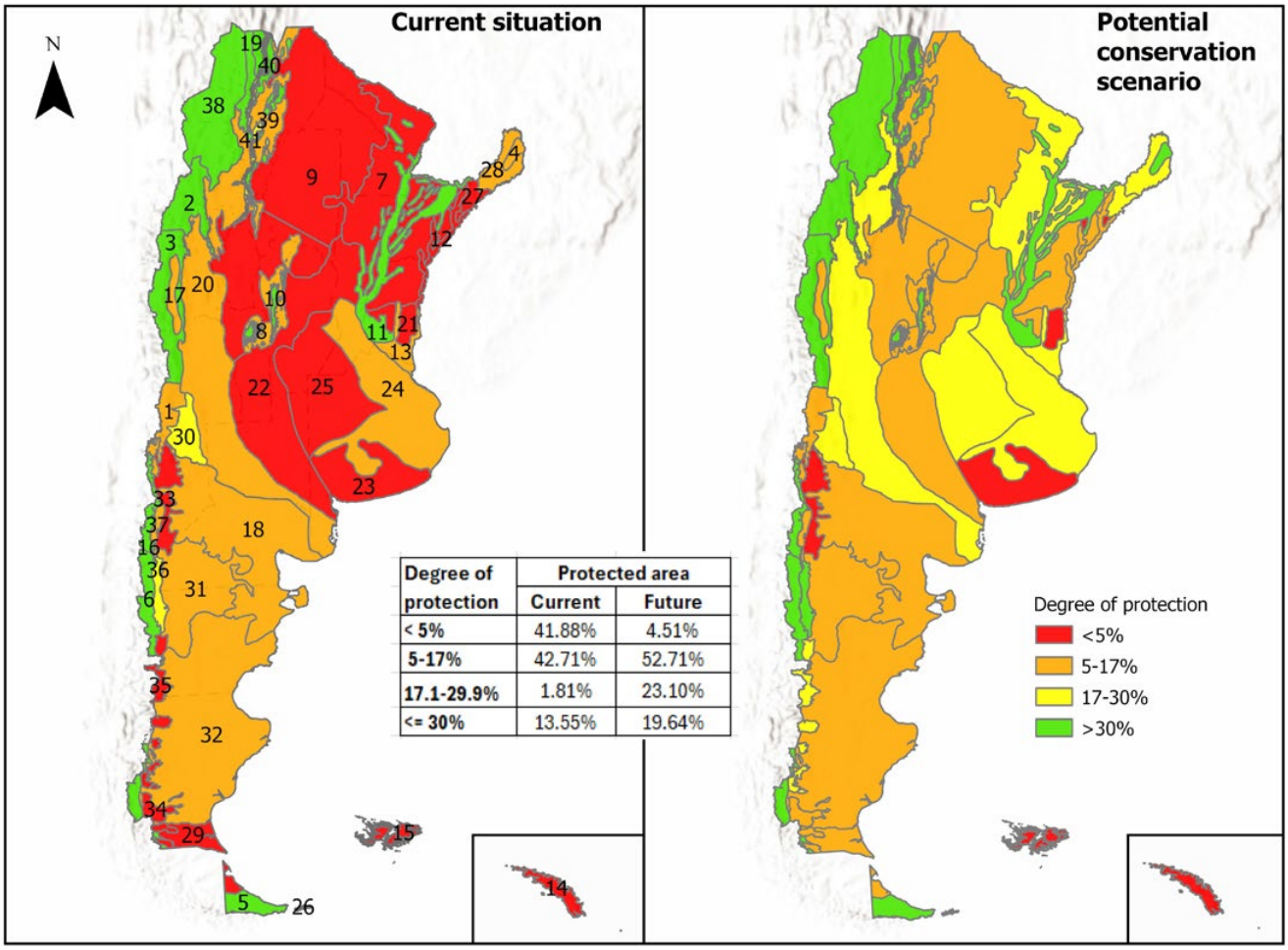

Figure 5: Current and potential conservation scenarios in Argentina considering the incorporation of KBAs under some conservation instrument (Supplementary Online Material: Figure 1)).

Current level of protection of Key Biodiversity Areas in Argentina

Argentina has 285 KBA recognised by IUCN, collectively covering 31,526,222 ha (BirdLife International, n.d.; UNEP-WCMC & IUCN, 2024). Of these, approximately 42 per cent are currently under some form of conservation instrument, although the percentage of protection is highly heterogeneous across biogeographic regions (Figure 3). Districts such as Páramos (subantarctic peat bog and tundra) and Bosques Magallánicos, Bosques Valdivianos, Pehuén, Puna and Comechingones (high altitude grasslands) show KBA protection levels ranging from 66 to nearly 100 per cent. In contrast, the Islas Malvinas province, representing subantarctic grasslands, has no protected areas within the national system, despite containing two KBAs that encompass its entire territory. Other districts with very low levels of KBA protection include Huarpe, where two KBAs together cover only 0.78 per cent of the district, and none of them are currently protected. In contrast, in Pampeano Occidental (dry grassland) and De los Campos, more than 20 per cent of each district corresponds to KBAs, but only 0.12 and 0.72 per cent, respectively, are protected. At the biogeographic province level, KBA protection generally ranges between 20 and 50 per cent, with the exception of the Pampeana province (7.04 per cent). Finally, Río Uruguay, Patagonia Subandina Meridional, Patagonia Occidental, Chaco Oriental (humid woodland), Pampeano Austral and Oriental (humid grassland) districts have less than 10 per cent of their KBAs protected (Supplementary Online Material: Table 4)

SIFAP coverage increase if unprotected KBAs are incorporated

The potential scenario, which assumes the incorporation of all currently unprotected KBAs into the conservation system, shows variable outcomes at the BD level (Figure 4; Supplementary Online Material: Table 5). Districts such as Espinal (temperate thorn woodland), Uruguayense (humid subtropical savanna), Chaco Occidental (dry woodland), Erémico (desert shrubland) and Santa Cruz (steppe), as well as Patagonia Subandina Meridional, Payunia Austral and Fueguina, would not

reach 10 per cent coverage even if all of their KBAs were protected. In contrast, the Pampeano Occidental district would increase its PA coverage from less than 2 to 30 per cent, while Bosques de Araucaria would rise from 10 to over 50 per cent. Similarly, De los Campos would increase from 0.19 to 22.9 per cent. A particular case is the Huarpe district, where incorporating KBAs would not significantly increase the overall level of protection. Finally, at the national scale, 41.88 per cent of the territory currently has less than 5 per cent protection; under a scenario in which KBAs are incorporated, this proportion decreases markedly to 4.51 per cent. This indicates an increase in the number of districts and biogeographic provinces with higher levels of protection, reflecting a redistribution of the national territory towards higher protection classes (Figure 5).

DISCUSSION

This study developed a consistent territorial and biogeographical baseline to assess key spatial components of Target 3. The evolutionary biogeographical approach serves as an encompassing analytical framework for conservation planning, enabling the identification of areas characterised by high biological complexity and phylogenetic diversity, and thereby ensuring the protection of territorial units that genuinely represent the ecological and evolutionary processes underpinning the functioning of biotas (Arana et al., 2021). While expanding the system necessarily requires increasing the total protected area, improving representativeness demands a strategic approach that prioritises areas of high irreplaceability. Within this framework, the identification of KBAs introduces an explicit focus on sites of high conservation value. Accordingly, and in line with the recommendations of Dudley and Parrish (2006) and UNEP-WCMC & IUCN, 2024, the analysis identifies those KBAs that are currently unprotected within the SIFAP, directly contributing to the recognition of critical gaps and spatially explicit strategic opportunities to guide biodiversity safeguarding in Argentina over the next five years.

Regarding the extension of the protected area network in Argentina, our results indicate that 11.06 per cent of Argentina's terrestrial territory is currently protected, a value comparable to that reported by SIFAP (12 per cent) and to the estimate of Baldi et al. (2025) (10.41 per cent), but approximately two percentage points higher than the value reported by the World Database on Protected Areas (UNEP-WCMC, 2026). Discrepancies among estimates reflect over- or underestimation of PA extent due to overlapping conservation designations, differences in cartographic data sources, and inconsistencies between published polygons and legally designated boundaries, including mismatches between national and provincial PA. In addition, municipal and private PA remain poorly documented and are rarely available through open-access platforms (Bauni et al., 2023). As highlighted by Baldi et al. (2025) and Visconti et al. (2013), the lack of clearly defined spatial criteria constitutes a structural limitation for accurately assessing system-wide coverage.

Beyond these technical discrepancies, current coverage remains well below the 30 per cent target established by Target 3 of the KMGBF (UNEP-WCMC & IUCN, 2024), implying that Argentina would need to place approximately 53 million additional hectares under conservation. Our analysis indicates that achieving this expansion will require more than the incorporation of currently unprotected KBAs. In many districts, even the full incorporation of unprotected KBAs would fall short of minimum coverage thresholds, whereas in others it would generate substantial gains.

In the case of OECMs, as noted above, none have yet been formally reported in Argentina, largely due to the recent approval of a detailed procedure (República Argentina, 2024; Resolution 446/2025) for their recognition. This procedure is aligned with the criteria for the identification and recognition of OECMs established under CBD Decision 14/8, and is expected to enable their formal recognition, thereby contributing to increased conserved area coverage and progress towards Target 3.

Regarding the representativeness of different jurisdictions within the conservation system, the results show that coverage in several districts depends largely on international designations, which in many cases rely on governance arrangements involving multiple jurisdictions, stakeholders and management objectives. This situation introduces an additional layer of institutional and operational complexity, as it requires coordination across scales, alignment of sometimes divergent priorities, and the integration of different legal and management frameworks (Schaaf & Clamote Rodrigues, 2016). At the same time, the presence of private protected areas highlights the role of diverse governance arrangements in contributing to conservation (Bauni et al., 2023), underscoring the need to strengthen their formal integration into the SIFAP to more effectively support Target 3.

On the other hand, area-based targets must be complemented by effective management in order to move towards an ecologically functional and socially viable conservation system. Territories identified through biogeographic and ecological criteria are not 'empty' or devoid of people; rather, they are shaped by diverse social, productive and cultural trajectories (Cebrián-

Piqueras et al., 2025; González-Urango et al., 2025). Therefore, identifying sites that retain natural features while also having conservation potential represents a major challenge. From this perspective, defining conservation priorities is not a neutral exercise, but one that requires integrating ecological and social dimensions through dialogue across concepts and scales of analysis, while acknowledging the partial nature of all analytical frameworks.

A clear example is the Espinal BD (temperate thorn woodland), where nearly 50 per cent of the territory has been modified, mainly due to productive land uses (Nanni et al., 2020). As a result, most natural and semi-natural environments are highly fragmented, persisting as small, isolated remnants typically associated with fluvial systems where agricultural expansion has been constrained by soil fragility (Natale et al., 2019). Even more concerning are the levels of modification in the Pampeano Austral (humid grassland) and Occidental districts (dry grassland) and in the Uruguayense BD (humid subtropical savanna), where more than 75 per cent of the territory has been converted (Nanni et al., 2020). This scenario raises the question of whether it is still feasible to conserve the large number of KBAs identified in these districts, which, according to our results, would allow protection levels to exceed the 17 per cent threshold.

Based on the analysis of biogeographic representativeness across provinces and districts within the SIFAP, two primary lines of action were identified. On the one hand, efforts should focus on consolidating and improving management effectiveness in districts where conservation coverage already exceeds 30 per cent. In these cases, priorities should include the assessment of management effectiveness and assurance of adequate management of unprotected KBA. On the other hand, system expansion should be prioritised in BD with low levels of protection, particularly those located within BP with limited overall coverage. These include the Islas Malvinas and Georgia del Sur (subantarctic grassland), where territorial management faces specific challenges related to the sovereignty dispute with the United Kingdom (UNEP-WCMC & IUCN, 2024); the Pampeana Province (temperate grasslands), where most districts show very limited protection; the Chaco Province (dry woodlands and shrublands), especially the Chaco Occidental and Oriental districts; and the Patagonia Province (cold temperate steppe), with emphasis on Payunia Austral, Fueguino, Patagonia Subandina Meridional and Occidental, and particularly De los Campos district (humid subtropical forests and wetlands) one of the least protected units nationwide.

Considering that the overlap between low representativeness and high levels of landscape modification generates a differentiated conservation urgency that cannot be addressed through biogeographical criteria alone, it becomes necessary to advance towards integrated spatial analyses that incorporate indicators of anthropogenic pressure, fragmentation and land use. This approach would enable a more precise identification of priority areas for conservation and ecological restoration, recognising that conservation cannot be separated from local ways of inhabiting, producing and assigning meaning to territory (Dudley et al., 2018).

Integrating this social and territorial dimension into ecological diagnostics is essential for advancing towards more inclusive, effective and sustainable conservation strategies (CBD, 2024; Lécuyer et al., 2024). In this regard, in order to address the increasing human modification of natural areas, OECM and ecological corridors emerge as strategic tools for guiding urban and agricultural expansion and for restoring ecological connectivity among areas of high conservation value, thereby helping to mitigate the cumulative effects of fragmentation (Dudley et al., 2018; Hilty et al., 2020; Natale et al., 2025).

Finally, a set of general recommendations is proposed, arising from both the analysis of the results and the broader national context. Regarding OECMs, recent advances represent a key opportunity to strengthen conservation efforts. In this context, identifying areas with potential to qualify as OECMs – such as Indigenous and community-managed territories, protected forests, and even internationally designated areas – could significantly expand conserved area coverage. It is also necessary to strengthen private conservation by consolidating and harmonising provincial regulatory frameworks, improving existing instruments where they are in place and promoting their development where they are absent, to ensure a more coherent and comprehensive national system.

CONCLUSION

Argentina, one of the world's largest and most biogeographically diverse nations (Wabö, 2016), faces profound socio-environmental challenges driving unprecedented biodiversity loss (Nori et al., 2024), making the question of where to conserve central to conservation planning debates. In this context, this study provides an integrated, multi-scale perspective that

identifies conservation gaps across biogeographical provinces and districts, as well as Key Biodiversity Areas (KBAs), thereby supporting the strategic targeting of conservation efforts to halt and reverse biodiversity loss in natural and semi-natural environments. This perspective aims to enhance existing diagnostic tools by integrating previous efforts to assess ecological representativeness with novel conceptual contributions. Rather than establishing absolute priorities, this study offers a framework for rethinking where and how conservation actions should be implemented, providing conceptual and analytical inputs to advance more integrated, coherent and sustainable conservation strategies in Argentina.

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RESUMEN:

La pérdida de biodiversidad exige estrategias de conservación que integren procesos evolutivos y ecológicos. La Meta 3 del Marco Mundial de Biodiversidad Kunming–Montreal propone proteger el 30 por ciento de las áreas terrestres para 2030, enfatizando la representatividad ecológica y la conservación de áreas de alto valor. Mediante un enfoque biogeográfico, se evaluó el sistema de áreas protegidas terrestres de Argentina a partir de análisis espaciales de cobertura, representatividad e inclusión de Áreas Clave para la Biodiversidad (KBA). Argentina protege actualmente el 11.06 por ciento de su territorio, muy por debajo del objetivo global, con una representación altamente desigual entre provincias y distritos biogeográficos, incluyendo vacíos críticos (<5 por ciento de cobertura). Solo el 42 por ciento de las KBA se encuentra protegido, y su incorporación total elevaría la cobertura apenas al 17.86 por ciento. Alcanzar la Meta 3 requerirá no solo ampliar la superficie protegida, sino también fortalecer otras medidas eficaces de conservación basadas en áreas (OMEC), la conservación privada y la conectividad ecológica en paisajes altamente transformados.

RÉSUMÉ

La perte de biodiversité exige des stratégies de conservation qui intègrent les processus évolutifs et écologiques. L'objectif 3 du Cadre mondial pour la biodiversité de Kunming-Montréal prévoit la conservation de 30 pour cent des zones terrestres d'ici 2030, en mettant l'accent sur la représentativité écologique et les zones à haute valeur de conservation. À l'aide d'un cadre biogéographique, nous avons évalué le système d'aires protégées terrestres de l'Argentine par le biais d'analyses spatiales portant sur la couverture, la représentativité et l'inclusion des zones clés pour la biodiversité (ZCB). L'Argentine protège actuellement 11.06 pour cent de son territoire, ce qui est bien en deçà de l'objectif mondial, avec une représentation très inégale entre les provinces et les districts biogéographiques, y compris des lacunes critiques (couverture < 5 pour cent). Seules 42 pour cent des ZCB sont protégées, et leur inclusion totale ne porterait la couverture qu'à 17.86 pour cent. Pour atteindre l'objectif 3, il faudra non seulement étendre les zones protégées, mais aussi identifier d'autres mesures de conservation efficaces par zone (OECM), des initiatives de conservation privées et assurer la connectivité écologique à travers les paysages transformés.

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NON-STATE RANGERS: IDENTIFYING AND SUPPORTING THE DIVERSE SET OF PEOPLE THAT FULFIL RANGER FUNCTIONS

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ABSTRACT

Rangers are widely recognised as essential actors in conserving biodiversity, cultural heritage and the rights and well-being of present and future generations. Yet global ranger discourse and policy frameworks have largely focused on state-employed personnel operating within formally designated protected areas. Across Indigenous territories, community conserved areas, other effective area-based conservation measures (OECMs), privately protected areas, etc., many individuals and groups perform comparable functions but remain poorly recognised and supported.

Building on the International Ranger Federation's definition of rangers, we introduce the concept of 'non-state rangers': individuals or groups who fulfil ranger functions but are not primarily employed or mandated by state authorities or subnational governments. We note that non-state rangers would include Indigenous rangers working for sovereign governments such as federally-recognised tribes in the United States.

Drawing on typologies and examples, the paper analyses relationships between state and non-state rangers and examines associated responsibilities, risks and opportunities. It proposes practical approaches to identifying, engaging with and supporting non-state rangers and offers recommendations for ranger associations, conservation organisations and governments to strengthen inclusive and effective conservation governance.

Keywords: rangers, environmental defenders, ICCAs, PPAs, OECMs

INTRODUCTION

Rangers are recognised as critical actors in conservation, safeguarding biodiversity, ecosystem services, cultural heritage and the rights and well-being of present and future generations in and beyond protected and conserved areas (PCAs; Stolton et al., 2023). The International Ranger Federation (IRF), together with regional ranger associations and initiatives such as the Universal Ranger Support Alliance (URSA), play a central role in advancing recognition of rangers, improving professional standards and advocating for better working conditions (Singh et al., 2021).

The IRF defines rangers as individuals or groups who play a critical role in conservation, within state, regional, communal, Indigenous or privately protected areas, to safeguard biodiversity, ecosystem services and cultural heritage and protect the rights and well-being of present and future generations (IRF, 2025). However, in practice, most policies, institutional frameworks and support mechanisms remain oriented towards state-based rangers operating in formally designated protected areas. Ranger surveys are also dominated by government rangers (Appleton et al., 2022; Parker, Hoffman et al., 2022). A significant set of actors who fulfil ranger functions outside state institutions remains under-recognised and under-supported.

Global conservation governance is undergoing profound changes. The Convention on Biological Diversity's (CBD) recognition of other effective area-based conservation measures (OECMs), the expansion of privately protected areas (PPAs), and the increasing visibility of Indigenous Peoples and local communities, and Indigenous and

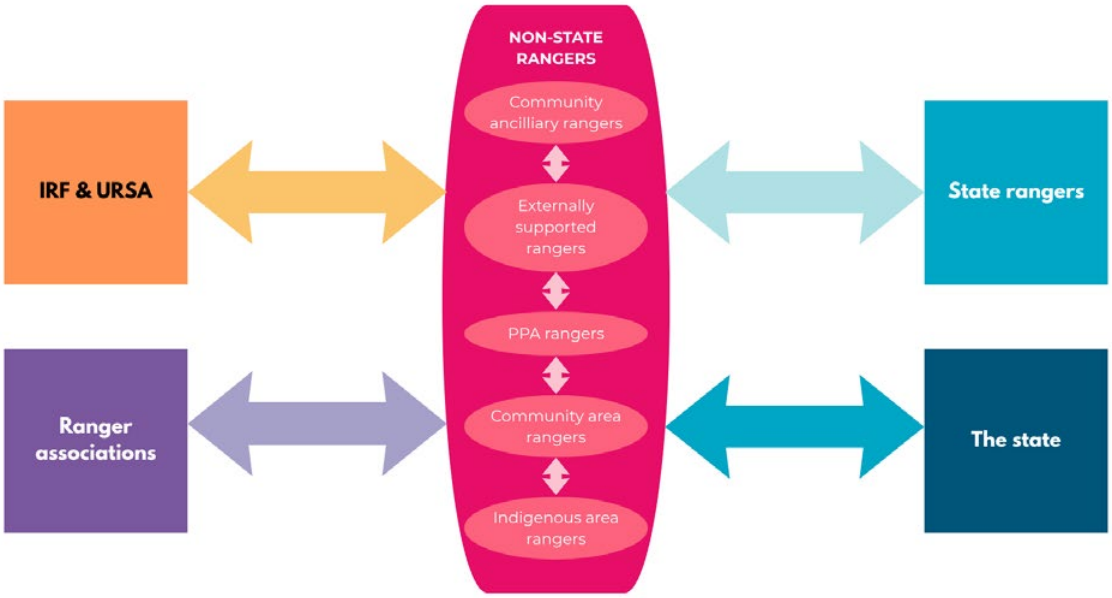

Figure 1. Relationships analysed in this study (see definitions in typology below)

Community Conserved Areas (ICCAs) have broadened the range of governance arrangements (IUCN, 2019).

Within these contexts, many individuals and groups undertake responsibilities that resemble those of rangers, including monitoring, upholding customary and legal norms, managing resources, mediating conflicts, supporting visitors and responding to threats.

This paper, based on a literature review and discussions with ranger associations and some rangers, coins the new term 'non-state rangers' (NSRs) and proposes the concept of NSRs to better understand and engage with diverse actors. Building on the IRF definition of rangers, NSRs are defined as "individuals or groups who fulfil ranger functions but are not primarily employed or mandated by state authorities". They operate within Indigenous, community, private or civil society governance systems and undertake responsibilities for safeguarding nature, cultural heritage and territorial integrity. This definition does not replace existing categories such as Indigenous rangers or community wardens, but provides a typology highlighting shared functions, challenges and opportunities. A more complete investigation is now needed to collect feedback from NSRs in the field.

Recognising NSRs raises important questions about relationships between different actors in conservation. State rangers increasingly operate in landscapes where conservation outcomes depend on collaborating with Indigenous Peoples and local communities, private actors and civil society. Ranger associations are becoming more inclusive, yet mechanisms for engaging with NSRs remain limited. Similarly, NSRs may seek recognition or support while prioritising autonomy, customary governance and self-determination. Understanding these dynamics is essential for clarifying responsibilities, managing risks and designing appropriate support mechanisms.

Several types of relationships warrant closer examination (Figure 1). First, interactions between state and NSRs may vary from cooperation to conflict, shaped by legal frameworks, power dynamics and history. Yet research shows that collaboration between Indigenous and state actors can enhance social capital, legitimacy and conservation outcomes (Zhang et al., 2024).

Second, ranger associations face questions about representation, membership and legitimacy when engaging with actors who do not fit the state ranger model. Hybrid models that include different forms of membership and representation can balance inclusivity with respect for autonomy and local governance (Singh et al., 2024).

Third, relationships among different types of NSRs may create opportunities for learning, coordination and mutual support, but also raise issues of equity and accountability.

This paper addresses key questions: (1) How can NSRs be identified in ways that respect diverse identities and governance systems? (2) What tools and approaches are available to engage with them ethically, equitably and effectively? (3) How can conservation organisations, ranger associations and state institutions support NSRs without undermining their autonomy or customary governance? (4) What responsibilities and risks arise when state rangers operate beyond formal protected

Non-state Ranger in a private reserve in Belize talking with visitors © Equilibrium Research

areas or collaborate with non-state actors? (5) How do these dynamics vary across regions and governance contexts? (6) How can lessons from NSRs inform broader ranger practice and conservation policy?

Answers to these questions can contribute to a more inclusive understanding of rangers and provide guidance for identifying, engaging with and supporting NSRs.

ANALYSIS AND RESULTS

Identifying non-state rangers within evolving conservation governance

According to the IRF, the term 'ranger' applies to any person regardless of title, including but not limited to wildlife warden, forest guard, forester, scout, watcher, game scout, marine ranger and park guard, who works in conservation and is responsible for safeguarding nature, biodiversity, landscapes and habitats, as well as cultural and historical heritage.

PPAs play an increasing role in conservation (Mitchell et al., 2018) and require capacity that mirrors state rangers. Similarly, many OECMs depend on teams to undertake surveillance, monitoring and community liaison. Establishing or strengthening these is key to sustained biodiversity outcomes (Jonas et al., 2024).

There is recognition in the literature that rangers' social and professional positions overlap in complex ways. Many are community or Indigenous members who maintain local roles and relationships alongside their ranger duties, presenting both opportunities and challenges in their work (Moreto et al., 2023; Parker, Singh et al., 2022; Stolton et al., 2024). Yet many individuals perform ranger duties without formal employment, and the implications of this remain underexplored. Global estimates of rangers in protected areas often include NSRs where organisations track workforce numbers, yet they almost certainly underestimate those in informal or ad hoc roles (Appleton et al., 2022). Despite their prevalence, NSRs remain only weakly integrated into formal ranger frameworks and professional networks (Mitchell et al., 2018; ICCA Consortium, 2025).

This gap reflects a broader structural bias towards state-centric models of governance and management. Local residents performing ranger duties in state protected areas often operate in a grey zone: while effectively state-mandated, they frequently lack the legal authority, protections and employment benefits afforded to state rangers. They are therefore included within the typology of NSRs used here (Table 1).

Relationships between the government and non-state rangers

As shown in Table 1, the spectrum of NSRs runs from formal embedding within state management systems to operating in parallel to state systems, to existing outside state authority. NSRs can enhance the effectiveness of state conservation actions by increasing workforces and contributing local ecological, social and cultural understanding.

Yet community rangers may be marginalised by state authorities, subject to inferior employment and working conditions and excluded from leadership. NSRs in Indigenous and community managed areas may distrust state authorities and be unwilling to cooperate, particularly where the state is perceived as undermining local rights (Verweijen et al., 2021). At the same time, community rangers may rely on state law enforcement and judicial authorities to address major threats (Franco et al., 2025; Sharkey et al., 2024).

Locally-recruited rangers often occupy ambiguous intermediary roles between conservation authorities and their communities, facing unequal power relations, limited influence over decision-making, and perceptions

Table 1. A tentative typology of non-state rangers

NSR category and definition (in decreasing level of formal state oversight)	Typical employment status	Typical roles and mandate	Specific issues	Example
A. Community ancillary ranger: a community member engaged by a state PA to support state rangers	A local resident performing ranger duties in a state-protected area on a voluntary, part-time or casual basis. While work is state-mandated, they do not have the employment status or benefits granted to state rangers (IIED & IUCN SULI, 2022).	Roles include monitoring, tracking, guiding, driving, maintenance, etc., plus an important role in liaison with communities, reducing conflict and helping de-escalate volatile situations.	Local knowledge adds to the effectiveness of state rangers. They may be discriminated against by full-time rangers and employers (for example, regarding training). There may be conflicts and conflicts of interest with the communities to which they belong.	Community patrol teams funded and supported by international NGOs but operating under state mandate on an ad-hoc basis.
B. Externally supported ranger: an externally employed and supported ranger operating inside a state PA	Two types are usually directly contracted by a supporting NGO or agency: i) Supplementary – supporting state rangers, working alongside them or with distinct duties and responsibilities. ii) Substitutional – entirely replacing state ranger forces and assuming a parastatal role. These usually include community members (often in non-leadership roles) and may operate under different working conditions to state rangers.	Conducting a wide range of duties for a project or partner of the site managing agency. Sometimes has a law enforcement mandate. May rely on accompanying state rangers or police for formal law enforcement. Type ii normally assumes all aspects or management of the PA.	Can significantly improve the effectiveness of PA operations and build capacity of state rangers. Type ii may be considered the only option where state managed protected areas (PAs) have failed. Lines of accountability and responsibility may be unclear, increasing the risk of misconduct. Different employment conditions may cause tensions with state rangers. State authorities may assume permanence of these teams, leading to underinvestment in state rangers. Externally supported rangers may assume permanence of their role, leading to problems when employment ends.	Type i) Many rangers funded by NGOs fall into this category. Many protected areas in Indonesia are supported by supplementary rangers (e.g. Rhino Protected Units supported by the Indonesia Rhino Foundation (YABI) in Ujung Kulon National Park (Talukdar et al., 2020). Type ii) Rangers employed by African Parks across 22 countries.

of being enforcers of external agendas (Parker, Singh et al., 2022). Rigid legal mandates, liability concerns, and professional hierarchies can reinforce inequalities. These factors can expose individuals and their families to ostracism, threats and violence (Dutta, 2020; Poppe, 2012).

Where externally supported NSRs operate as parastatal rangers, systems of leadership, accountability and oversight vis-à-vis both employers and the state may be unclear, increasing the risk of conflicting management decisions and of misconduct.

Relationships between state rangers and non-state rangers

Coordination between state and NSR can range from co-management and partnership to conflict and exclusion. For instance, co-management on the Qinghai–Tibet Plateau has enhanced social recognition, mutual learning and legitimacy between Indigenous rangers and state institutions, contributing to improved conservation (Zhang et al., 2024). Kenya Wildlife Service rangers collaborate with rangers from Kenyan conservancies

Table 1. A tentative typology of non-state rangers cont.

NSR category and definition (in decreasing level of formal state oversight)	Typical employment status	Typical roles and mandate	Specific issues	Example
C. PPA ranger: working in conservation areas under private ownership or management	Two types usually employed by managing entities: i) NGO-employed rangers – protecting areas managed by the NGO. ii) Private sector-employed rangers – protecting areas managed by companies. Employed under terms and conditions of employer, usually in line with national employment regulations.	Wide range of roles from tourism rangers on private wildlife reserves to enforcement rangers on private game reserves. They may be subject to state regulation, oversight and inspection (e.g. South Africa Game Reserves). They may rely on state rangers or police for formal law enforcement. Work may be coordinated with national or local government rangers.	Potential lack of accountability for national laws and regulations. Continued deployment is dependent on the financial status of the employer. PPAs constitute a minimum of 6.5% of all PAs recorded globally (Lewis et al., 2023), indicating that private-sector rangers form a significant component of the workforce. However, there is limited information available on this area.	Type i) UK charities such as the Wildlife Trusts, the National Trust and the RSPB employ staff to support reserve management. Type ii) Rangers employed in private game reserves in South Africa often have full law enforcement powers.
D. Community area ranger: a local community member who works as a ranger	A local community member responsible for managing and conserving a PCA under community governance. Often voluntary. Ranger work may be integrated into main occupation (e.g. in managed use areas). They may operate in informal or formal ways (under guidance of state authorities). They may be considered 'environmental defenders'.	A variety of roles depending on the area's goals. These may include patrols, monitoring, wildlife management and use regulation. They are unlikely to have law enforcement rights unless specifically deputised. They may be mandated to enforce community-agreed regulations and their work may be coordinated with law enforcement authorities.	They can provide effective, informed management but often have limited capacity to respond to major violations. They are reliant on authorities for support in law enforcement, yet may not be recognised by state authorities and may dislike or distrust these authorities. They are vulnerable to threats and violence and may not use the national language. They may not be linked into, be aware of, or see the relevance of ranger networks, tools and standards.	Community Wildlife Ambassadors in South Sudan manage community conserved areas. Community Surveillance and Monitoring Teams (CSMT) in India undertake systematic wildlife surveillance and stewardship in landscapes beyond formal PAs.

(KWCA, 2018). In South Sudan, joint patrols and training between Wildlife Service rangers and Community Wildlife Ambassadors have increased community participation and reduced conflict between state rangers and communities (Fauna & Flora, 2024).

Conversely, conflicts arise where state ranger enforcement clashes with customary governance, or where Indigenous territorial defenders face criminalisation (Global Witness, 2021). When state rangers operate alongside NSRs, questions of legal authority, accountability and personal safety arise. Conservation NGOs report effective collaboration where joint training on standard operating procedures and Codes of Conduct clarifies roles, jurisdictions and limits on enforcement powers. Fauna & Flora has applied this approach in South Sudan, Mozambique and Liberia (Fauna & Flora, 2024).

There is clear scope for consolidation. IRF could play a mediating role by developing ethical guidance, risk frameworks and operational protocols to support collaboration across governance systems.

Table 1. A tentative typology of non-state rangers cont.

NSR category and definition (in decreasing level of formal state oversight)	Typical employment status	Typical roles and mandate	Specific issues	Example
E. Indigenous area ranger: an Indigenous Person who works as a ranger	A person belonging to an Indigenous community who manages and conserves their traditional territory, exercising customary governance, ecological stewardship, and culturally informed conservation on behalf of their community. Not usually employed in a conventional sense. Ranger work may be integrated into main occupations and lifestyles. Individuals and teams may be assigned ranger equivalent duties by their community and may be compensated in various ways. They may be considered 'environmental defenders'.	They are unlikely to have law enforcement rights unless specifically deputised. They may be mandated to enforce community-agreed local regulations and their work may be coordinated with local state rangers. They may be able to call on state authorities when needed. Some Indigenous groups have organised their own ranger forces that are trained to operate in similar ways to state rangers.	They can provide highly effective, locally based and culturally appropriate management. They often have limited resources and capacity to respond to major violations. They are reliant on authorities for support in law enforcement, yet may not be recognised by state authorities and may dislike or distrust these authorities. They may not recognise state governance over the territory and conflicts may arise where Indigenous territories overlap state PAs. They are vulnerable to threats and violence, may not use the national language and may operate in ways not understood by the mainstream conservation sector. They may not be linked into, be aware of, or see the relevance of ranger networks, tools and standards.	Australia's Indigenous Rangers Program assists First Nations people in managing Country according to Traditional Owners' objectives (National Indigenous Australians Agency, n.d.).

Relationships among non-state rangers

Coordination among different types of NSRs remains limited but presents significant opportunities. Networks linking Indigenous rangers, community wardens and private conservation actors could support shared standards, exchange of good practice and mutual support, particularly where state engagement is weak or contested.

However, differences in governance structures, power relations and priorities pose challenges. Global guidance emphasises the need for governance systems that enable collaboration while respecting autonomy and rights (Borrini-Feyerabend et al., 2013). IRF, URSA and ranger associations could support such polycentric networks by acting as conveners.

Bangangai Game Reserve Ranger Post Commander Captain Michael Luciano with Community Wildlife Ambassador Sorophina Nauruyo on bio-monitoring patrol © Justin Purefoy / Fauna & Flora

Bangangai Game Reserve bio-monitoring patrol in South Sudan
© Justin Purefoy / Fauna & Flora

Relationship between environmental defenders and NSRs

The UN defines environmental human rights defenders 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" (UNGA, 2016). Based on this definition, working as a ranger should not automatically exclude individuals from being recognised as defenders contrary to suggestions by Verweijen et al. (2021).

Many NSRs, particularly Indigenous or community area rangers, are likely to fall within this definition. For other NSRs the situation is more complex, if for instance they are engaged in enforcement activities. Large numbers of NSRs are embedded in communities and actively promote environmental and social justice. NSRs and state rangers alike may, in their private capacity, engage in community activism and advocacy, and may require support in navigating conflicts of interest and personal risk arising from these dual roles.

Relationships between professional bodies and non-state rangers

Understanding how professional ranger bodies engage with NSRs is key to questions of their legitimacy, representation and inclusion within the global ranger workforce. The International Ranger Federation (IRF) has made progress in broadening the conceptual definition of rangers. However, beyond volunteer rangers in state protected areas, operational identification of NSRs remains challenging. Tools developed for identifying OECMs and ICCAs could be layered with established ranger competency frameworks (Appleton, 2016; IRF & URSA, 2023a) to help map NSRs within diverse governance systems. Inclusion of NSRs in ranger discourse, frameworks and support networks could strengthen legitimacy, recruitment, retention and morale (Moreto et al., 2021).

Indeed, global ranger support tools, such as the IRF's Rangers for 30x30 Framework, were designed for state-employed rangers but are increasingly applied in non-state contexts. For example, the IRF Code of Conduct has been developed with Community Wildlife Ambassadors in South Sudan. Extending such tools requires adaptation to diverse governance systems and sensitivity to differences in resources, mandates and strengths.

Recognition mechanisms are evolving. The IUCN WCPA International Ranger Awards explicitly recognise community, private and Indigenous rangers. Since 2021, while most recipients have been state-employed (29 individuals and teams), 13 non-state individuals and teams have been recognised, reflecting progress but continued imbalance (IUCN, n.d.).

Research on Indigenous and community governance emphasises co-design, respect for customary institutions and rights recognition as prerequisites for engagement (Dawson et al., 2021). The CSMT model in India illustrates this approach: support focuses on capacity-building, safety, documentation and information-sharing rather than extending enforcement authority, thereby reducing conflict and avoiding interference with customary governance.

Indigenous and community governance systems often generate innovative conservation practices and strong local stewardship (Charles, 2021; Esmail et al., 2023; Reyes-García, 2023). Privately protected area rangers may contribute technical expertise and resources (Stolton et al., 2024), while OECM ranger teams – often

Non-state Ranger in the Caucasus Wildlife Refuge in Armenia © Equilibrium Research

drawn from existing land management roles such as forestry – bring distinct skills and stakeholder engagement experience. Supporting polycentric networks and cross-learning among these groups could enhance conservation outcomes.

At the national level, ranger associations have traditionally represented state-employed rangers. Including NSRs raises questions of membership, legitimacy and accountability. While association membership may provide access to advocacy, professional networks and welfare support, it may also risk imposing external norms or undermining customary governance. Hybrid models that combine different forms of membership and representation for formal associations and community-based networks may offer a balanced approach (Singh et al., 2024).

The desirability of association-based representation varies regionally. In areas with strong Indigenous governance traditions, such as parts of Latin America and the Pacific, NSRs may prioritise territorial autonomy over professional identity. In regions with expanding private conservation sectors, including parts of Europe and Africa, private-sector rangers may seek integration into professional associations. These differences underscore the need for context-specific rather than universal models.

DISCUSSION

Towards an inclusive framework for rangers

While the IRF definition accommodates diverse actors, there is a structural disconnect between the expanding diversity of rangers and the institutional frameworks supporting them. Recognising NSRs requires both a refined typology, as proposed here, and a functional approach to identification based on roles, responsibilities, risks and governance rather than employer or legal status.

This discussion intersects with debates on environmental human rights defenders. Many NSRs, particularly Indigenous and community rangers, operate at the interface of conservation, land rights and social justice. Ranger and defender identities are not mutually exclusive, and exclusion based on occupational labels risks misrepresenting lived realities (Global Witness, 2021; Verweijen et al., 2021).

Ultimately, recognising and supporting NSRs is not merely a technical or institutional challenge but a transformative opportunity. By highlighting the diverse actors who safeguard nature, conservation governance can become more inclusive, equitable and

Non-state Ranger, Samburu District, Kenya © Jack Hewson

effective. NSRs embody forms of stewardship that offer alternative pathways to conservation. Integrating their knowledge, practices and governance systems into ranger discourse has the potential to reshape the architecture of conservation governance.

Power, legitimacy and ethics in engaging non-state rangers

Engagement with NSRs is inherently political. Indigenous and community actors often operate within contexts of marginalisation and dispossession. Formal recognition by state or international institutions can bring benefits but also risks, including increased surveillance or loss of autonomy. In line with a rights based approach, NSRs should not merely be incorporated into existing structures but engaged as partners with distinct rights and knowledge systems. Ranger associations face a choice: to remain professional bodies for employed rangers or become inclusive platforms representing diverse conservation actors, who may not self-identify as rangers but fulfil ranger equivalent roles. The analysis suggests that a hybrid model is ideal, combining formal professional representation with flexible mechanisms for engaging NSRs. IRF is well positioned to facilitate this by developing global guidance, adapting training and promoting ethical standards.

The deployment of NSRs alongside or in the place of state rangers presents several challenges, in terms of mandates, legality, oversight and accountability. To avoid risks to communities, individuals and employers, these arrangements should be unambiguous and transparent to all, including the rangers themselves.

Risk, responsibility and accountability

The interaction between state and NSRs raises complex questions of responsibility and risk. State rangers may be legally accountable for actions taken beyond formal protected areas, while NSRs often operate without legal protection. Collaborative frameworks must address liability, safety and accountability. Joint protocols for collaboration, risk assessment and conflict resolution could mitigate these risks. Such protocols need to be context-specific but guided by shared principles of equity, transparency and mutual respect.

CONCLUSIONS AND RECOMMENDATIONS

Achieving Target 3 of the Kunming-Montreal Global Biodiversity Framework will not only rely on increasing state-governed PAs, but also a substantial increase in

non-state conservation areas and a subsequent increase in the NSR workforce. NSRs constitute a significant, under-recognised component of global conservation. Across PCAs, diverse actors perform functions that closely align with the IRF's definition of rangers. NSRs are not peripheral actors but central contributors to conservation, which increasingly depends on plural governance systems and locally embedded stewardship. Non-state actors are key in generating social capital, legitimacy and adaptive governance.

NSRs often operate without formal mandates, legal protection or access to professional networks. This creates uncertainty regarding responsibilities, legitimacy, accountability and safety, and reflects deeper tensions between state-centric conservation models and pluralistic governance arrangements.

The concept of NSRs provides a useful analytical and operational lens. However, NSRs are not a homogenous group; they range from parastatal agents to groups operating independently of (and sometimes in opposition to) state systems, and their role overlaps with that of environmental defenders.

Ultimately, recognising NSRs is not merely a technical exercise but a political and ethical imperative. It requires rethinking who is considered a legitimate conservation actor and how power, knowledge and responsibility are distributed across governance systems. It is about reshaping institutional architectures, professional identities and values. By engaging with, learning from and supporting NSRs, conservation institutions can enhance effectiveness, equity and resilience. Conversely, failure to do so risks perpetuating structural inequities and undermining the legitimacy of conservation efforts.

Based on the above conclusions, we propose the following recommendations:

a. Adopt a functional approach to ranger recognition – 2026–2028
International ranger associations should operationalise ranger identification based on functions, responsibilities, risks and governance context rather than employment status or formal titles, and reflect this in their metadata collection. Adopting the definition of NSRs should have direct implications on the formal and voluntary recognition of the ranger profession by international bodies such as the ILO and IUCN (see IUCN Member's Assembly Motion 102, 2025).

b. Develop guidance on the roles and functions of NSRs and their relationship to state rangers and institutions – 2027–2029
This should be co-developed with relevant NSRs and groups, and should include
- Guidance for employers and supporters on the benefits and risks associated with NSRs and on recommendations to address these;
- Clear, context-sensitive guidance on collaboration between state rangers and NSRs, addressing authority, liability, safety, accountability and information-sharing, grounded in rights-based approaches, including free, prior and informed consent. Joint training on codes of conduct and standard operating procedures represents a practical entry point.

c. Adapt global ranger tools for NSRs – 2027–2030
Existing ranger tools and standards and capacity development materials should be reviewed and adapted for NSRs. Case-based learning should inform this process, ensuring sensitivity to legal pluralism, customary governance and resource constraints. Using these standards, NSRs should be held to similar levels of standards and competencies as their state counterparts.

d. Support inclusive and hybrid models of representation – 2027–2035
Ranger associations should explore hybrid engagement models that combine formal professional representation with flexible mechanisms for engaging and representing NSRs, without undermining autonomy or customary institutions. IRF could play a convening role.

e. Recognise overlap with environmental defender roles – 2027–2032
Policies should avoid assuming that ranger status excludes recognition as environmental human rights defenders or vice versa. Social safeguards, risk mitigation and advocacy mechanisms should consider NSRs operating at the intersection of conservation, land rights and social justice.

f. Address research gaps – 2027–2032
Despite growing recognition of governance diversity, empirical research on NSRs remains limited. Priority areas include:
(i) systematic mapping of NSR roles, numbers and governance contexts;
(ii) comparative analysis of collaboration models between state- and NSR;
(iii) assessment of risks, legal vulnerabilities and support needs;
(iv) evaluation of representation and legitimacy within ranger associations;
(v) documentation of ranger-specific learning emerging from NSRs.

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RÉSUMÉ

Les gardes forestiers sont largement reconnus comme des acteurs essentiels de la conservation de la biodiversité, du patrimoine culturel, ainsi que des droits et du bien-être des générations actuelles et futures. Pourtant, le discours mondial sur les gardes forestiers et les cadres politiques se sont principalement concentrés sur le personnel employé par l'État et intervenant au sein d'aires protégées officiellement désignées. Sur les territoires autochtones, dans les zones de conservation communautaire, dans le cadre d'autres mesures de conservation efficaces par zone (OECM), dans les aires protégées privées, etc., de nombreux individus et groupes remplissent des fonctions comparables, mais restent peu reconnus et peu soutenus.

En nous appuyant sur la définition des gardes forestiers donnée par la Fédération internationale des gardes forestiers, nous introduisons le concept de gardes forestiers non étatiques : des individus ou des groupes qui remplissent des fonctions de gardes forestiers mais ne sont pas principalement employés ou mandatés par les autorités étatiques ou les gouvernements infranationaux. Il convient de noter que les gardes forestiers non étatiques incluent les gardes forestiers autochtones travaillant pour des gouvernements souverains, tels que les tribus reconnues au niveau fédéral aux États-Unis.

S'appuyant sur des typologies et des exemples, cet article analyse les relations entre les gardes forestiers étatiques et non étatiques et examine les responsabilités, les risques et les opportunités qui y sont associés. Il propose des approches pratiques pour identifier, impliquer et soutenir les gardes forestiers non étatiques et formule des recommandations à l'intention des associations de gardes forestiers, des organisations de conservation et des gouvernements afin de renforcer une gouvernance de la conservation inclusive et efficace.

RESUMEN

Los guardabosques son ampliamente reconocidos como actores esenciales en la conservación de la biodiversidad, el patrimonio cultural y los derechos y el bienestar de las generaciones presentes y futuras. Sin embargo, el discurso global sobre los guardabosques y los marcos normativos se han centrado en gran medida en el personal contratado por el Estado que opera dentro de áreas protegidas designadas oficialmente. En los territorios indígenas, las áreas conservadas por la comunidad, otras medidas de conservación eficaces basadas en el área (OECM), las áreas protegidas de titularidad privada, etc., muchas personas y grupos desempeñan funciones comparables, pero siguen sin recibir el reconocimiento ni el apoyo que merecen.

Partiendo de la definición de guardabosques de la Federación Internacional de Guardabosques, introducimos el concepto de guardabosques no estatales: personas o grupos que desempeñan funciones de guardabosques, pero que no están empleados ni reciben su mandato principalmente de las autoridades estatales o los gobiernos subnacionales. Cabe señalar que los guardabosques no estatales incluirían a los guardabosques indígenas que trabajan para gobiernos soberanos, como las tribus reconocidas a nivel federal en los Estados Unidos.

A partir de tipologías y ejemplos, el documento analiza las relaciones entre los guardabosques estatales y no estatales y examina las responsabilidades, los riesgos y las oportunidades asociados. Propone enfoques prácticos para identificar, colaborar con y apoyar a los guardabosques no estatales, y ofrece recomendaciones a las asociaciones de guardabosques, las organizaciones de conservación y los gobiernos para fortalecer una gobernanza de la conservación inclusiva y eficaz.

TOWARDS RECONCILIATION AND INDIGENOUS SELF-DETERMINATION IN PARK PLANNING AND OPERATIONS MANAGEMENT IN NORTHWESTERN BRITISH COLUMBIA

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ABSTRACT

Reconciliation and Indigenous self-determination have importance globally for the management of protected-area systems, as these landscapes constitute key arenas where conservation, colonial history and contemporary struggles for Indigenous governance and authority interface. This case study examines the role of reconciliation and Indigenous self-determination in the Northwestern region of British Columbia's (BC) provincial parks system in Canada. The objectives were to identify socio-political barriers to Indigenous inclusion in BC Parks' planning and operations management and to develop practical recommendations for park planners and operations managers to support reconciliation and Indigenous self-determination in their work. Twenty-eight semi-structured interviews with Gitxsan First Nation Chiefs and Elders and BC Parks staff revealed that settler colonialism, residential schools and assimilation policies have created longstanding mistrust in the Province. Gitxsan participants emphasised that reconciliation is community-specific, and self-determination requires greater control, agency and governance over their territories. BC Parks participants called for regionally located Indigenous Relations specialists, co-management of parks and Indigenous Protected and Conserved Areas to support engagement and relationship-building. The paper argues that meaningful inclusion of Indigenous Peoples in park planning and operations management is essential for advancing reconciliation, supporting self-determination, and addressing broader social and environmental issues.

Key words: Parks, Settler Colonialism, Protected Areas, First Nations, Indigenous Protected and Conserved Areas, Canada

INTRODUCTION

Questions of Indigenous rights, governance and land stewardship are being raised globally and with increasing urgency in the fields of conservation and protected-area management; however, research on Indigenous inclusion, reconciliation and self-determination in provincial park planning and management remains limited. This urgency has intensified with the adoption of Target 3 under the Kunming–Montreal Global Biodiversity Framework (Convention on Biological Diversity, 2022), which commits countries to protect at least 30 per cent of the world's land and oceans by 2030 while emphasising equitable governance and respect for Indigenous territories. **Protected areas** are geographically defined areas managed for the long-term conservation of nature and associated cultural values. **Parks** are one form of protected area, formally designated and managed by government agencies for conservation, recreation, and the protection of cultural and historical values.

In 2019, the Legislative Assembly of British Columbia (BC) passed the Declaration on the Rights of Indigenous Peoples Act (DRIPA), making BC the first and only Canadian province to legislate the principles of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) (2007). DRIPA establishes UNDRIP as the Province's framework for reconciliation and requires provincial laws to be aligned with UNDRIP. International frameworks such as UNDRIP have influenced how countries including Australia, New Zealand and the United States consider self-determination and Indigenous authority in land and

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'Ksan Historical Village in Gitxsan First Nation Territory (Laxyip) © Sophia Graham

resource governance. Canada's context is uniquely shaped by histories of settler colonialism and reconciliation efforts (Graham & Osborne, 2024). The current investigation considers this context and analyses reconciliation, self-determination and Indigenous inclusion in park planning and management in an effort to contribute to these international, scholarly discussions.

There is research on the inclusion of Indigenous Peoples within national parks operated by Parks Canada (Cook, 2020; Houde, 2007; Johnston & Mason, 2020, 2021), and within this literature, there is a focus on environmental monitoring (Popp et al., 2019; Thompson et al., 2019). To date, there are no studies that offer recommendations for working towards reconciliation and self-determination in BC Parks' planning and management. The only study that discusses the inclusion of Indigenous Peoples in BC Parks was conducted by Kadykalo et al. (2021), who interviewed and surveyed BC government decision-makers from a variety of ministries. The current case study built upon Kadykalo et al.'s (2021) work by focusing on BC Parks management and including Indigenous Peoples' perspectives. While previous scholarship has examined Parks Canada's reconciliation policies (Corntassel et al., 2009; Finegan, 2018), this literature has not analysed the role of reconciliation in provincial park management agencies or how self-determination can be best supported by park agencies and managers. This study addressed these literature gaps, with an emphasis on the ways in which socio-political factors influence the inclusion of Indigenous Peoples and their perspectives in BC Parks, and how BC Parks can prioritise reconciliation and self-determination in their planning and management of protected areas. We contend that including Indigenous Peoples in park planning and management is imperative for mobilising reconciliation, self-determination, and addressing larger social and environmental issues.

Previous research on settler colonialism and reconciliation in parks highlights how colonial power structures systematically dispossessed Indigenous Peoples of their lands, erased their histories, and marginalised their governance. Scholars such as Mason (2014, 2021) and Binnema and Niemi (2006) show that Canadian parks were established through colonial policies, including the Indian Act (1894), which forcibly displaced Indigenous communities without consent, imposed Eurocentric place names and narratives, and restricted Indigenous cultural practices – thereby undermining Indigenous sovereignty and ways of life. Today, Indigenous histories and knowledge often remain underrepresented or misrepresented in park signage, programming and staff understanding, sustaining colonial myths and impeding reconciliation efforts (Johnston & Mason, 2020).

Indigenous perspectives on the environment centre the concept of relationality, where Indigenous Peoples understand themselves as living in deep, reciprocal relationships with the land, water, plants, animals and all forms of life (Cajete, 2004). These relational understandings form the foundation of Indigenous

Figure 1. BC Parks Regions. Reprinted from: the Government of British Columbia, 2021, BC Parks Administrative Boundaries for the Provincial Parks System. Retrieved November 4, 2025 from https://portalext.nrs.gov.bc.ca/documents/ processed_files/ Park+Contacts+ Conditions+and+ Restrictions+2021-01-18.pdf. Copyright 2021 by the Government of British Columbia.

Protected and Conserved Areas (IPCAs), which are protected areas legislated under the jurisdiction and laws of Indigenous governments to protect their lands and waters (Finegan, 2018). Studies on IPCAs demonstrate how Indigenous self-determination is expressed through stewardship rooted in traditional beliefs and values (Murray & Burrows, 2017; Tran et al., 2020). IPCAs offer a practical pathway to reconcile conservation objectives with Indigenous rights and are increasingly recognised as a key tool for advancing Indigenous governance, cultural revitalisation, and biodiversity protection within protected-area management.

The research was guided by two questions: (1) What socio-political factors influence the inclusion of Indigenous Peoples in park planning and operations management? And (2) How do Chiefs, Elders and Parks personnel view reconciliation and self-determination in terms of park planning and management? In addressing these questions, this research aimed to offer practicable recommendations for park planners and operations managers to meaningfully include Indigenous Peoples, with a focus on upholding the principles of reconciliation and self-determination in park planning and management.

Three key concepts underpinned the study's analysis. First, settler colonialism is a distinct form of colonialism in which settlers seek to remove and erase Indigenous Peoples through culturally genocidal practices to expropriate and use their lands in perpetuity (Tuck & Yang, 2012). This form of colonialism aims to replace Indigenous identities with a colonial identity – often through forcible assimilation (Tuck & Yang, 2012).

Second, reconciliation has been defined as establishing and maintaining a mutually respectful relationship between Indigenous and non-Indigenous peoples (Truth and Reconciliation Commission of Canada [TRC], 2015). Third, self-determination is a First Nation's right to govern their lands, territories and resources, serving as an animating force for reconciliation by confronting legacies of empire, discrimination and cultural suppression to build social and political relations based on mutual respect (TRC, 2015).

METHODS

The research focused on BC Parks' North Coast Skeena Region (see Figure 1). BC Parks is an agency of the British Columbia Ministry of Environment and Climate Change Strategy, responsible for the designation, management and conservation of provincial parks. Its mandate is to protect natural environments and biodiversity, manage cultural values, and steward parks as a public trust for conservation, recreation, education, scientific study, and reconciliation with Indigenous Peoples (BC Parks, 2025). This was an ideal location to study reconciliation and Indigenous self-determination, as it is home to approximately 25 distinct First Nations and contains 190 parks and protected areas. The research team chose to work with the Gitxsan First Nation due to the first author's personal connections with Gitxsan Peoples, the size of their Territory (known as Laxyip), and the number of BC Parks located within it. Gitxsan Laxyip spans 33,000 km² and contains 10 BC Parks (see Figure 2).

The research employed a case study methodology that focused specifically on the institution of BC Parks, the Indigenous perspectives of Gitxsan First Nation members, and the processes of BC Parks planning and operations management, within the context of Northwestern BC. Case study research is well suited to exploring complex, context-dependent phenomena, although scholars note limitations related to generalisability, time intensity, and the potential production of large volumes of data (Yin, 2003). Because case studies are deeply embedded in place, their findings are most directly applicable to similar contexts; however, robust case studies that provide detailed, multi-faceted analysis can still generate insights that are relevant in other settings (Yin, 2003). The study's focus – Northwestern BC Parks and Gitxsan Indigenous Knowledge – mean the findings are most applicable to northern and coastal First Nations within BC Parks' planning and management system. While this study lacks complete generalisability for other parks and regions, several of the findings, particularly the practical and adaptable recommendations related to Indigenous inclusion, reconciliation and self-determination, may be more generally useful to park agencies.

The authors are White women of settler descent, and attention to position and power dynamics shaped each stage of the research. The project received approval from Gitxsan Huwilp Government in June 2022, BC Parks North Coast Skeena Region in September 2022, and the University of Northern British Columbia's Research Ethics Board in January 2023 (File No.: E2022.1019.058.00). The first author worked with Gitxsan Huwilp Government to develop a formal Research Agreement and Data-sharing Protocol in November 2022. This agreement outlined the binding expectations between the First Nation and the authors regarding the collection, use, storage, disclosure and analysis of data. Research agreements and data-sharing protocols help prevent misunderstanding and misconduct and protect community interests, information and privacy. The first author completed the First Nations Information Governance Centre's OCAP (Ownership, Control, Access and Possession) training and applied the OCAP Principles throughout the study to support Indigenous data sovereignty and information governance. Free, prior and informed consent was obtained from participants before beginning research activities.

Participant recruitment followed two nonprobability sampling approaches: purposive convenience sampling and snowball sampling. Purposive convenience sampling involves selecting participants based on practical criteria such as accessibility, availability and willingness to participate, while snowball sampling refers to identifying

Figure 2. Gitxsan First Nation Laxyip Boundary Map. Adapted from: Huwilp Gitxsan Government, 2019, Gald'm Mahlasxw, Gitxsan Laxyip. https://gitxsan.ca/wp-content/uploads/2019/03/Gitxsan_MarchNewsletter_2019.pdf. Copyright 2019 by Gitxsan Huwilp Government. Adapted with permission.

additional participants through referrals from initial participants who possess relevant knowledge or characteristics (Patton, 2015). Recruitment criteria for the study required that all BC Parks participants had direct involvement in park management planning processes, and because sharing Indigenous Knowledge is a culturally governed responsibility, only Chiefs and Elders from Gitxsan First Nation were included in the study, aligning with Indigenous governance systems and methodological guidance that identifies Chiefs and Elders as knowledge authorities (Simpson, 2001). These sampling approaches were selected intentionally due to the relational, jurisdictional and ethical considerations required when conducting research with Indigenous communities and government agencies. Chiefs' and Elders' contact information is not publicly available, and access requires trust-building, the establishment of a formal Research Agreement and Data-sharing Protocol, and direct approval from Gitxsan Huwilp Government. Similarly, identifying BC Parks employees who had contributed to park management planning required prior approval and relationship-building with BC Parks regional leadership.

Both purposive convenience and snowball sampling carry acknowledged limitations, including potential sampling

Lax An Zok Fishing Camp (Traditional Fishing Hole/Anaat) located near Gitanyow, BC © Sophia Graham

bias, non-representativeness and limited generalisability (Patton, 2015). The convenience and referral-based nature of these methods does not guarantee that participants reflect all possible perspectives within Gitxsan First Nation or BC Parks, and the findings represent the experiences of a specific subpopulation. However, in research involving Indigenous governance, Indigenous Knowledge Holders, culturally governed knowledge-sharing protocols, and specialised administrative institutions, these methods are widely used and appropriate for accessing individuals with the necessary authority, cultural knowledge, or involvement in the processes under study (Atkinson & Flint, 2001; Kovach, 2021; Smith, 2021). These institutional and cultural realities made random or statistically representative sampling for this study impossible and ethically inappropriate (Kaarbo & Beasley, 1999).

The Executive Director of Gitxsan Huwilp Government and the Regional Director and Planning Section Head of BC Parks North Coast Skeena Region assisted in identifying appropriate participants and facilitating communication. In total, 28 semi-structured interviews were conducted with Gitxsan First Nation Chiefs and Elders (n = 17) and BC Parks staff (n = 11) between March and July 2023. There are approximately 11 employees in BC Parks North Coast Skeena Region that contribute to park management planning. Gitxsan Huwilp Government consists of 60 Hereditary Chiefs and 38 Wilps (houses) that govern the Territory.

All interviews were conducted individually, audio-recorded and manually transcribed verbatim. Transcripts were analysed using thematic analysis in NVivo (QSR International Pty Ltd., 2023). Thematic analysis seeks to identify patterns of meaning within qualitative data (Aronson, 1995), and in this project both data-driven (inductive) and theory-informed (deductive) coding strategies were employed to categorise, interpret and synthesise findings (Cope, 2021).

RESULTS

To protect anonymity, participants were given pseudonyms. With permission, in the study's writeup, Gitxsan First Nation participants are identified by community and BC Parks participants by job title. The results are organised around three key themes – Indigenous inclusion, reconciliation and self-determination – with exemplar quotes provided to illustrate each finding.

Indigenous inclusion

Sixteen of the 17 Gitxsan First Nation participants described longstanding tensions with the Province stemming from settler colonialism, the Residential School system, and assimilation policies. These histories led to a deep mistrust of the government, making collaboration difficult. Krystal (Chief, Gitwangak) reflected: "Our ancient traditional livelihoods and political systems were broken down by the federal and provincial governments of Canada and BC … so how do you trust them when they say they want to work together?" Danni (Chief, Gitwangak) noted how the

repression of cultural practices affected her family: "My mom and grandma remember not being able to use parks for medicine gathering anymore, or other sustenance uses practiced by my Wilp there for thousands of years before BC Parks were established." These experiences illustrate how the erasure of Gitxsan cultural practices in parks has contributed to present-day challenges in trust and inclusion.

Eight of the 11 BC Parks employees identified First Nations' historic mistrust of the provincial government as a major social and political barrier to inclusion. Casey (Operations) expressed the need for employees to "build relationships with First Nations that have historically been undermined, mistreated, and exploited by government policies and relationships". Nelly (Operations) noted how staff are often viewed with scepticism: "Being a provincial representative … unless you have those good relationships, you're just whitewashed with all the other ministries and agencies." Relationship-building is often further complicated by frequent staff turnover. Five BC Parks participants highlighted how staff changes weaken continuity and can damage fragile relationships with First Nations. Limited regional capacity and shifting personnel challenge BC Parks' ability to build and sustain trust. All 11 BC Parks employees stressed that hiring regionally located Indigenous Relations staff to support consultation, engagement and relationship-building with First Nations would be beneficial. As Casey (Operations) explained: "… each region really needs its own Indigenous Relations folks so that they can understand the nuances of each Nation". This was identified as a consistent and urgent priority across the region. The Gitxsan Chiefs and Elders explained how their laws, culture and traditions guide relations with BC Parks, with 14 participants citing the examples of their trespass law and ban on recreational fishing within their Territory and on the Anaat (i.e. traditional fishing holes). As Wesley (Elder, Gitwangak) noted: "Within our culture, it is taught that you do not play with your food. We are against recreational fishing, and this is tied to our Ayook [Gitxsan law]." Mary (Chief, Glen Vowell) added: "Sport fishermen are banned from the Gitxsan Territory, and the Fishing and Angling Permits issued by the BC government do not authorise trespass." Since 2019, Hereditary Chiefs have enforced these laws due to declining salmon, yet the Province continues to issue fishing licences and campers still fish in parks in Gitxsan Territory. These tensions illustrate the difficulty of aligning provincial regulations with Gitxsan governance.

Totem poles in Gitwangak/Kitwanga, BC, within Gitxsan First Nation Territory (Laxyip). These totem poles represent one of the most extensive and oldest collections of original totem poles found in their original village context within BC, with some dating back to the mid-19th century (c. 1840-1905) © Sophia Graham

Reconciliation

Reconciliation was discussed by both BC Parks and Gitxsan First Nation participants as a complex and evolving process, with no single definition. The participants described reconciliation as context-specific, requiring relationship-building, sincerity and respect. All 11 BC Parks employees explained that reconciliation is dependent on collaboration, ongoing engagement, relationship building, and partnerships. As Dennis (Operations) highlighted: "It's working with the Nations, trying to figure out how to best work with the Nation on their reconciliation goals … whatever that looks like for the Nation." Sixteen Gitxsan First Nation participants explained that reconciliation should be centred around humility, respect and kindness. Roy (Chief, Gitanmaax) stated: "Kindness and respect go a long way with Chiefs and Elders – if you don't show respect, you don't get it in return." Twelve Gitxsan participants discussed reconciliation in terms of participating in cultural activities when invited and learning the culture, for example, Donald (Chief, Kispiox) said: "Go do those small things. When you're invited, attend the ceremonies, sit at the feasts, go to the fish camps, experience and learn the culture … and respect it." Fifteen Gitxsan participants underlined the importance of sustained, sincere communication. Spring (Chief, Kispiox) advised BC Parks: "Reach out, be curious, be sincere, be respectful and polite. Then, stay in contact with those communities." These findings show that reconciliation is an ongoing practice grounded in relationships and community-specific priorities, not broad government frameworks.

Both participant groups viewed territorial acknowledgements and co-management (viz., shared park management decision-making and responsibilities

Gitanmaax/Hazelton, BC, with Hagwilget Peak (Sti gyo'den) in the background, meaning "stand alone mountain" and "big brother to the Seven Sisters Range." This is a prominent, culturally significant peak located within Gitxsan First Nation Territory (Laxyip) © Sophia Graham

by both provincial authorities and Indigenous governments) as meaningful steps towards reconciliation. All 17 Gitxsan First Nation participants asserted that signage projects acknowledging Indigenous territory were important for reconciliation. Roy (Chief, Gitanmaax) stated: "All we want is acknowledgement… *tell the truth of this land*. This land is Gitxsan land." Similarly, Eddie (Elder, Gitanmaax) urged: "Acknowledge our Territory, let us tell our story. And that's it." Twelve Chiefs and Elders stressed the use of Gitxsanimx/Gitksenimx (Gitxsan language) in signage as part of reconciliation. Gladys (Elder, Kispiox) explained: "All signs in parks should incorporate the Indigenous language." Fourteen Gitxsan participants also underlined co-management as critical. Fred (Elder, Glen Vowell) noted: "Unless we have co-management of the parks, how we wish to manage our land is not being incorporated." Roy (Chief, Gitanmaax) was more direct: "Land back! They need policy or legislation changed to allow for co-management." In contrast, eight BC Parks participants viewed reconciliation as developing incrementally through collaborative planning and partnerships. Tammy (Operations) explained that "Reconciliation is dependent on collaboration, ongoing engagement … making those relationships and building partnerships in working together." Stanley (Planning) reflected: "Renaming parks with Indigenous names and telling both stories is a way I've seen BC Parks do reconciliation." While BC Parks has embraced steps like signage and collaborative arrangements, Gitxsan participants consistently indicated the need for deeper systemic changes – particularly shared governance.

Self-determination

All 17 Gitxsan participants defined self-determination as having more power, agency and governance over their Territory. Mary (Chief, Glen Vowell) stated: "We want more control over our land and waters … more stake in parks, in the natural resources and park visitation decisions." Fifteen Gitxsan participants described self-determination as directly tied to land and governance. Desiree (Elder, Kispiox) declared: "This is our land. It will always be our land. And we want it back." These views underscored that self-determination in park management must go beyond consultation and include shared or full Indigenous governance over lands and resources. While BC Parks has moved towards collaborative arrangements, statutory decision-making remains with the Province, which creates a disparity between reconciliation rhetoric and actual Indigenous authority.

BC Parks is implementing programmes to include First Nations in operations management, with seven participants highlighting the Indigenous Guardian Shared Compliance and Enforcement programme. This programme trains Indigenous Guardians alongside Park Rangers and grants them equivalent legal authority while they remain employed by their Nations. As Dennis (Operations) explained: "There's a shared compliance and enforcement pilot programme role where we … appoint select Indigenous Guardians from each Nation with Park Act authorities – similar to that of a Park Ranger – but they are employed by their Nation, not BC Parks." This initiative represents a practical step towards supporting Indigenous self-determination and partnership in park governance.

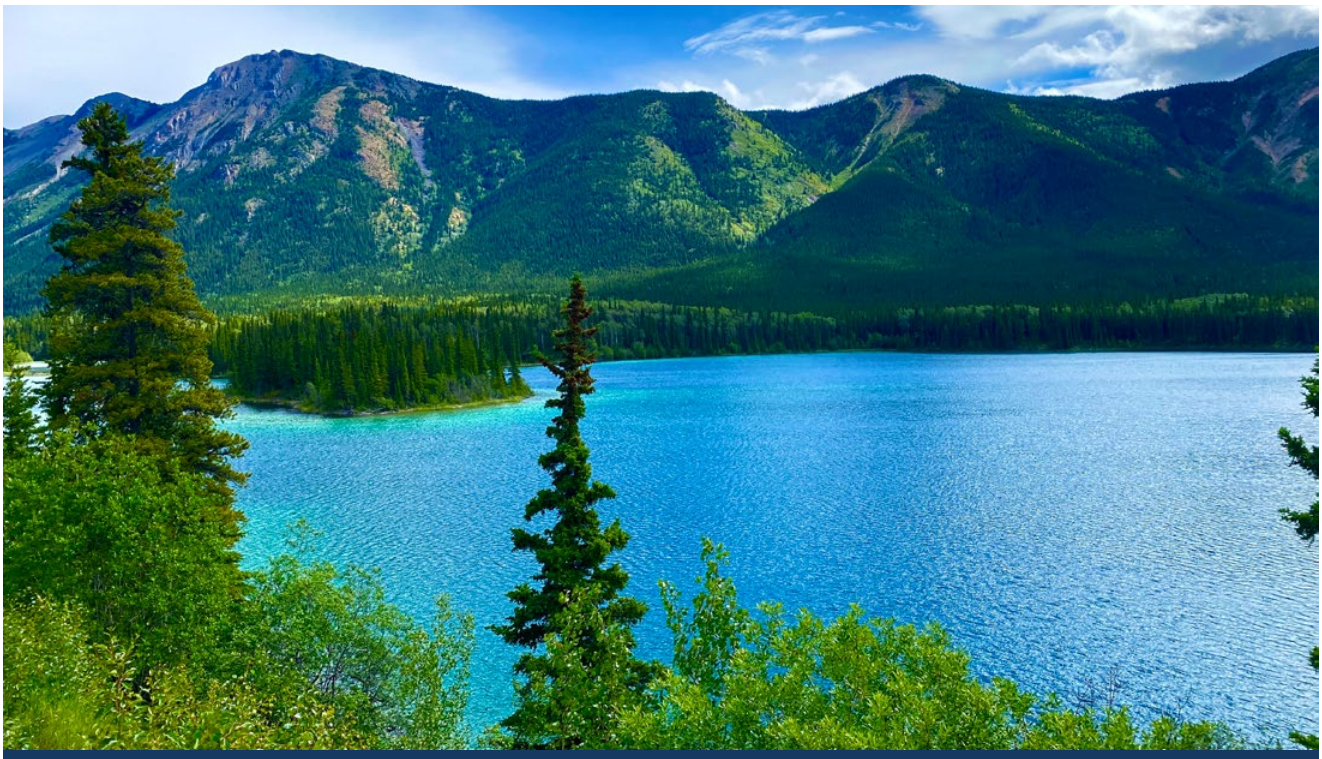
Thirteen Gitxsan participants and eight BC Parks participants identified IPCAs as a tool for asserting self-determination. Herb (Chief, Gitanyow) discussed Wilp Wii Litsxw Meziadin IPCA: "There was much pressure on us to … protect that area to ensure food security for our Nation … When BC was taking too long … we had to act." Stanley (Planning) acknowledged: "From a self-determination standpoint, I can see why Nations proceed with designations that they see as necessary." Although BC Parks employees expressed support for greater Indigenous governance, existing policies continue to impose constraints, and six participants specifically noted these limitations in their interviews. Theresa (Planning) admitted: "We are not lined up for legislative changes at least for five years. That's really challenging because we have to navigate that while Nations are wanting to do all sorts of interesting things in parks that have never been done." Eight BC Parks participants noted the likelihood of new legislation and major policy changes in the coming years. Kenneth (Planning) offered cautious optimism: "We could be looking at new designation tools for First Nations-run parks and protected areas." These findings show that while BC Parks recognises the significance of self-determination, it remains constrained by existing policy frameworks – leaving IPCAs as a promising, community-led solution for now.

DISCUSSION

The findings from this study align with previous research identifying policy, programme and hiring capacity challenges faced by park planners and operations managers in including Indigenous Peoples (Kadykalo et al., 2021; Spielmann & Unger, 2000). Gitxsan members emphasised the importance of BC Parks staff becoming educated about their laws, culture and history, noting that this improves engagement and builds trust. They stressed two critical laws – the prohibition of trespassing and ban on recreational fishing on the Anaat – which are overlooked by government policies. The continued issuance of licences permitting anglers to fish and trespass on Gitxsan lands undermines the Nation's rights, sovereignty and reliance on their traditional fishing holes. In Gitxsan Territory, all BC Parks allow fishing, and some allow hunting, directly conflicting with Gitxsan laws forbidding trespass and sport fishing to safeguard resources. To uphold DRIPA (2019), BC Parks should recognise and implement Gitxsan laws alongside provincial regulations to sustain cultural practices, stewardship and food sovereignty – key elements of First Nations' identities and rights. BC Parks employees noted that historical injustices and mistrust complicate their relationships with First Nations, challenges made worse by frequent staff turnover and limited regional capacity. Relationship-building is time-intensive and often occurs without formal recognition, dedicated resources or performance incentives, placing additional strain on staff capacity. Hiring regionally based Indigenous Relations specialists was identified as a way to support planners and operations staff in consultation, engagement and relationship-building.

A central finding was that reconciliation is a complex, multifaceted and context-specific process that is difficult to define, measure and achieve, especially within the realm of park planning and management. Gitxsan members emphasised that reconciliation varies across Indigenous communities, reflecting diverse values, histories and priorities. This insight aligns closely with Finegan (2018) and Corntassel et al. (2009), who argue that reconciliation must be rooted in community-based forms of justice that go beyond universal or governmental definitions. Meaningful engagement, territorial acknowledgements that name Indigenous communities and recognise colonial harm (Finegan, 2018), and education about colonial histories are crucial for advancing reconciliation. However, critiques from LaPorte (2023) and others caution that acknowledgements without concrete actions risk tokenism. Tokenism is the practice of doing something at a minimal, symbolic level to mitigate criticism and give the appearance that people are being treated fairly. Genuine reconciliation must involve acknowledging past atrocities, engaging with intergenerational trauma (Snelgrove et al., 2014; Tuck & Yang, 2012), and transforming parks from sites of colonial exclusion to places of Indigenous presence, healing and self-determination (Rebonne, 2024).

Building respectful relationships and partnerships with Indigenous communities is indispensable to reconciliation, with Gitxsan participants and BC Parks employees highlighting co-management as one approach. Yet, literature has critiqued co-management for maintaining colonial power structures and not fully restoring Indigenous authority or addressing restorative justice (Finegan, 2018; Langdon et al., 2010). Nevertheless, Parks Canada's (2023) guide for supporting Indigenous leadership in park planning outlines opportunities for co-management. A similar guide from BC Parks could help advance Indigenous self-determination and make opportunities for collaboration more accessible to First Nations. Furthermore, IPCAs represent an emerging pathway for reconciliation and self-determination when supported in line with Indigenous leadership's vision, requiring dismantling settler institutional barriers to enable



Tā Ch'ilā Provincial Park (formerly Boya Lake Provincial Park) in BC Parks North Coast Skeena Region. This scenic and remote park is located on the Stewart-Cassiar Highway in Northern BC © Sophia Graham

Indigenous stewardship and decolonial futures (Townsend & Roth, 2023).

Gitxsan First Nation Chiefs and Elders and BC Parks employees concurred that Indigenous self-determination in park governance is vital and often intertwined with reconciliation. Many BC Parks staff equated increasing Indigenous agency with advancing reconciliation. BC Parks participants envisioned greater co-management frameworks or the return of ownership and management of parklands to First Nations. The Land Back movement strongly echoes these calls for Indigenous sovereignty and land restitution, framing self-determination as the restoration of Indigenous stewardship and governance over ancestral territories (NDN Collective, 2020). Within the Gitxsan communities, diverse perspectives on self-determination range from co-management agreements and Indigenous programmes to unequivocal demands to "get our land back", underscoring the need for tailored, community-based engagement to support complex and varied Indigenous aspirations.

Programmes such as the Indigenous Guardian Shared Compliance and Enforcement programme exemplify practical steps towards increasing Indigenous governance by training First Nations members to exercise legal authority over land management alongside government Park Rangers (Government of British Columbia, 2022). Reed et al. (2021) found that such guardian programmes across Canada, Australia, Aotearoa-New Zealand and the United States support Indigenous environmental governance by empowering Indigenous resistance and reconstituting power relations. IPCAs are a particularly promising mechanism for Indigenous self-determination, enabling Indigenous Peoples to govern lands according to their cultural values, laws and traditions while fostering economic development and cultural revitalisation (Murray & Burrows, 2017; Tran et al., 2020). The Wilp Wii Litsxw Meziadin IPCA, established by Gitxsan First Nation in response to environmental threats, illustrates how IPCAs can assert Indigenous authority in the absence of governmental support (Gitanyow Hereditary Chiefs and Hlimoo Sustainable Solutions, 2023). BC Parks staff anticipated more IPCAs emerging and recommended supporting First Nations through partnership, public recognition and education initiatives to respect Indigenous laws and culture and promote self-determination within park governance.

Recommendations for park agencies and practitioners

The findings from this study highlight the urgent need for park agencies to move beyond consultation and symbolic gestures towards tangible actions that support reconciliation and Indigenous self-determination. Addressing structural barriers, recognising Indigenous laws and cultural protocols, and fostering long-term, trust-based relationships are essential to transforming parks into spaces of Indigenous presence and governance. Co-management frameworks,

Guardian programmes and IPCAs offer practical pathways for advancing Indigenous governance while respecting community priorities and knowledge.

Building on these insights, the following recommendations provide actionable guidance for park agencies and practitioners. To support reconciliation in park planning and operations management, agencies should recognise and respect the diverse cultural values, histories and priorities of Indigenous communities; adopt meaningful, community-based reconciliation approaches rooted in Indigenous justice systems and healing processes; document Nation-specific priorities to guide planning; improve consultation processes in line with modern reconciliatory legislation; engage consistently with Indigenous communities at the local level to understand varied perspectives and avoid one-size-fits-all strategies; incorporate Indigenous Knowledges, laws and cultural protocols into park management policies, educational materials and signage; promote public and agency awareness of Indigenous history, laws and the cultural significance of protected areas; ensure reconciliation efforts are ongoing, adaptable and context-specific; facilitate Indigenous participation in decision-making and co-create governance frameworks that reflect Indigenous worldviews; and employ regionally based Indigenous Relations specialists to strengthen consultation, engagement and relationship-building.

To enhance Indigenous self-determination in park planning and operations management, agencies should support the establishment and expansion of co-management frameworks that grant First Nations shared or full ownership and management of parklands; recognise and actively support IPCAs, including publicly partnering with Indigenous communities to advance their creation and stewardship; facilitate Indigenous Guardian programmes that empower Indigenous Peoples with authority to manage, monitor and enforce regulations on their territories; provide funding and institutional support for Indigenous-led stewardship initiatives; integrate Indigenous laws and Knowledge into park policies, operations, tourism management, wildlife stewardship and land-use planning, including economic and cultural aspects; engage in legislative reforms and policy development to enhance Indigenous inclusion and governance rights; and create accessible resources for Indigenous Peoples and Nations outlining opportunities for Indigenous engagement, collaboration and governance to support transparency, awareness and community-driven decision-making.

These recommendations respond directly to the power imbalances, policy barriers and socio-political factors that continue to limit Indigenous inclusion in protected-area governance. They are intended to support concrete action towards reconciliation and self-determination by promoting structural change in park planning and operations management.

CONCLUSIONS

This study shows that advancing reconciliation and Indigenous self-determination in parks requires moving beyond symbolic gestures towards structural transformation and meaningful actions. Respectful, long-term engagement, empowerment of Indigenous governance through shared authority, and support for Indigenous-led initiatives are central to building more equitable, inclusive and socially just protected-area systems. The findings highlight how settler-colonial histories and ongoing political dynamics continue to shape trust and engagement between First Nations and park agencies and reveal the diversity of Indigenous perspectives on reconciliation. While territorial acknowledgements and Indigenous language signage are meaningful, participants stressed that these gestures are insufficient without sustained collaboration, structural change and governance that reflects each Nation's laws, values and priorities.

Future research should continue to explore Indigenous inclusion, reconciliation and self-determination in parks and environmental governance, especially in relation to shifting political contexts and evolving legislation around reconciliation and self-determination. Studies that examine how co-management frameworks, IPCAs and Indigenous Guardian programmes are operationalised across regions will help illuminate how Indigenous governance can be strengthened in practice. Expanding research to include a wider range of Indigenous perspectives will deepen understanding of community-specific reconciliation goals and governance aspirations. Further investigation into the recognition and application of Indigenous laws in park management, and the balance between visitation, conservation and cultural rights and values, will be essential to developing policies that support Indigenous sovereignty.

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RÉSUMÉ

La réconciliation et l'autodétermination autochtone revêtent une importance mondiale pour la gestion des réseaux d'aires protégées, car ces espaces constituent des lieux clés où se croisent la conservation, l'histoire coloniale et les luttes contemporaines pour la gouvernance et l'autorité autochtones. Cette étude de cas examine le rôle de la réconciliation et de l'autodétermination autochtone dans la région du Nord-Ouest du réseau des parcs provinciaux de la Colombie-Britannique (C.-B.), au Canada. Les objectifs étaient d'identifier les obstacles sociopolitiques à l'inclusion des Autochtones dans la planification et la gestion opérationnelle de BC Parks, et d'élaborer des recommandations pratiques à l'intention des planificateurs et des gestionnaires opérationnels des parcs afin de soutenir la réconciliation et l'autodétermination autochtone dans leur travail. Vingt-huit entretiens semi-structurés menés auprès de chefs et d'anciens Gitxsan ainsi que du personnel de BC Parks ont révélé que le colonialisme des colons, les pensionnats indiens et les politiques d'assimilation ont engendré une méfiance de longue date dans la province. Les participants de BC Parks ont appelé à la mise en place de spécialistes des relations avec les Autochtones au niveau régional, à la cogestion des parcs et des zones protégées et conservées autochtones afin de soutenir l'engagement et l'établissement de relations. Les participants gitxsan ont souligné que la réconciliation est spécifique à chaque communauté et que l'autodétermination nécessite un contrôle, une capacité d'action et une gouvernance accrus sur leurs territoires. L'article soutient qu'une inclusion significative des peuples autochtones dans la planification et la gestion opérationnelle des parcs est essentielle pour faire progresser la réconciliation, en soutenant l'autodétermination et en s'attaquant à des enjeux sociaux et environnementaux plus larges.

RESUMEN

La reconciliación y la autodeterminación indígena revisten importancia a nivel mundial para la gestión de los sistemas de áreas protegidas, ya que estos paisajes constituyen escenarios clave en los que convergen la conservación, la historia colonial y las luchas contemporáneas por la gobernanza y la autoridad indígenas. Este estudio de caso examina el papel de la reconciliación y la autodeterminación indígena en la región noroeste del sistema de parques provinciales de Columbia Británica (CB), en Canadá. Los objetivos eran identificar las barreras sociopolíticas que impiden la inclusión indígena en la planificación y la gestión operativa de BC Parks, así como elaborar recomendaciones prácticas para que los planificadores de parques y los gestores operativos apoyen la reconciliación y la autodeterminación indígena en su trabajo. Veintiocho entrevistas semiestructuradas con jefes y ancianos gitxsan y con personal de BC Parks revelaron que el colonialismo de los colonos, los internados y las políticas de asimilación han generado una desconfianza de larga data en la provincia. Los participantes de BC Parks pidieron especialistas en relaciones indígenas ubicados a nivel regional, así como la cogestión de los parques y de las áreas protegidas y conservadas indígenas para apoyar la participación y el establecimiento de relaciones. Los participantes gitxsan hicieron hincapié en que la reconciliación es específica de cada comunidad y que la autodeterminación requiere un mayor control, capacidad de acción y gobernanza sobre sus territorios. Este artículo sostiene que la inclusión efectiva de los pueblos indígenas en la planificación y la gestión operativa de los parques es esencial para impulsar la reconciliación, apoyar la autodeterminación y abordar cuestiones sociales y medioambientales más amplias.

REVITALISING INDIGENOUS KNOWLEDGE TO SUPPORT SUSTAINABLE MANAGEMENT OF RAMSAR WETLANDS IN KILOMBERO VALLEY, TANZANIA

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ABSTRACT

The Kilombero Valley Ramsar Site supports 1.5 million livelihoods through wetland ecosystem services historically stewarded by Indigenous Peoples. This study documented Indigenous knowledge practices, identified continuity barriers, and assessed integration potential across 11 villages using 93 key informant interviews, 22 gender-disaggregated focus groups, 59 household interviews, and communication, education and public awareness programmes (n = 796 participants). Clan governance through escalating penalties (fishing bans, goat fines, grain confiscation) and sacred site protection sustained fisheries and forest cover pre-1990s. However, its 95 per cent abandonment over 30–50 years, driven by immigration of of many tribes including Sukuma people (~ 70 per cent), science-only curricula (~ 80 per cent youth scepticism), religion, globalisation and unenforceable village by-laws, have triggered pollution (~ 80 per cent waterbodies), destructive fishing, and forest conversion. CEPA training revealed strong support for hybrid governance: 85 per cent adult trainees favoured joint patrols of traditional healers (*mbui*) and rangers; and improved sacred site recognition among pupils (n = 490). Formal governance failures (remote enforcement gaps, absent legitimacy) underpin community demands for Indigenous knowledge systems reintegration. Kilombero Valley Ramsar site demonstrates the urgent need for hybrid conservation approaches that draw on surviving surviving clan authority to achieve Ramsar wise use principles where top-down approaches have failed.

Key words: Indigenous knowledge systems; Natural resources management; Ramsar site; Ramsar Convention; Community based conservation

INTRODUCTION

Indigenous knowledge systems (IKS) are embedded in spiritual beliefs and oral traditions that are unique to specific cultures. They are descriptive, place-based and rarely written, relying on intergenerational transmission for continuity. This dependence on memory renders IKS vulnerable, as knowledge may be lost or transformed when younger generations fail to fully inherit traditions from elders (Sillitoe & Marzano, 2009). The absence of systematic documentation further heightens the risk of erosion and extinction. Wetlands are among the world's most productive ecosystems, providing water purification, flood regulation, biodiversity support, and livelihoods for millions, services that IKS have sustained for millennia (Bell et al., 2025; IPBES, 2023; Millennium Ecosystem Assessment, 2005; Ramsar Convention Secretariat, 2016a). The Ramsar Convention, ratified by Tanzania in 2000, explicitly recognises culture and Indigenous knowledge in wetland conservation through Article 3.1 and subsequent resolutions, including Resolution VII.8 (1999) on cultural values, Resolution X.3 (2008) on traditional knowledge and management practices, and Resolution XII.11 (2015) on synergies with the Convention on Biological Diversity (Ramsar Convention Secretariat, 2023). Together, these instruments promote the integration of Indigenous and Local Knowledge (ILK) into the Convention's 'wise use' principle, which aims to maintain ecological character while supporting human well-being (Finlayson et al., 2011; Ramsar Convention Secretariat, 2010).

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Globally, IKS/ILK are defined as place-based, experiential systems co-evolved by Indigenous Peoples and local communities (IPLCs), integrating empirical observation, spiritual values, and adaptive practices for ecosystem stewardship (Pascual et al., 2022; Tengö et al., 2014). This framing aligns with the Kunming–Montreal Global Biodiversity Framework Target 3, which mandates the integration of IPLCs' knowledge into biodiversity strategies by 2030 (CBD, 2022), and with IUCN Best Practice Guideline No. 20, which advocates participatory co-production in protected areas (Borrini-Feyerabend & Hill, 2013). In the Kilombero Valley Ramsar Site (KVRS), IKS manifest as clan-regulated taboos, rituals and customary rules (Emmanuel & Kweka, 2024) that are directly relevant for addressing governance gaps in community-led wise use. Historically, such systems have embedded ecological understanding within cultural and spiritual practice, guiding wetland management through oral traditions and customary law (Diawuo & Issifu, 2015; Hill et al., 2020; UNESCO, 2013).

The KVRS, designated in 2002 (Ramsar Convention Secretariat, 2002), is Tanzania's largest freshwater wetland, covering over 796,000 ha in the Rufiji River Basin and contributing more than 60 per cent of basin freshwater to sustain fisheries, wildlife and livelihoods under seasonal flooding (MNRT, 2004a; MNRT, 2018; URT, 2002). Its current Integrated Management Plan relies largely on top-down enforcement and faces low compliance, particularly in relation to encroachment (MNRT, 2018). Integrating IKS, through clan governance and sacred sites, offers a pathway to intercultural 'wise use', consistent with Ramsar Resolution XII.11 and Strategic Plan Target 12 (Ramsar Convention Secretariat, 2016b). Indigenous groups, including the Pogoro and Ndamba, and clans of the Bena, Hehe and Ngoni, have long applied intergenerational ecological knowledge of species behaviour, seasonal cycles, and hydrological dynamics to manage KVRS resources. Across Africa, sacred landscapes regulated by clan institutions have contributed to biodiversity conservation and ecosystem resilience (Diawuo & Issifu, 2015; Udgaonkar, 2002). ILK promotes sustainable resource use (Bell et al., 2025; Cameron, 2020) by embedding spiritual sanctions within community governance, enabling collective compliance without external enforcement (Berkes, 2017; Tengö et al., 2014). These systems are increasingly disrupted by immigration, monoculture expansion, infrastructure-driven deforestation, and global commodity chains (IPBES, 2023; Kangalawe & Liwenga, 2005; Msoffe et al., 2019; Wilson et al., 2024), threatening the ecological integrity of Ramsar sites.

Despite their significance, ILK and cultural heritage remain poorly documented in Tanzanian wetlands. This study addresses this gap by: (i) documenting ILK in KVRS; (ii) identifying challenges to intergenerational continuity; and (iii) exploring pathways for integration with formal governance frameworks, including Ramsar and IUCN mechanisms. The study contributes to intercultural governance by strengthening community well-being, sustainability and the operationalisation of Ramsar's wise use principles and associated resolutions.

METHODS

Study area

This study was conducted in 11 villages within the KVRS, East Africa's largest low-altitude freshwater wetland located in the region's founding countries (Tanzania, Kenya and Uganda) (MNRT, 2004b). Designated in 2002, the KVRS lies at approximately 8°40′S, 36°10′E, covering about 796,735 ha with a catchment of roughly 40,000 km² (Materu et al., 2019; Ramsar Convention Secretariat, 2002). It is bounded by the Eastern Arc Mountains, including the Udzungwa catchment to the northwest and the Mahenge escarpment to the southeast (Materu et al., 2021; Ramsar Convention Secretariat, 2002). The valley is characterised by permanent and seasonal rivers that supply freshwater and support diverse livelihoods such as farming, fishing and livestock keeping (Materu et al., 2021). The climate is sub-humid, with average annual temperatures around 26 °C. Rainfall is bimodal, with short rains from December to February and long rains from March to June, producing about 1,600 mm annually (Bakengesa et al., 2011).

According to the 2022 Population and Housing Census, the KVRS supports ~1.5 million people across Kilombero (1,000,000), Malinyi (225,126) and Ulanga (232,895) districts (NBS, 2023). With an annual growth rate of 3.2 per cent, populations are projected to rise markedly by 2050, increasing pressure on wetland resources, highlighting the urgency of sustainable management aligned with Tanzania's Vision 2050 and the SDGs, particularly SDG 6 on water, SDG 15 on ecosystems, and SDG 13 on climate action. Indigenous Pogoro and Ndamba (fishing communities) coexist with immigrant Sukuma pastoralists, creating diverse governance systems. Native clans historically managed sacred sites through taboos and rituals, while pastoral influx since the 1990s drives rice expansion and wetland conversion (Kangalawe & Liwenga, 2005).

Data collection

Traditional, Indigenous and local knowledge, innovations and practices of managing natural resources in the KVRS were assessed and documented through social surveys and CEPA (Communication, Education

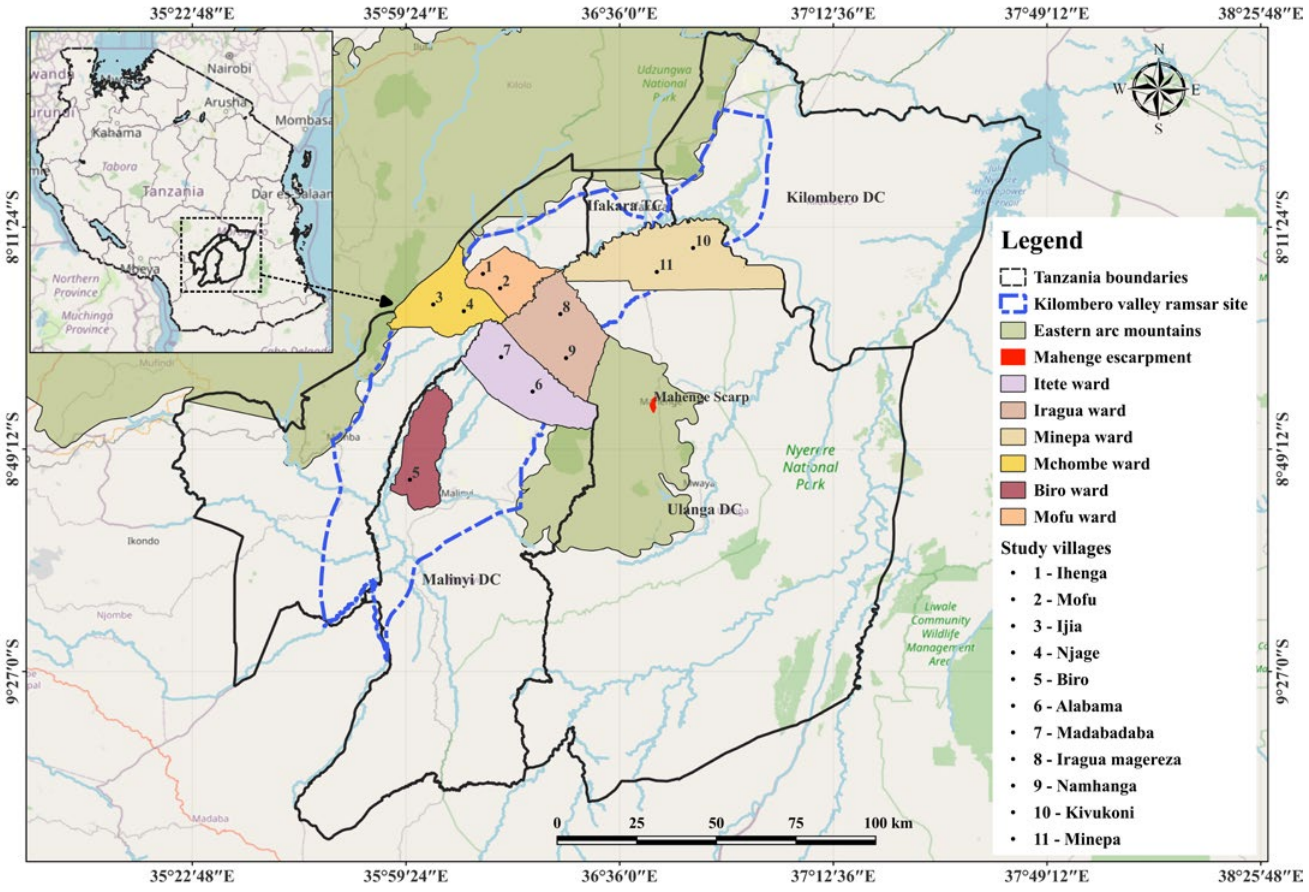

Figure 1. A map of Tanzania showing the location of the Kilombero Valley Ramsar Site and the study villages

and Public Awareness) programmes, a widely used approach in environmental conservation, climate action, biodiversity management, and sustainable development to influence people's knowledge, attitudes and behaviours. Based on the socio-ecological gradient of the study area (riparian fishers, pastoralists community and mixed farming clans; Online Supplementary Table S1), this study was conducted in 11 villages, namely; Biro, Alabama and Madabadaba (Malinyi District); Iragua-Magereza, Namhanga, Minepa and Kivukoni (Ulanga District); and Ijia, Njage, Mofu and Ihenga (Mlimba District) (Figure 1).

Key informant interviews (KIIs): A heterogeneous purposive sample of 93 key informants (Online Supplementary Table S2) was systematically selected across district, ward and village administrative levels from seven sectors, strategically designed to capture the complete IKS transmission continuum (Palinkas et al., 2015; Tongco, 2007). This well-established non-probability approach targets information-rich respondents whose positional expertise spans knowledge custodians, transmission disruptors, and governance implementers.

Traditional healers (*mbui*, n = 9) and village elders (*mzee maarufu*, n = 11) provided oral histories of clan governance, taboos and rituals, complemented by religious leaders (n = 19) preserving spiritual foundations of resource stewardship (Tongco, 2007). Education officers (n = 14) and ward extension officers (n = 6) represented institutional forces driving generational knowledge displacement through science-centric curricula and formalisation policies.

KIIs with forest officers (n = 3), livestock and fisheries officers (n = 6), village executive officers (n = 11) and community development officers (n = 3) offered critical insights into formal governance capacity for hybrid IKS integration (Palinkas et al., 2015).

Focus group discussions (FGDs): FGDs comprised two gender-disaggregated sessions per village (one male, one female) across all 11 study villages (Online Supplementary Table S2), yielding 22 groups strategically designed to capture the socio-cultural dynamics of Indigenous knowledge transmission (Krueger & Casey, 2015).

Household interviews (HHIs): Household interviews (n = 59) employed participatory resource mapping to document generational continuity barriers and integration potential, spatially representing clan-

owned waterbodies, sacred forests, and regulated resource harvesting practices and any gendered access restrictions or spiritual prohibition / protocols.

CEPA training programmes: Communication, education and public awareness training programmes test community receptivity to integrating IKS into formal governance while generating evidence on generational knowledge gaps and scalability constraints. Adult training (n = 306; 162 males, 144 females) across nine villages evaluated integration feasibility between clan governance and statutory mechanisms. Participants, including hamlet representatives, environmental committees, executive officers, extension officers and teachers, received Kiswahili manuals covering wetland ecology, Ramsar designation, threats, and wise use principles. Field visits contrasted conserved sacred sites with degraded zones like rice conversion, complemented by cultural events and 18 seminars (nine villages, nine schools). The information obtained from KIIs and FGDs specifically probed community-government officers' collaboration models and wise-use education scalability.

Pupil training (n = 490; grades 2–6) quantified IKS transmission across generations, targeting environmental club members. Pre/post-tests measured recognition of sacred sites and ILK practices. These interventions produced baseline metrics for knowledge recovery potential while identifying youth scepticism towards spiritual foundations.

Ethical consideration

Research permits were obtained from Sokoine University of Agriculture (DPRTC/R/126/SMCOSE/2/2019) and the Regional Administrative Authority (SUA/SM-CoSE/RS/01). Informed photo release and participation consent were secured, ensuring voluntary participation, withdrawal rights and participant confidentiality. To address the sensitivity of Indigenous knowledge, cultural norms were respected and potential harm minimised. Training materials were provided in Kiswahili to ensure accessibility. The study adhered to principles of transparency, respect and reciprocity, with findings shared with community stakeholders to strengthen empowerment and sustainable resource management.

RESULTS

Documented IKS and ILK practices

Clan-based IKS and ILK historically governed wetland and forest resource use across the KVRS through customary rules, taboos, rituals and clan justice mechanisms. KIIs with village elders (*mzee maarufu*) and traditional healers (*mbui*) revealed that offences such as poison fishing, harvesting fingerlings, cutting

Photo 1: A traditional healer's '*mbui*' hut in a sacred forest, visited only for rituals, where tree cutting is strictly prohibited © S. F. Materu

sacred trees or burning wetlands were addressed through clan council hearings. Penalties followed an escalating structure, beginning with temporary fishing bans, followed by ritual fines such as goat sacrifices and, in cases of repeated violations, confiscation of grain stores until cleansing rituals were performed. As one elder explained, "Every youth attended these hearings to learn why swamps must rest during the dry season" [Male elder FGD, Kivukoni].

Community compliance relied primarily on shared spiritual beliefs rather than formal enforcement. HHIs across fisher, farmer and pastoralist households consistently indicated communal vigilance over wetlands and forests, "No one needed armed guards; everyone watched each other because the swamp belonged to all clans" [Fisher HHI, Namhanga]. Spiritual sanctions were widely regarded as effective deterrents, with respondents frequently citing fear of ancestral punishment. A farmer in Mofu noted, "Burning sacred grass during the dry season calls lightning from the ancestors, our grandparents witnessed this" [HHI, Mofu]. Despite increasing pressures, a few sacred sites remain actively protected. Traditional healers reported restricted access to sacred forests areas such as Magombero and ritual swamps including Kibasila and Ngapemba, where entry and resource extraction are prohibited except during specific ceremonies (Photo 1). These sites were consistently identified during FGDs as critical dry-season refugia for birds and other wetland species (Photo 2).

Photo 2. Foraging water birds in the wetlands, highlighting the rich biodiversity of endemic and migratory bird species © S. F. Materu

Photo 3. A fallen tree and fire illustrate the process of clearing forest land for new farms; including tree cutting, charcoal production, and removal of remaining logs in preparation for the planting season © E. J. Ligate

Clan-owned waterbodies were governed by strict harvesting regulations designed to sustain fish populations. Ponds such as Luvili, Lusongo and Ndawihachi permitted only the capture of mature fish using traditional fishing gear, including *ndanga*, scoop nets and *mgono* traps. Harvesting of fingerlings was prohibited, and seasonal fishing restrictions were enforced. Gendered access rules excluded women from entering certain ponds, based on spiritual protocols intended to prevent contamination of waterbodies. "Small fish stay to grow; women never enter these ponds because washing angers the fish spirits" [KII, Njage]. Folklore and ritual narratives reinforced compliance, linking violations to ecological consequences, such as the drying of ponds following unauthorised harvesting. "One boy took fingerlings from Lusongo; next day the pond turned to mud. He brought a goat and performed the cleansing dance" (Njage FGD).

Indigenous fire management practices reflected ecological awareness embedded in spiritual norms. Taboos prohibited burning green grasslands, wetlands and sacred areas, with fire associated with ancestral punishment and ecological imbalance. KIIs with *mbui* healers from Madabadaba, Ijia and Iragua-Magereza emphasised that ritual trees and sacred groves historically functioned as fire refuges within the landscape. Although agricultural expansion, charcoal production and land clearing have increased fire incidence in recent decades (Photo 3), some ritual trees and sacred forest patches remain protected due to continued respect for spiritual authority.

Barriers to IKS continuity

A substantial erosion of IKS and ILK was consistently reported across all data collection methods. KIIs, FGDs and HHIs indicated that approximately 95 per cent of traditional taboos, rituals and customary rules governing wetland and forest use had been abandoned over the past 30–50 years. As one religious leader noted, "All rules are gone except Magombero forest, no one fears ancestors anymore" [KII, Itete]. FGDs among fishing communities similarly estimated that more than 80 per cent of traditional fishing regulations were no longer observed, with youth increasingly using destructive fishing techniques.

Demographic change and cultural mixing emerged as a primary barrier to IKS continuity. Respondents across villages consistently linked the erosion of clan authority to the influx of Sukuma pastoralists since the 1990s, which fragmented Indigenous governance structures. Women's FGDs in Biro, Mofu and Itete emphasised that clan-based fishing and wetland rules were no longer respected by immigrant groups, "Our Ndamba rules mean nothing to cattle herders, they graze everywhere" [Women's FGD]. Key informants estimated that approximately 70 per cent of IKS erosion in the KVRS could be attributed to demographic shifts and the weakening of clan-based social cohesion.

Formal education systems were repeatedly identified as undermining intergenerational transmission of IKS. KIIs with education officers and school leaders reported that science-oriented curricula diminished the legitimacy of elders' knowledge and spiritual explanations of ecological processes. A primary school headteacher stated,

Photo 4. A newly established settlement in the Kilombero Valley © S. F. Materu

Photo 5. Adult training on the Ramsar concept of wise use, with discussions on integrating IKS to strengthen community-based wetland conservation © S. F. Materu

"Children learn that trees have no spirits and laugh at elders' stories" [KII, Iragua-Magereza]. About 80 per cent of pupils in CEPA training initially expressed scepticism towards oral traditions and spiritual taboos, citing weak intergenerational knowledge transfer at household level.

Replacement of customary governance by formal institutions emerged as a key barrier. Over two-thirds of respondents said policies and by-laws replaced clan rules for wetland and forest management, yet enforcement was weak. Officers described by-laws as nominal, while HHIs and FGDs reported encroachment (Photo 4), including cultivation in Namwai and Madabadaba forests.

The erosion of IKS was linked to ecological impacts across the KVRS. Respondents reported destructive fishing, including poison fishing (*utupa*), mosquito nets, and small-mesh wires (*kokoro*), causing declining fish stocks. Fisheries officers estimated 80 per cent of waterbodies were polluted, while forest degradation increased due to fires, charcoal production and settlement expansion.

Religious transformation further accelerated IKS erosion. Interviews with Christian and Muslim leaders showed that about 98 per cent rejected the spiritual basis of Indigenous taboos, reframing environmental stewardship within religious doctrines. Leaders cited Quranic guidance against Earth's corruption (Quran 7:56), Biblical teachings on caring for creation (Genesis 2:15), and Islamic tree-planting traditions. However, elders reported that this shift weakened clan-based ecological authority [KII-imam Ulanga].

Community attitudes towards IKS revival

Community attitudes towards the revival of IKS and ILK were assessed through CEPA training programmes, FGDs and HHIs. Overall, adult participants demonstrated strong support for reintegrating IKS into formal wetland governance. Across nine villages, 85 per cent of adult trainees (Photo 5) expressed preference for hybrid governance arrangements that combine clan-based authority with statutory enforcement. During FGDs, participants consistently contrasted the effectiveness of customary rules with formal enforcement mechanisms, noting that clan sanctions were perceived as more legitimate and difficult to evade. "Clan rules worked better than armed guards – bring back councils with our own forest officers" [Men's FGD, Alabama and Ijia].

HHIs reinforced this perspective; with respondents indicating that fear of spiritual sanctions associated with *mbui* authority persisted despite declining public adherence to rituals. "People may say they no longer believe, but everyone still fears *mbui* curses" [HHI, Njage]. FGDs further indicated that adult support for IKS revival was conditional on integration with government structures rather than a full return to exclusive clan control, reflecting concerns about inclusivity in ethnically mixed villages.

Youth attitudes towards IKS differed from those of adults but showed measurable improvement following CEPA interventions. Pre-training discussions revealed that most pupils had limited awareness of sacred sites and fishing taboos and were sceptical of spiritual explanations for environmental regulation. Following

Photo 6. Pupils on an educational excursion to a protected forest. © S. F. Materu

training sessions and field excursions (Photo 6), pupils demonstrated improved recognition of culturally protected sites and increased understanding of taboo restrictions. Pupils frequently emphasised the value of combining traditional narratives with scientific explanations, "Sacred grove stories may help, but we also need science to explain rainfall patterns" [Pupil FGD, Kivukoni].

Across adult and youth groups, discussions revealed community-led proposals for IKS revival. FGDs and HHIs suggested collaboration between traditional healers and forest officers to map sacred zones, integrating elders' knowledge into school activities, and joint patrols with rangers in remote wetlands, framed as complementary to statutory governance.

DISCUSSION

Strengths of documented IKS and ILK practices

Documented IKS and ILK practices in the KVRS align with global community-based management and Ramsar wise-use principles by integrating spiritual beliefs, customary law and ecological knowledge to ensure high compliance without formal enforcement. Similar governance arrangements have been reported elsewhere in wetlands and forested landscapes, where spiritually anchored norms function as effective regulatory mechanisms for resource use (Aniah et al., 2014; Hill et al., 2020).

Practices such as restrictions on harvesting fingerlings, seasonal access to waterbodies, and prohibitions on burning wetlands reflect adaptive strategies consistent with contemporary ecosystem-based approaches. Embedding ecological limits within cultural norms reduced enforcement costs while enhancing ecosystem resilience, a feature similarly documented in sacred groves in India, floodplain wetlands in West Africa, and small-scale fisheries in the Pacific Islands (UNESCO, 2013). Clan-based governance further strengthened these systems through collective responsibility and social accountability. The persistence of sacred forests and ritual wetlands within the KVRS mirrors global evidence that culturally protected sites often function as biodiversity refugia within increasingly modified landscapes (Hill et al., 2020). Such systems align closely with the Ramsar Convention's principle of wise use, which emphasises local stewardship, social legitimacy and long-term ecological sustainability.

This study also demonstrates the adaptability of IKS and ILK within hybrid governance frameworks. Community preferences for integrating customary institutions with statutory mechanisms reflect a growing global consensus that pluralistic governance enhances effectiveness and legitimacy in complex socio-ecological systems. Comparable hybrid arrangements have been documented in Ramsar Sites and Indigenous Territories elsewhere, where Indigenous governance complements formal conservation structures (IPBES, 2019).

Barriers to IKS continuity and global erosion trends

Despite their strengths, IKS and ILK in the KVRS have experienced substantial erosion, reflecting broader global trends in Indigenous knowledge loss. The findings align with international evidence that demographic change, cultural mixing, and weakening of customary authority undermine Indigenous governance systems, particularly in rapidly transforming wetland landscapes (Diawuo & Issifu, 2015; IPBES, 2019). In the KVRS, the influx of pastoralist communities and the resulting fragmentation of clan-based governance structures significantly reduced compliance with traditional rules.

Formal education systems further contributed to IKS erosion by prioritising scientific knowledge while marginalising oral traditions and spiritual explanations of ecological processes. Globalisation further disrupts IKS continuity whereby media promotes Western lifestyles over traditional life, undermining intergenerational transmission. Similar patterns have been documented globally, where school curricula and modernisation narratives weaken intergenerational transmission of Indigenous knowledge (Hill et al., 2020; UNESCO, 2013). In the KVRS, this shift diminished the legitimacy of elders' authority and reduced youth engagement with customary environmental practices. The replacement of customary governance by statutory institutions also mirrors global conservation challenges. While formal policies and by-laws have expanded across Ramsar Sites worldwide, enforcement gaps and limited local legitimacy frequently constrain their effectiveness

(IPBES, 2019). In the KVRS, respondents consistently reported that statutory mechanisms failed to regulate remote wetlands previously governed through spiritually enforced norms, resulting in increased resource degradation.

Religious transformation represents an additional driver of IKS erosion, as belief systems that reject ancestral spiritual authority weaken culturally embedded environmental sanctions. This trend has been widely observed across Africa and Asia, where shifts towards organised religions reframe environmental stewardship in moral rather than customary terms, often without equivalent enforcement mechanisms (UNESCO, 2013).

Community attitudes towards IKS revival and potential pathways

Community attitudes towards IKS revival were shaped by social heterogeneity, historical coexistence of multiple ethnic groups, and contemporary governance arrangements. While Ndamba and Pogoro clans are Indigenous to the floodplain, the landscape is now shared with Sukuma pastoralists, Hehe and other migrant communities, resulting in diverse value systems and varying levels of attachment to customary institutions. This plurality strongly influenced perceptions of IKS revival across villages.

Adult participants generally expressed support for reviving IKS, particularly where customary rules were perceived to have regulated resource use more effectively than current statutory mechanisms. However, this support was frequently conditional. Respondents favoured hybrid governance arrangements, combining clan-based norms with formal by-laws, to ensure inclusivity in ethnically mixed settlements. This reflects broader evidence that IKS revival is more socially acceptable where it accommodates multiple identities rather than reinstating exclusive clan authority (Hill et al., 2020; IPBES, 2019).

Farming and fishing communities demonstrated stronger support for restoring customary wetland rules, citing declining fish stocks and increased flooding as consequences of weakened governance. In contrast, pastoralist groups were more cautious, particularly where revived taboos were perceived as restricting grazing access to wetlands during dry seasons. These dynamics highlight the need for negotiated revival pathways that balance historical IKS with contemporary livelihood realities, rather than attempting full restoration of pre-existing systems.

Youth attitudes towards IKS were more ambivalent but showed potential for positive change. Consistent with global findings, younger participants were less familiar with spiritual narratives and customary sanctions, reflecting weakened intergenerational transmission and the influence of formal education systems (UNESCO, 2013). However, CEPA activities demonstrated that combining Indigenous narratives with scientific explanations improved youth engagement and acceptance of culturally grounded conservation principles. This suggests that IKS revival is most viable when framed as complementary to scientific knowledge. Participants identified adaptive pathways, including recognition of sacred sites in village land-use plans, collaboration among traditional elders, *mbui* and government officers, and integration of local histories into school education. Such approaches align with evidence favouring inclusive, flexible systems over rigid customary restoration (Diawuo & Issifu, 2015; IPBES, 2019).

Overall, community attitudes in the KVRS indicate cautious but meaningful support for IKS and ILK revival, provided that revival efforts acknowledge ethnic diversity, contemporary livelihoods, and the need for hybrid governance structures. These findings reinforce the argument that IKS persistence depends less on cultural preservation alone and more on negotiated integration within modern conservation frameworks.

Implications for Ramsar governance and policy integration

Our findings highlight that effective Ramsar governance requires more than statutory regulation alone. The decline of IKS and ILK coincides with rising wetland pressures, showing that excluding culturally embedded practices weakens conservation. Historically, clan-based institutions enforced access, harvesting and fire norms with minimal external oversight, but their erosion has reduced compliance. Integrating IKS into Ramsar tools, through recognition of sacred sites, customary fishing zones, and ritual wetlands in management plans and land-use frameworks, can strengthen protection while enhancing community legitimacy. The KVRS case illustrates that IKS cannot be restored in its original form, as contemporary social heterogeneity, religious transformations and changing livelihood strategies necessitate flexible, context-sensitive governance approaches. Therefore, Ramsar frameworks should support co-management that negotiates among stakeholders, combining customary practices with statutory oversight rather than paper or symbolic recognition alone.

RECOMMENDATIONS

Based on our results, we recommend school-based elder knowledge sessions, joint clan–ranger patrols in remote wetlands, and low-cost, community-led documentation of sacred sites, oral histories and customary rules using village registers, maps and audio recordings to support planning, enforcement and intergenerational knowledge transfer. Complementary measures include mandating at least two clan elders on Village Environmental Committees and formally gazetting sacred zones in District Land Use Plans. Traditional clan sanctions can be adapted through co-drafted village by-laws aligned with Ramsar Resolution X.3. Future research should track knowledge retention among pupils, compare compliance under co-produced versus top-down enforcement, and evaluate any locally held documentation's impact on resource governance, embedding IKS within formal management.

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RESUMEN

El sitio Ramsar del valle de Kilombero sustenta los medios de vida de 1,5 millones de personas gracias a los servicios ecosistémicos de los humedales, gestionados históricamente por los pueblos indígenas. Este estudio documentó las prácticas de conocimiento indígena, identificó las barreras que impiden la continuidad y evaluó el potencial de integración en 11 aldeas mediante 93 entrevistas a informantes clave, 22 grupos focales desglosados por género, 59 entrevistas a hogares y programas de comunicación, educación y sensibilización pública (n = 796 participantes). La gobernanza de los clanes mediante sanciones cada vez más severas (prohibiciones de pesca, multas por cabras, confiscación de cereales) y la protección de los lugares sagrados mantuvieron la pesca y la cobertura forestal antes de la década de 1990. Sin embargo, su abandono en un 95 % durante 30-50 años, impulsado por la inmigración del pueblo sukuma (~ 70 %), los planes de estudio exclusivamente científicos (~ 80 % de escepticismo entre los jóvenes), la religión, la globalización y las ordenanzas municipales inaplicables, ha provocado contaminación (~ 80 % de las masas de agua), pesca destructiva y conversión de bosques. La formación en CECP reveló un fuerte apoyo a la gobernanza híbrida: el 85 % de los alumnos adultos se mostraron a favor de las patrullas conjuntas de curanderos tradicionales (*mbui*) y guardabosques, y se mejoró el reconocimiento de los lugares sagrados entre los alumnos (n = 490). Los fallos de la gobernanza formal (lagunas en la aplicación de la ley en zonas remotas, falta de legitimidad) sustentan las demandas de la comunidad para la reintegración de los sistemas de conocimiento indígenas. El sitio Ramsar del valle de Kilombero demuestra la urgente necesidad de una conservación híbrida que aproveche la autoridad tribal sobreviviente para lograr los principios de uso racional de Ramsar, allí donde han fracasado los enfoques descendentes.

RÉSUMÉ

Le site Ramsar de la vallée de Kilombero assure la subsistance de 1,5 million de personnes grâce aux services écosystémiques des zones humides, historiquement gérés par les peuples autochtones. Cette étude a documenté les pratiques traditionnelles, identifié les obstacles à la continuité et évalué le potentiel d'intégration dans 11 villages à l'aide de 93 entretiens avec des informateurs clés, 22 groupes de discussion ventilés par sexe, 59 entretiens avec des ménages et des programmes de communication, d'éducation et de sensibilisation du public (n = 796 participants). La gouvernance clanique, qui prévoyait des sanctions de plus en plus sévères (interdiction de pêcher, amendes pour les chèvres, confiscation des céréales) et la protection des sites sacrés ont permis de préserver les pêcheries et le couvert forestier avant les années 1990. Cependant, son abandon à 95 % en 30 à 50 ans, dû à l'immigration du peuple Sukuma (~ 70 %), aux programmes scolaires exclusivement scientifiques (~ 80 % de scepticisme chez les jeunes), à la religion, à la mondialisation et à des règlements villageois inapplicables, a entraîné une pollution (~ 80 % des plans d'eau), une pêche destructrice et la conversion des forêts. La formation CEPA a révélé un fort soutien en faveur d'une gouvernance hybride : 85 % des adultes formés étaient favorables à des patrouilles conjointes des guérisseurs traditionnels (*mbui*) et des gardes forestiers, et à une meilleure reconnaissance des sites sacrés parmi les élèves (n = 490). Les défaillances de la gouvernance formelle (lacunes dans l'application des lois dans les régions reculées, absence de légitimité) sous-tendent les demandes de la communauté en faveur de la réintégration des systèmes de connaissances autochtones. Le site Ramsar de la vallée du Kilombero démontre l'urgence d'une conservation hybride s'appuyant sur l'autorité clanique survivante pour mettre en œuvre les principes d'utilisation rationnelle de Ramsar là où les approches descendantes ont échoué.

SUSTAINABLE CONSERVATION LIVELIHOODS: A CASE FROM THE ROYAL MANAS NATIONAL PARK, BHUTAN

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ABSTRACT

In the multiple-use zone of the Royal Manas National Park, over 64 per cent of households rely on subsistence farming, with livestock rearing as the main source of household income through dairy products. The traditional practice of maintaining large cattle herds in the forests increases vulnerability of livestock to carnivore predation, intensifies competition with wild ungulates, and contributes to forest degradation, threatening livelihoods and endangered species such as tigers. To address these challenges, a self-sustaining Jersey calf-sharing scheme was introduced, distributing 'seed cows' free of cost with the condition to share any female offspring with other households. Five years after implementation, this study assessed the livelihood and conservation outcomes through a survey of 56 beneficiary households administered via the SMART (Spatial Monitoring and Reporting Tool) database. The findings indicate a 43.6 per cent increase in Jersey cows, reduced forest grazing, lower livestock losses to carnivores, and improved dairy income. The scheme enhanced equitable benefit sharing, strengthened community engagement, and fostered positive conservation attitudes. We recommend exploring similar conservation livelihood initiatives across protected areas, supported by regular monitoring to ensure long-term sustainability.

Keywords: Human-wildlife conflict, biodiversity conservation, community livelihoods, protected areas, improved cattle breeds, free grazing

INTRODUCTION

Bhutan is predominantly an agrarian country with 61 per cent of the population residing in rural areas (National Statistical Bureau, 2022) and over 90 per cent of farming households practising subsistence agriculture (Yeshey et al., 2022). These communities often experience human–wildlife conflict, especially in settlements located within or adjacent to protected areas (PAs) and state forests (Royal Manas National Park, 2023; Sulistiyono et al., 2023; Yeshey et al., 2023). The risk is high because 52 per cent of Bhutan's land falls under the protected area network (Forest Monitoring and Information Division, 2025) and forests cover nearly 70 per cent of the country (Forest Monitoring and Information Division, 2023).

The protected area network in Bhutan is managed under different zonation systems, including multiple-use zones that encompass settlements, built-up areas, privately registered lands, and designated resource-use areas for resident communities (Nature Conservation Division, 2020). In Royal Manas National Park (RMNP), 15.24 per cent (161.06 km^2) of the park area is designated as a multiple-use zone and is inhabited largely by subsistence farming communities (Royal Manas National Park, 2023). Livestock rearing is an integral component of rural livelihoods, contributing to household income through the sale of dairy products, domestic consumption, and manure production (Royal Manas National Park, 2023). Amongst the livestock, cattle are predominantly reared for milk and dairy production. Farmers maintain large herds of local cattle breeds that require substantial labour inputs. As a result, cattle are often released without herders into the nearby forests for free grazing (Tshering & Thinley, 2017).

https://doi.org/10.2305/WPGZ3455

RMNP represents a pristine habitat for the Asiatic Water Buffalo besides others © Dorji Wangchuk

Although this practice has been reported to facilitate regeneration and reduce rodent damage in conifer forests (Roder et al., 2002), the uncontrolled grazing contributes to decline in the quality of broadleaved forests (Norbu, 2000; Roder et al., 2002). Such grazing is also recognised as a driver of forest degradation (Ministry of Agriculture and Forests, 2017). Further, these free-ranging cattle can indirectly influence large carnivore populations by competing with wild ungulates for forage, reducing the prey base of big cats (Roberts et al., 2021). Declines in wild prey availability can push Bengal Tigers (*Panthera tigris*) and other large carnivores closer to human settlements, increasing livestock depredation and intensifying human–wildlife conflict (Nature Conservation Division, 2024).

Park records indicate a steady increase in tiger numbers in RMNP since 2010 (Royal Manas National Park, 2023). The National Tiger Survey 2022 showed that RMNP harbours the highest number of tigers (29 individuals) of all Bhutan's PAs, with a density exceeding two tigers per 100 km² (Department of Forests and Park Services, 2023). Healthy populations of other predators exist, including Common Leopard (*Panthera pardus*) and Asiatic Wild Dog (*Cuon alpinus*), elevating the risk of livestock depredation during free grazing, negatively affecting community livelihoods and undermining conservation efforts through retaliatory actions against endangered species.

Balancing biodiversity conservation with rural livelihood security is a critical management priority. In response, RMNP implemented Integrated Conservation and Development Programme activities aimed at fostering coexistence between people and wildlife. Livestock depredation is the second most serious human–wildlife conflict issue in RMNP after crop damage (Royal Manas National Park, 2023), with the traditional practice of free grazing of cattle a key driver of depredation (Tshering & Thinley, 2017). The management of cattle forms a strategic intervention for human–wildlife conflict reduction.

To address conflict reduction, park management introduced a livelihood support scheme under the banner "No cost sharing but calves sharing: A self-sustaining initiative". The initiative involved the distribution of improved cattle breeds (hereafter referred to as Jersey cows) to local communities. This aligns with a broader national trend showing increasing farmer preference for improved breeds over local cattle (National Statistical Bureau, 2021). However, sustainability remains a persistent challenge in conservation-linked livelihood programmes. For example, the Tiger Conservation Fund, established in 2003 to compensate farmers for livestock losses to tiger (Sangay & Vernes, 2008), was discontinued in 2014 due to financial exhaustion (Tshering & Thinley, 2017). To ensure long-term sustainability and equitable benefit sharing, RMNP adopted an innovative approach which differed from an existing scheme that supplied improved breeds on a cost-sharing system, where farmers bore 70 per cent of the cost and received a 30 per cent subsidy including transport support (International Fund for Agriculture Development, 2022; Ministry of Agriculture and Forests, 2019). The new scheme supplied Jersey cows at no cost to recipient households. In return, beneficiaries were required to pass on two female calves to subsequent eligible households. This scheme was designed to be self-sustaining and community-monitored through locally agreed-upon bylaw. The programme was expected to expand access to improved cattle breeds, gradually replacing low-productive local cattle. The Jersey cows are

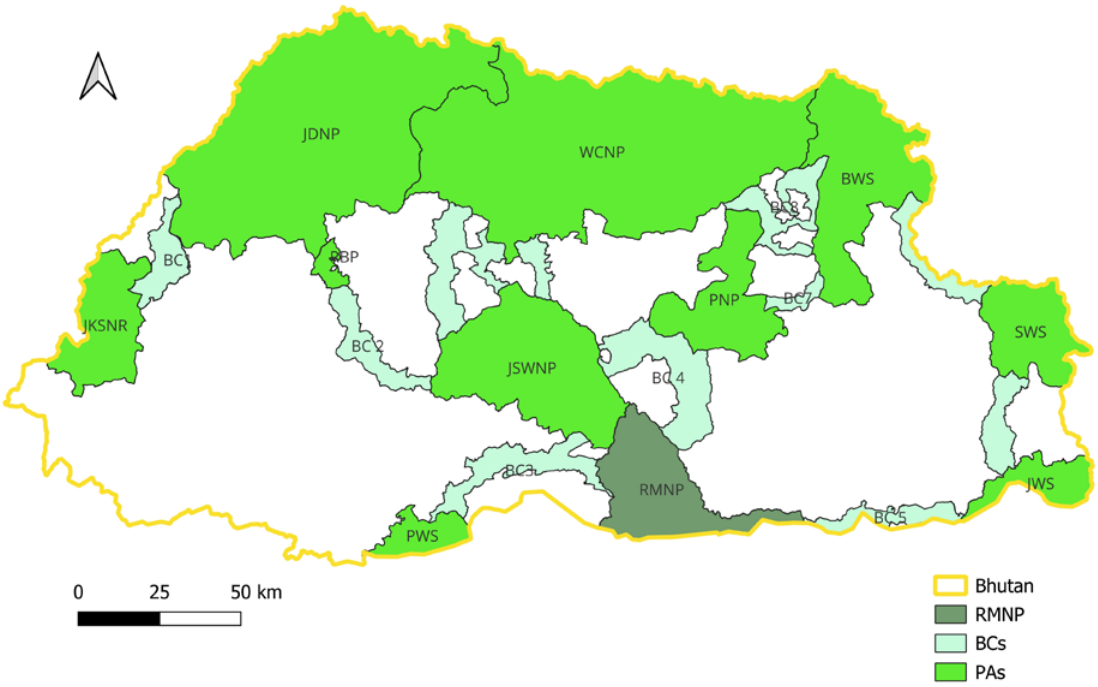

Figure 1. Location of RMNP in relation to other protected areas (PA) and biological corridors (BC).

to be stall-fed rather than free-grazed, given their higher productivity and economic value. The scheme was implemented with the following objectives.

- Reduce the number of low-productive local cattle through gradual replacement with Jersey cows via an equitable calf-sharing mechanism;
- Discourage free grazing in forests, thereby reducing livestock depredation and strengthening conservation outcomes; and
- Improve community livelihoods through increased dairy productivity and reduced livestock losses, decreasing dependence on forest resources and mitigating human–wildlife conflict.

The scheme was initiated in 2019 and is in its sixth year. This study aims to assess the effectiveness of the scheme against its intended objectives, document innovative lessons, and provide recommendations for improvement and long-term sustainability.

METHODS

Study area

RMNP is Bhutan's oldest national park. It is situated in the south-central foothills of Bhutan, between 90°35′E and 91°13′E longitude and 26°46′N and 27°08′N latitude and covers an area of 1,057 km². The park ranges in elevation from 70.06 m to 2,714 m above sea level, with a wide altitudinal gradient that supports diverse ecological zones and forest types, including subtropical, warm broadleaved, and cool broadleaved forests. RMNP spans seven administrative blocks across three districts: Zhemgang District, Sarpang District and Pemagatshel District. Phangkhar is the only block located entirely within the park's jurisdiction.

The park contains an extensive network of perennial and seasonal rivers and streams. The Manas River, one of the largest rivers in Bhutan, is formed by the confluence of four major tributaries: Mangdechhu, Chamkarchhu, Kurichhu and Drangmechhu, and flows through the park. RMNP supports diverse natural habitats, including grasslands, natural mineral licks and waterholes, which are concentrated mainly in the foothill areas. The management and restoration of these habitats constitute a key component of park programmes aimed at enhancing ecosystem productivity and ecological integrity (Department of Forests and Park Services, 2021).

RMNP shares a boundary with Manas National Park in India, together forming the Transboundary Manas Conservation Area (TRAMCA). RMNP is ecologically connected through established biological corridors to several protected areas: Jigme Singye Wangchuck National Park (north-west), Phibsoo Wildlife Sanctuary (south-west), Phrumsengla National Park (north-central) and Jomotsangkha Wildlife Sanctuary (south-east). Owing to its altitudinal range, habitat diversity and strategic connectivity, RMNP constitutes a critical component of Bhutan's protected area network at both national and regional scales (*Figure 1*).

The RMNP is administered through a network of range offices, beat offices and guard posts. The management is guided by a zoning system comprising core, buffer,

The four major rivers of Bhutan converge to form the Manas river, which flows through the park © Dorji Wangchuk

multiple-use and transition zones (Nature Conservation Division, 2020). Grazing is permitted in the buffer and multiple-use zones, and seasonally in designated transition areas, but is prohibited in the core zone (Royal Manas National Park, 2023).

Approximately 15 per cent of the park is designated as a multiple-use zone, where resident communities comprise 1,389 households with an estimated population of 11,755. Subsistence agriculture is the primary livelihood, supporting 64.69 per cent of the resident population. Households cultivate a range of crops for both consumption and income generation. Maize is the principal staple crop, followed by paddy, while areca nut, cardamom and orange are grown as cash crops. Livestock rearing constitutes an additional source of income through the sale of butter, cheese, milk, poultry and pork. Communities also supplement household income by harvesting non-timber forest products, including mushrooms, ferns, canes and medicinal plants.

RMNP provides critical habitat for numerous threatened species of global conservation significance, such as the Royal Bengal Tiger. In recognition of its tiger conservation efforts, RMNP was accredited as a Conservation Assured Tiger Standards (CA|TS) site in 2019 for meeting international standards of effective site-based tiger conservation. Additionally, in 2020, the park received the TX2 Conservation Excellence Award. These recognitions underscore the park's global importance as a biodiversity hotspot.

Notably, 7 of Bhutan's 9 recorded wild cat species occur within RMNP (Dhendup et al., 2016). Furthermore, the park provides an important habitat for Golden Langur (*Trachypithecus geei*), Clouded Leopard (*Neofelis nebulosa*), Asian Elephant (*Elephas maximus*), Asiatic Water Buffalo (*Bubalus bubalis*), Asiatic Wild Dog, and Gaur (*Bos gaurus*). The park also supports populations of the Critically Endangered Pygmy Hog (*Sus salvanius*) and the Endangered Elongated Tortoise (*Indotestudo elongata*). In addition to the faunal species, the park harbours globally rare and threatened plant species, including Rosewood (*Dalbergia oliveri*), Agarwood (*Aquilaria malaccensis*), Yew (*Taxus baccata*) and Brown Pine (*Podocarpus nerifolius)* which are distributed in localised pockets.

Scheme description

The bylaw governing the scheme was developed through a participatory process involving local communities, in collaboration with the Bhutan Tiger Center, local government authorities and the livestock sector. The bylaw titled '*Supply and Management of Jersey Cows Chathrim 2019*', establishes provisions related to eligibility criteria, procurement procedures, cost and payment arrangements, distribution and sharing, monitoring and reporting requirements, legal undertakings and penalties (Royal Manas National Park, 2019). The consultative drafting process was intended to promote transparency, strengthen institutional coordination and ensure community ownership of the scheme.

Figure 2. Distribution of Jersey cows to beneficiary communities in the presence of community representatives in Norbugang block, Pemagatshel district.

The number of seed Jersey cows allocated to each block was determined in proportion to the number of households. Within each block, beneficiary households were selected based on joint recommendations from the local government and livestock sector. Selection criteria included household willingness to participate, size of existing cattle holdings and prior receipt of benefits from related support programmes (e.g. biogas units or corrugated galvanized iron roofing sheets). The scheme was designed to ensure progressive and equitable coverage, with all households expected to benefit over time through a structured calf-sharing mechanism.

The procurement of Jersey cows was undertaken by a multi-stakeholder committee comprising the Livestock Production Officer, Livestock Production Supervisor of the concerned block, a representative from the Bhutan Tiger Center, the Regional Livestock Centre, an Accounts Officer and a representative from the park. This institutional arrangement ensured transparency, accountability and technical oversight throughout the procurement and distribution process. Technical verification by district livestock officials and the Regional Livestock Centre supported the acquisition of genuine Jersey breeds. These cows were sourced primarily from nearby districts and towns. Each animal was assigned a unique identification number, and distribution to selected households was conducted through a lucky dip system to maintain fairness and transparency. Animals were handed over in the presence of community representatives creating awareness about the bylaw (*Figure 2*).

To ensure long-term sustainability beyond the project period, a structured calf-sharing mechanism was introduced (*Figure 3*). Beneficiary households received one Jersey cow free of cost under the condition that female calves would be transferred to subsequent eligible households. Each recipient is required to share the first and third female calves, while retaining other female calves and any male calves. The transferred female calves are distributed to households on a waiting list to serve as seed cows for the new recipients. This cascading mechanism is repeated by successive beneficiaries, thereby facilitating gradual and equitable distribution of livestock assets across participating households.

Data collection and analysis

The project documents and relevant background information including project objectives, implementation modalities and beneficiary records were reviewed to formulate the study design. A review of relevant literature and scientific publications further guided the methodological framework. Survey questionnaires were

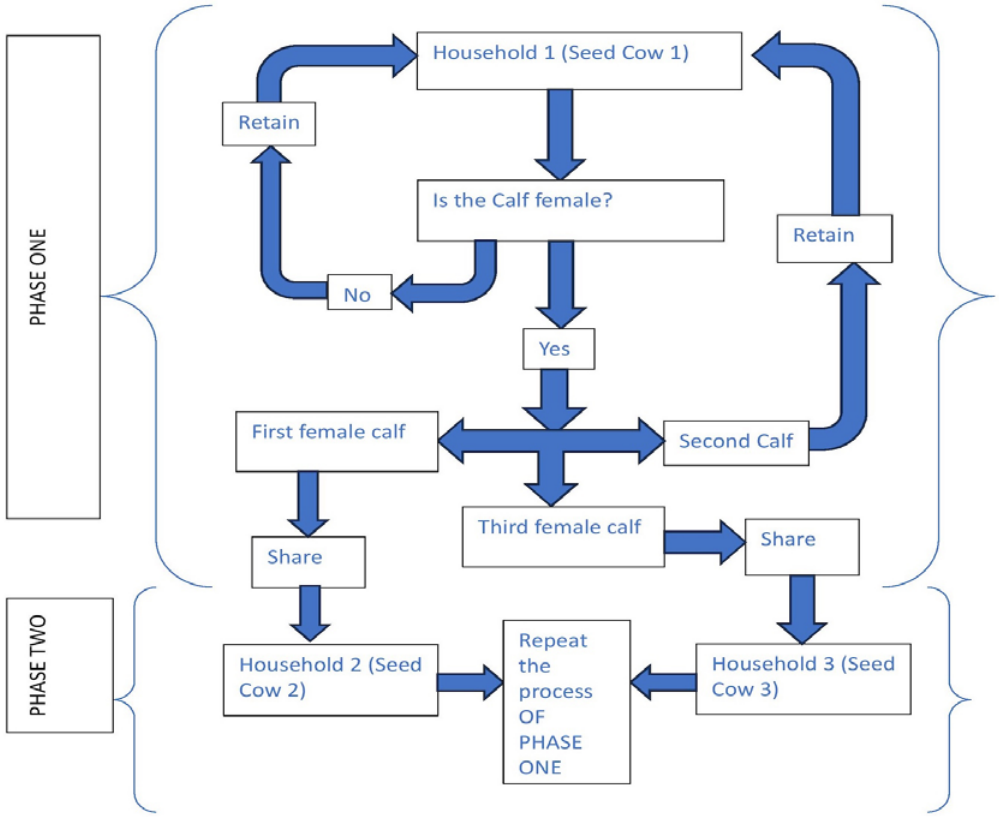

Figure 3. Sustainability of the scheme is ensured through the calf-sharing process implemented in accordance with the bylaw (Royal Manas National Park, 2019).

developed in alignment with the scheme objectives and comprised both open and closed-ended questions which were refined through team discussions and incorporation of feedback to enhance clarity and internal consistency.

The questionnaire was digitised using the Spatial Monitoring and Reporting Tool (SMART) and piloted in a small number of households to assess consistency, usability and reliability for data collection. Lessons from the pilot phase were incorporated, and the SMART database was subsequently finalised for full-scale data collection.

SMART is a widely used conservation platform designed to collect, manage and analyse field-based data to improve conservation effectiveness. It is routinely used by RMNP staff to record wildlife observations, document illegal activities and track community services conducted by patrol staff, thereby supporting evidence-based patrol planning and threat analysis. Therefore, the SMART application was already installed on the smartphones of field personnel, and staff were familiar with its operation, which provided an efficient and standardised platform for survey data collection. The customised survey database was shared with nominated technical staff responsible for data collection.

The survey sample included households that had received Jersey cows across three generations of the calf-sharing scheme. First-generation recipients were households that directly received seed Jersey cows from park management. Second-generation recipients obtained cows through calf sharing from first-generation beneficiaries, while third-generation recipients received cows from second-generation households. Only female Jersey cows were considered, as the bylaw mandates sharing of female calves. Households with deceased Jersey cows were excluded from the study.

A total of 56 households were interviewed, comprised of 30 first-generation, 22 second-generation and 4 third-generation recipients. Interviews were conducted with the household member primarily responsible for managing the Jersey cow to ensure genuine responses. Beneficiary lists generated from the survey were cross-checked against official distribution records maintained by the park. Of the 56 respondents, 37 were male and 19 were female. Respondent ages ranged from 21 to 77 years, with a mean age of 45 years. The survey was conducted between May and June 2025.

Eight forestry field staff carried out the survey. All enumerators received prior training on the use of the questionnaire and digital data entry procedures. Updated

Table 1. The number of Jersey cows supplied in 2019 and changes observed in 2025 across districts and corresponding blocks. Phangkhar is wholly (W) within the park, while other blocks are partly (P) included.

Districts	Blocks	Wholly (W) Partly (P)	Number of Jersey cows		Change
			2019	2025	
Pemagatshel	Norbugang	P	6	9	+3
Sarpang	Jigmecholing	P	3	5	+2
	Tareythang	P	3	5	+2
	Umling	P	3	3	0
Zhemgang	Ngangla	P	3	3	0
	Phangkhar	W	12	16	+4
	Trong	P	9	15	+6
	Blocks (N) = 7		39	56	+17

beneficiary lists, including second and third generation recipients, were obtained from village heads and provided to the respective field staff. Data were collected through door-to-door visits to each beneficiary household. Where responses were unclear, follow-up clarification was sought through telephone communication.

Survey data were downloaded from the SMART application in CSV format and transferred to computers for cleaning and verification, then cross-checked against official supply lists to ensure accuracy and completeness. Data were then analysed using Microsoft Excel to generate descriptive statistics, tables and graphical representations.

RESULTS

Changes in Jersey cow and local cattle populations

The study assessed changes in Jersey cow numbers and community perceptions of local cattle populations following the implementation of the scheme. The total number of Jersey cows supplied under the project increased from 39 in 2019 to 56 in 2025, representing an overall increase of 17 cows (~43.6 per cent) across the seven blocks (*Table 1*). Nine of the original 39 Jersey cows had died during this period. The largest increase occurred in Trong block (+6 cows, 66.7 per cent), while Ngangla and Umling recorded no change. The community perceptions of local cattle populations indicate that 71 per cent of respondents observed a declining trend, 13 per cent reported no change, and 11 per cent perceived an increase in local cattle numbers (*Figure 4*).

Perceptions of trends in free grazing, livestock predation and livelihood improvement

Most households (92.5 per cent) reported a reduction in free grazing of cattle in forest areas, while 7.5 per cent perceived no change. Similarly, 62 per cent of respondents observed a decrease in predation of cattle by wild carnivores, 16 per cent reported no change, 20 per cent were unsure, and only 2 per cent perceived an increase (*Figure 4*).

The majority of respondents (>70 per cent) reported an increase in income from dairy cattle following the implementation of the scheme, while 13 per cent observed no change, and 11 per cent reported a decline. Women accounted for 33.9 per cent of those actively engaged in Jersey cow rearing. Respondents ranged in age from 21 to 77 years, with an average of 45 years. Most farmers (54 per cent, n = 30/56) belonged to the 41–60-year age group.

DISCUSSION

Increase in Jersey cows and trends in local cattle populations

The scheme has resulted in a notable increase in Jersey cows, directly benefiting 56 households through the calf-sharing programme, with additional households on a

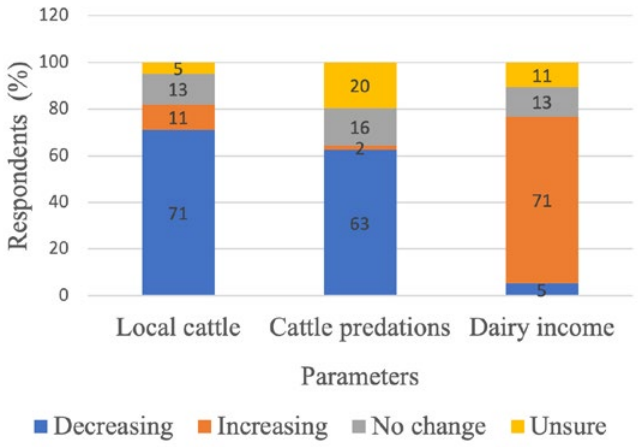

Figure 4. Perception of surveyed households regarding changes in local cattle population, cattle predation by wild carnivores, and income from dairy cattle following the implementation of the scheme (%).

waiting list expected to benefit in subsequent generations. This outcome aligns with national policy objectives to introduce high-yielding breeds to enhance farmer livelihoods, reduce dairy imports, and minimise environmental impacts (Samdup et al., 2010). These interventions are implemented without compromising the conservation of indigenous cattle genetic diversity (Biodiversity Act of Bhutan, 2022; National Biodiversity Centre, 2008).

Concurrently, the study observed a declining trend in local cattle populations. This pattern reflects national trends, which indicate a 10 per cent decrease in local cattle from 2010 to 2020 and a continued shift towards improved milch breeds preferred by small-scale farmers (National Statistical Bureau, 2024; Tenzin et al., 2023). In the present study, households reported that improved breeds were preferred due to higher dairy production, reduced labour requirements, limited grazing availability, and a declining working-age population in rural communities. However, local cattle populations remain stable or increased in some localities, indicating spatial variation in adoption patterns. From a conservation perspective, the reduction of local cattle in forested areas reduces potential encounters with predators, thereby decreasing human–wildlife conflict (Boronyak et al., 2020).

Reduction in free grazing and livestock predation

While acknowledging the small sample size, the results suggest that the shift towards stall-fed Jersey cows has contributed to a substantial reduction in free grazing in forested areas. Most households now manage improved breeds in confined conditions and use cattle dung for biogas production promoted under the same scheme. This practice discourages firewood collection, a known driver of forest degradation in Bhutan (Ministry of Agriculture and Forests, 2017) and helps maintain the integrity of wildlife habitats, including water sources that are vulnerable to drying up (Wangchuk et al., 2018).

Reduced free grazing minimises spatial overlap between domestic cattle and wildlife, lowering predation rates while maintaining prey abundance for carnivores in natural habitats. Consequently, wild animals can move freely without encroaching on human settlements, reducing both crop damage and livestock losses. This leads to reduced forest entry by cattle owners searching for stray livestock and decreases the risk of human–wildlife encounters. Historical cases, such as the 2010 tiger attack on a man in Trongsa, Bhutan (Bhutan Broadcasting Service Corporation, 2010), highlight the dangers of unregulated forest access. The current findings are consistent with community reports indicating a decline in livestock predation over the past five years within the study area.

Livelihood improvement and community engagement

The introduction of Jersey cows has increased household income through the sale of dairy products, reflecting the scheme's contribution to local livelihoods. Such improved economic conditions reduce dependency on natural resources and provide incentives for households to engage as conservation partners rather than exploiters of forest resources (Velho et al., 2019). Beneficiaries emphasised the scheme's equitable benefit-sharing mechanisms, which narrow economic disparities and contribute indirectly to the reduction of human–wildlife conflicts. The livelihood enhancement of the park communities is beneficial to conservation as poverty also drives forest degradation (Ministry of Agriculture and Forests, 2017), and increases vulnerability to illegal resource use, including poaching (Knapp et al., 2017).

Nevertheless, there are associated challenges with the scheme. The Jersey cows are more susceptible to diseases and require reliable fodder, particularly during winter, whereas indigenous cattle are more resilient to endemic and emerging livestock diseases (Tenzin et al., 2023). Both men and women actively participate in the management of Jersey cows, although some beneficiaries are over 70 years old, highlighting the declining rural working age groups and increasing rural-to-urban migration (National Statistical Bureau, 2026). Overall, the scheme demonstrates that integrating improved livestock breeds with participatory management and calf-sharing mechanisms can simultaneously enhance rural livelihoods, reduce human–wildlife conflict, and support conservation objectives.

CONCLUSION

The Jersey cow calf-sharing scheme has contributed to a reduction in livestock predation by wild carnivores, primarily through decreased free grazing in the forests. Simultaneously, it has enhanced local livelihoods by increasing household income from dairy production. These outcomes have fostered more positive attitudes towards conservation among communities within and surrounding the protected area, strengthening their role as active partners in biodiversity protection. However, this study focuses on the perspectives and experiences of scheme beneficiaries, which may limit the broader applicability of the findings and indicate the need for larger-scale studies.

We recommend the continued exploration and scaling of similar livelihood enhancement interventions intrinsically linked to conservation objectives. Such initiatives can enhance community engagement, leading to long-term stewardship of natural resources. At the same time, community awareness should be reinforced to ensure that such beneficiaries understand that these benefits are facilitated through conservation funding mechanisms.

The implementation of similar programmes should adopt a collaborative framework, engaging relevant sectoral authorities for effective protected area management, to ensure technical support, transparency and long-term sustainability. The programme design should also account for post-project impacts and mechanisms to maintain benefits over successive generations.

Finally, periodic monitoring and evaluation of the scheme are recommended to assess long-term outcomes on both community livelihoods and conservation objectives, enabling adaptive management and continuous improvement of the programme.

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Jampel Lhendup is a Forest Ranger and conservationist leading the SMART app implementation in the conservation sector in Bhutan. In October 2025, he received the prestigious International Ranger Award at the IUCN Congress in Abu Dhabi in recognition of his contribution to biodiversity conservation.

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RÉSUMÉ

Dans la zone à usage multiple du Parc national de Manas, plus de 64 pour cent des ménages dépendent de l'agriculture de subsistance, l'élevage constituant la principale source de revenus grâce aux produits laitiers. La pratique traditionnelle consistant à faire paître de grands troupeaux de bovins dans les forêts accroît la vulnérabilité du bétail face aux prédateurs carnivores, intensifie la concurrence avec les ongulés sauvages et contribue à la dégradation de la forêt, menaçant ainsi les moyens de subsistance et les espèces en voie de disparition telles que les tigres. Pour relever ces défis, un programme autonome de partage de veaux Jersey a été mis en place, distribuant gratuitement des "vaches mères" à condition de partager toute progéniture femelle avec d'autres ménages. Cinq ans après sa mise en œuvre, cette étude a évalué les résultats en matière de moyens de subsistance et de conservation à travers une enquête menée auprès de 56 ménages bénéficiaires via la base de données SMART (Spatial Monitoring and Reporting Tool). Les résultats indiquent une augmentation de 43.6 pour cent du nombre de vaches Jersey, une réduction du pâturage en forêt, une diminution des pertes de bétail dues aux carnivores et une amélioration des revenus laitiers. Le programme a favorisé un partage équitable des bénéfices, renforcé l'engagement communautaire et encouragé des attitudes positives envers la conservation. Nous recommandons d'explorer des initiatives similaires de conservation et de moyens de subsistance dans les zones protégées, soutenues par un suivi régulier afin d'assurer une durabilité à long terme.

RESUMEN

En la zona de uso múltiple del Parque Nacional Real de Manas, más del 64 por ciento de los hogares depende de la agricultura de subsistencia, siendo la cría de ganado la principal fuente de ingresos familiares gracias a los productos lácteos. La práctica tradicional de mantener grandes rebaños de ganado en los bosques aumenta la vulnerabilidad del ganado ante la depredación de los carnívoros, intensifica la competencia con los ungulados silvestres y contribuye a la degradación forestal, lo que pone en peligro los medios de vida y a especies en peligro de extinción como los tigres. Para hacer frente a estos retos, se introdujo un programa autosostenible de intercambio de terneros de raza Jersey, mediante el cual se distribuían "vacas Semilla" de forma gratuita con la condición de compartir cualquier cría hembra con otros hogares. Cinco años después de su implementación, este estudio evaluó los resultados en materia de medios de vida y conservación a través de una encuesta realizada a 56 hogares beneficiarios gestionada mediante la base de datos SMART (Spatial Monitoring and Reporting Tool). Los resultados indican un aumento del 43.6 por ciento en el número de vacas Jersey, una reducción del pastoreo en los bosques, menores pérdidas de ganado a causa de los carnívoros y una mejora de los ingresos por la producción lechera. El programa mejoró el reparto equitativo de los beneficios, reforzó la participación de la comunidad y fomentó actitudes positivas hacia la conservación. Recomendamos explorar iniciativas similares de conservación y medios de vida en todas las áreas protegidas, respaldadas por un seguimiento periódico para garantizar la sostenibilidad a largo plazo.

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TOURISM POTENTIAL OF TIGER REINTRODUCTION IN CAMBODIA: LINKING CONSERVATION WITH ECONOMIC FUTURES

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ABSTRACT

Cambodia's tourism sector has shown strong post-pandemic recovery, driven largely by its globally renowned cultural heritage sites. The country's protected area network and high biodiversity offer opportunities for diversification beyond cultural tourism. This paper assesses the potential for tiger reintroduction – specifically in the Cardamom Mountains Landscape – to catalyse a new, sustainable wildlife-based tourism economy. Cambodia welcomed 6.7 million international visitors in 2024, generating USD 3.6 billion – figures that underscore the importance of exploring additional tourism products. This study estimates that tiger-based tourism in the Cardamoms could generate USD 5–7 million annually within a decade, create significant local employment, and contribute up to 2 per cent of national tourism GDP. Complementary mechanisms – such as wildlife levies, regulated safari zoning, community-based ecotourism models, and strong governance – could ensure equitable benefit sharing and long-term financial sustainability. By integrating biodiversity conservation with strategic tourism expansion, tiger reintroduction presents a unique opportunity to Cambodia to revive a lost species, stimulate rural economies, and position itself as an ecotourism destination in Southeast Asia.

Keywords: Wildlife-based tourism, Cardamom Mountains Landscape, Nature-based tourism development

INTRODUCTION

Nature-based tourism, including ecotourism, is a significant and rapidly expanding segment of the global tourism industry, generating billions of dollars in revenue annually. It is a growing market that is economically important and plays a crucial role in protecting biodiversity and supporting local communities (Samal & Dash, 2023; World Bank, 2024). The global ecotourism market was estimated at USD 172.4 billion in 2022 and is projected to reach USD 374.2 billion, with a growth rate of 13.9 per cent by 2028 (MarketResearch.com, 2023). For developing countries with abundant natural resources, for example in South Asia and Southeast Asia, nature tourism provides an opportunity for economic growth and development (Christie & Crompton, 2001; OECD, 2009; United Nations Environment Programme, 2011, 2013).

Wildlife tourism is a component of nature-based tourism defined as "tourism undertaken to view or encounter wildlife" (Duffus & Dearden, 1990; Reynolds & Braithwaite, 2001). Wildlife tourism raises awareness about benefits from nature and produces economic benefits that can support protected area management and conservation initiatives (Balmford et al., 2009; Hudson & Lee, 2010; Roe et al., 1997). Wildlife tourism can offset conservation costs (Lindsey et al., 2005), create incentives to conserve wildlife through revenue sharing (MacKenzie, 2012) and positively affect local communities' attitudes towards conservation (Infield, 1988). Wildlife tourism destinations often use mega-herbivores and large carnivores as flagship species for promotion (Skibins, 2012). Flagship species, which are often charismatic animals, are able to inspire a connection with nature to increase political and public support for conservation, raise finances and improve public recognition of a site or tourist destination (Dalerum et al., 2008; Skibins et al., 2013; Walpole & Leader-Williams, 2002; Xiang et al., 2011)

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Cardamom forest © Jimmy Borah

The tiger (*Panthera tigris*) is considered one of the most charismatic flagship species globally. Its conservation plays a critical role in promoting forest protection, raising public awareness, and mobilising financial and community support for broader ecosystem conservation. Latest estimates suggest that approximately 5,500 wild tigers remain globally, occupying only a small fraction, around 7–8 per cent, of their historical range (Global Tiger Forum, 2023). Of the 13 tiger range countries, there is no evidence of breeding populations in Cambodia, Vietnam (Walston et al., 2010) and Laos (Rasphone et al., 2019). Key factors in the demise of tiger populations are loss of habitat, destruction of individuals because of their threat to human populations and domestic animals, and take for the wildlife trade in tiger claws and traditional medicines. Exacerbating these issues is the tiger's solitary behaviour and natural low population density. Thus, in any consideration of reintroduction of tigers, it is necessary to ensure a sufficiently large and remote area of suitable habitat with large prey species, security of human populations, preferably without large farm animals and the ability to manage the threat of poaching. These ecological prerequisites are assumed to be met at the sites we consider and therefore not discussed in detail.

In a significant and commendable step, Cambodia became the first country to acknowledge national extirpation of tigers in the 21st century (despite tigers likely having gone extinct in Laos and Vietnam in the preceding years) and started to develop clear steps for recovery. Tiger reintroduction was identified as critical in the Cambodia Tiger Action Plan (CTAP) endorsed in 2016 by the Ministry of Agriculture, Forestry and Fisheries (MAFF). The Eastern Plains Landscape in Mondulkiri Province and the Cardamom Mountains Rain Forest in Koh Kong province were identified in the CTAP as candidate landscapes for tiger reintroduction due to their large, contiguous forest cover, healthy and recovering prey bases, and historical presence of tigers. The Eastern Plains offers expansive dry forests, while the Cardamoms provide dense rainforest, strong ecological connectivity, and secure core zones with low human–livestock interaction. These landscapes meet the essential ecological and security conditions necessary for sustaining a viable tiger population. However, the Cardamom forest habitats will limit direct wildlife visibility compared to open habitats; therefore, habitat augmentation (e.g. grassland patches, waterholes) may be required.

Nestled in the southwestern part of the Indochina peninsula, Cambodia is one of the fastest-growing economies in Asia. Much of the country's landscape is characterised by a low-lying central plain surrounded by uplands and low mountains. Dominant features include the seasonally inundated Tonle Sap, Southeast Asia's largest freshwater lake, and the Mekong River, which traverses the country from north to south. Cambodia has one of the world's most extensive protected area networks; more than 75,000 km^2, or approximately 41 per cent of the country's area, and connected through a system of biodiversity corridors (Ministry of Environment, 2017).

Described as one of the "great game-lands of the world; a Serengeti of Asia", the plains of northern and eastern Cambodia support a diverse and abundant megafauna of ungulates, predators and scavengers (Tordoff et al., 2005; Wharton, 1957). Cambodia, however, suffered substantial political instability and conflict throughout the 20th century escalating during the Lon Nol (1970–1975) and Pol Pot (1975–1979) regimes (Chandler, 2000). There is evidence of declines in the regional population and distribution of large mammal species including tiger, leopard (*P. pardus*), Asian elephant (*Elephas maximus*), banteng (*Bos javanicus*), Eld's deer (*Cervus eldii*) and hog deer (*Axis porcinus*) (Duckworth & Hedges, 1998; Loucks et al., 2008).

Although the primary destination for tourists in Cambodia is more focused on cultural heritage sites and rural landscapes, we argue that livelihood and cultural heritage tourism can be complemented with wildlife tourism, extending the opportunity to generate higher revenues, which can directly and indirectly contribute to the economy and GDP of the country and alleviate poverty in remote areas. In this paper, we assessed the possibility of using tigers as flagship species to promote wildlife-based tourism in more remote areas and diversify Cambodia's offer as an internationally attractive destination.

METHODS

This study adopts a desk-based analytical approach to assess the potential for tiger-based wildlife tourism in Cambodia. Data were compiled from multiple secondary sources, including government reports (e.g. Ministry of Tourism and Ministry of Environment of the Royal Government of Cambodia), published literature, and international datasets on tourism trends and conservation economics.

Tourism statistics, including international arrivals, domestic visitation, and revenue figures, were obtained from official national reports for the period 2019–2024. These were used to analyse pre-, during and post-COVID trends in Cambodia's tourism sector. Provincial-level tourism data for Koh Kong were similarly derived from Ministry of Tourism datasets and used to establish baseline visitation patterns.

Future projections (2025–2030) were developed using a trend-based approach, applying percentage growth rates observed in recent years to estimate visitor increases under a business-as-usual scenario. Economic projections for tiger-based tourism (e.g. revenue generation, employment, and visitor spending) were derived using comparative benchmarks from established wildlife tourism models in India and Nepal, adjusted to reflect Southeast Asian ecological and tourism contexts.

All projections presented in this study are indicative and based on a set of assumptions, including stable tourism growth rates, gradual infrastructure development, and effective governance and enforcement mechanisms. The analysis is intended to provide a scenario-based assessment of potential opportunities rather than precise forecasts.

RESULTS

Cultural tourism trends in Cambodia

Cambodia's tourism sector experienced a significant rebound in 2024, welcoming approximately 6.7 million international tourists; an increase of nearly 23 per cent from 2023. This surge generated an estimated USD 3.6 billion in revenue, underscoring the country's tourism sector as a vital pillar of its economy. The primary international source markets included Thailand (32per cent), Vietnam (20 per cent) and China (12.7 per cent) (Ministry of Tourism, 2024). Additionally, domestic tourism remained robust, with millions of Cambodians exploring local attractions. Tourism now contributes significantly to Cambodia's GDP and plays a key role in employment and rural development. The Ministry of Tourism continues to prioritise sustainable and diversified tourism products and experiences, including wildlife and ecotourism, as core to its strategic growth agenda.

Cambodia is famous for the Angkor Wat World Heritage Site, one of the most important archaeological sites in

Table 1. Overview of international tourist arrivals and revenue at Angkor Archaeological Park before, during and after the COVID-19 pandemic

Period	International visitors	Ticket revenue (in USD)
PreCOVID (2019)	~2.2 million	~99 million
During COVID	2020: 400,889 2021: <200,000	2020: 18.65 million
Early recovery	2022: 287,454	11.5 million
PostCOVID	~798,069 in 2023	13.52 million
By end 2024	~1,023,688 in 2024	~47.8 million

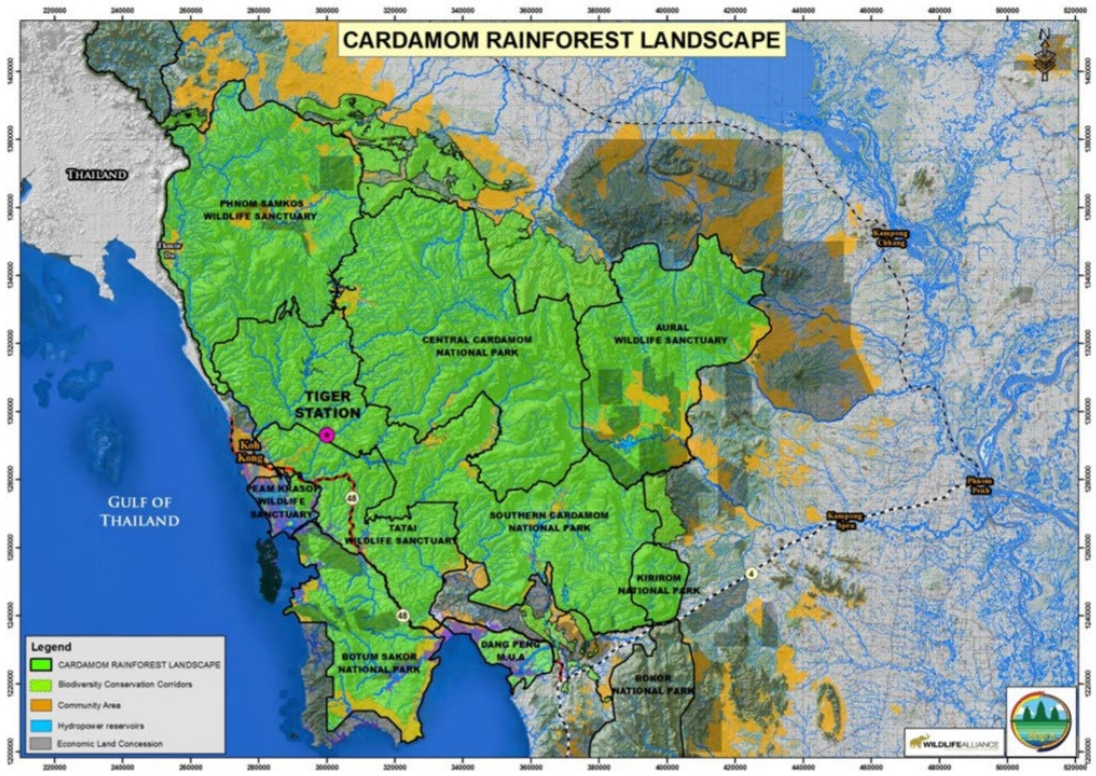

Figure 1. Major protected areas in the Cardamom rainforest landscape (Source: Ministry of the Environment/Wildlife Alliance)

Southeast Asia, located in the northern province of Siem Reap. Stretching over 400 km², Angkor Archaeological Park contains the remains of the different capitals of the Khmer Empire, from the 9th to the 15th century. One of the premier tourist destinations nationally, it welcomed 1,023,688 international tourists in 2024, generating USD 47.83 million in revenue, a 28.27 per cent increase from the previous year (Table 1; Ministry of Tourism, 2024).

Wildlife tourism trends in Cambodia

The province of Koh Kong, located in south-western Cambodia, is a predominantly natural landscape with approximately 85 per cent forest cover, making the region significant for biodiversity conservation (Muñoz et al., 2024). Three major protected areas – Central Cardamom Mountains National Park (401,313 ha), Southern Cardamom National Park (410,392 ha) and Botum Sakor National Park (171,250 ha) –form the core of southwestern Cambodia's conservation landscape. Botum Sakor lies entirely within Koh Kong province, while the other two extend across provincial boundaries (Figure 1). Together, they account for approximately 88 per cent of Koh Kong's total land area and hold significant biodiversity value (Ministry of Environment, 2017).

In recent years, the landscapes of Koh Kong Province and the Cardamom Mountains have emerged as growing destinations for ecotourism in Cambodia (Ministry of Tourism, 2024). These areas are rich in biodiversity and natural attractions, hosting a variety of critically endangered and endemic species, including the Siamese crocodile (*Crocodylus siamensis*), pileated gibbon (*Hylobates pileatus*), sun bear (*Helarctos malayanus*) and Asian elephant (*Elephas maximus*). Wildlife experiences in the region are based mostly on forest treks, community-based ecotourism projects, and guided tours within protected areas such as Botum Sakor National Park and Central Cardamom Mountains National Park. The Chi Phat community ecotourism initiative and Trapeang Rung village are notable examples where local communities have successfully linked conservation with tourism towards improved livelihoods (Carter et al., 2013).

In 2024, Koh Kong attracted more than 511,000 visitors, including 492,000 domestic and 19,000 international (Ministry of Tourism, 2024), representing 1.75 per cent of Cambodia's total national tourism volume (29.22 million). Projections suggest that by 2030, the province could welcome nearly 1.5 million visitors, accounting for 3.7 per cent of the national total (Table 2).

Visitors typically stay between three to five days, participating in jungle safaris, kayaking, bird watching, and volunteering in conservation activities. As infrastructure develops and with tiger reintroduction,

Table 2. Visitor numbers and national tourism share for Koh Kong province, Cambodia (2023–2030)†

Year	Koh Kong domestic tourists ('000)	Koh Kong international tourists ('000)	Total Koh Kong ('000)	Cambodia domestic tourists (million)	Cambodia international tourists (million)	Cambodia total tourists (million)	Koh Kong share of national tourists (%)
2023	311	6	317	18.74	5.45	24.19	1.31%
2024	492	19	511	22.52	6.70	29.22	1.75%
2025	856	55	911	24.55	7.24	31.79	2.87%
2026	921	60	981	26.02	7.67	33.69	2.91%
2027	1,012	66	1,078	27.06	8.13	35.19	3.06%
2028	1,220	70	1,290	28.14	8.54	36.68	3.52%
2029	1,310	76	1,386	29.00	9.05	38.05	3.64%
2030	1,400	80	1,480	30.15	9.56	39.71	3.73%

† Note: Figures for 2023 and 2024 are actual; figures from 2025 onward are official projections by the Ministry of Tourism of Cambodia. Source: Tourism Statistics Department, Ministry of Tourism (2025).

wildlife tourism is expected to become one of the most valuable economic drivers in the province, based on the types of experiences currently only offered in India (USD 200–500 per person for three days) (Lyngdoh et al., 2017).

Can tigers help?

Cambodia's formal plan to reintroduce wild tigers into the Cardamom Mountains Landscape would make it the first country in Southeast Asia to do so in over a decade. The plan includes initially translocating one male and three female tigers from India, supported by strong bilateral cooperation and guided by IUCN translocation protocols (Global Tiger Forum, 2023; IUCN/SSC, 2013). This bold initiative is expected to transform the region into a high-value ecotourism hub, based on the Chitwan model in Nepal, as well as comparable multi-day wildlife experiences in Southeast Asia (e.g. Thailand and Malaysia). In Chitwan, tiger presence has directly contributed to the creation of over 6,000 jobs and significantly improved local infrastructure (Thapa et al., 2017). Beyond economic benefits, the tiger's return would be a beacon for conservation in Cambodia, galvanising national and international support and elevating the country's global profile in biodiversity conservation and restoration.

Tiger habitats also hold a wide range of non-consumptive recreational opportunities such as hiking, birdwatching, wildlife viewing and related pursuits. These activities have flow-on secondary effects to tourism support sectors, which influence the livelihoods of many people residing near such areas (Verma et al., 2015). The Cardamoms Landscape shares certain ecological characteristics with the Central Indian Highlands, of which Kanha Tiger Reserve (KTR) is a representative example (Verma et al., 2015), although differences in vegetation structure and visibility conditions necessitate context-specific tourism approaches. Unlike the more open forest–grassland mosaics of central India, the dense tropical forests of Southeast Asia, such as those in Khao Yai National Park, Thailand, present lower wildlife visibility and require context-specific tourism models (Lynam et al., 2013). It is estimated that the KTR provides flow benefits worth USD 2.3 million (~USD 1,120 per hectare) annually. One of the important services originating from KTR includes recreation value or revenues from tourism related activities, which generate USD 5.3 million per year. Various other important ecosystem services originating from KTR include gene pool protection, provisioning of water to downstream regions, fodder in buffer areas, habitat and refuge for wildlife and sequestration of carbon (Verma et al., 2015).

Similar revenues can be generated for the Cardamoms Landscape in Cambodia with careful and meticulous planning, which ultimately would contribute to the country's GDP and support mixed livelihoods for local communities. Successful frameworks for tiger-based wildlife tourism already exist, particularly in India and Nepal, where structured tourism models have contributed to conservation financing, community livelihoods, and protected area management (Karanth & DeFries, 2011; Thapa et al., 2017) which, if appropriately adapted for the Cambodian physical and social environment, can contribute to profitable tiger tourism in Cambodia. With a long-term perspective of conservation through tourism of an iconic species, its habitats and improving the well-being of local communities, there exists the opportunity to generate sufficient revenue to offset initial investments in tiger conservation and wildlife tourism. We use the wildlife safari experience of KTR as a model for the Cardamoms.

Tented house, cardamoms © Jimmy Borah

a. **Tourist routes and capacities:** It is well-known that tourists can be detrimental to biodiversity, including iconic wildlife, if not managed (regulated and controlled). We support application of the 80:20 rule (National Tiger Conservation Authority [NTCA], 2012) in Cardamoms, where only 20 per cent of the area should be allowed for tourism purposes, while 80 per cent of the area is an inviolate zone to be accessed only for protection and research purposes. A similar policy (STRIPES, 2012) in Indian tiger reserves has yielded fruitful results both in terms of controlling overcrowding as well as maintaining intact undisturbed habitats to sustainably support tigers and other wildlife. For generating relative profits from wildlife tourists, the safari zones and numbers of safari vehicles must be capped to minimise tiger disturbance. Entry fees would be collected from each visitor or group, either directly at the entry gates or through corporate group tour arrangements. Entrance per person should start at a modest level then increase over time to reflect the quality of the experience. Pricing structures should be tiered and adaptive, taking into account local affordability, international market positioning, and willingness-to-pay dynamics. A similar sized park in India (e.g. KTR), allows around 80 vehicles for safaris per day based on a first come booking basis (NTCA, 2012). Each vehicle has a maximum of six tourists, one official guide and one driver, with a maximum of two safaris – morning and afternoon (NTCA, 2012). Considering the current trend in tourist numbers in Koh Kong, around USD 5 million can be expected from entry fees, and a maximum of 960 persons on any given day, with a maximum peak tourism season of 180 days. The marketing of a quality experience would increase revenues and numbers of international tourists visiting the Cardamoms for tiger sightings. This could generate direct employment for approximately 160 people (e.g. drivers and guides) from local communities, while also creating substantial indirect employment across sectors such as vehicle maintenance, fuel supply, hospitality and food services, thereby supporting diversified livelihoods and strengthening incentives for wildlife conservation.

b. **Wildlife levy:** We use levy to mean an amount of money paid to a government (a tax) or organisation for a specified purpose. A wildlife levy, or the willingness to pay (WTP) of wildlife tourists, can be used to help sustain reintroductions and improve economic growth and environmental quality of an area (Israel & Levinson, 2004). It is important to distinguish between park entry fees, which may contribute to general government revenues, and wildlife levies, which are typically earmarked for conservation and community benefit-sharing mechanisms. The pricing strategy to visit a protected area is as important for protecting the tigers and wildlife as it is for the local economy (Samdin et al., 2010). All tourists visiting Koh Kong and the Cardamom Landscape should be asked to contribute USD 1 and USD 2 respectively per person per night as a wildlife levy for local and international tourists, respectively. Since more than 75 per cent of

tourists visit Koh Kong Province to experience nature, this would represent a small contribution for the protection of nature, and by generating an additional USD 100,000 per year will support the government to manage the natural assets in the long term. However, it is imperative that revenues generated from a wildlife levy are managed and governed transparently and used only for the management of protected areas and the development and protection of communities residing near these protected areas.

Tiger tourism projections and contribution to Cambodia's economy

Building on trends from India and Nepal, the introduction of tiger tourism in the Cardamoms Landscape could generate more than USD 5 million annually within five years of tiger reintroduction. Realising the potential of wildlife-based tourism in the Cardamoms will require investment in basic infrastructure, including access roads, visitor facilities, trained guides and accommodation, alongside strengthening institutional arrangements for protected area management. With proper infrastructure, international marketing and strong enforcement, this could grow to over USD 7 million per year in the following decade, which can be used to cover the cost of law enforcement and protection for all protected areas in the province. These figures are based on comparable visitation and revenue streams reported for India's Kanha and Nepal's Chitwan tiger reserves. In Cambodia's context, even a modest 10 per cent increase in international tourist stays and a rise in average stay duration (from three to five nights) due to tiger tourism could significantly boost regional economies. Local communities could benefit from over 300 new direct jobs (as guides, rangers and service staff), while indirect employment opportunities across transport, food and lodging sectors could reach several hundred more. A USD 1 wildlife levy per visitor is projected to generate an additional USD 300,000 annually in ten years or more, funding community conservation efforts and improving protected area management. In the same timeframe, tiger tourism could contribute an estimated 1.5–2 per cent to Cambodia's overall tourism GDP, making it a transformative economic and conservation strategy. With an increase in tourism products and sites across Koh Kong, it would be fruitful to apply and adhere to standards such as Community Based Ecotourism (CBET). Any developments of new hotels and guesthouses must be managed harmoniously with the natural assets that help to draw more tourists to the province, and therefore more revenues.

DISCUSSION

Cambodia has seen a positive surge in international tourist arrivals in 2024, significantly aiding the country's economic growth. The tourism sector contributed 9.4 per cent to Cambodia's GDP in 2024, making the sector one of the key drivers of the country's economy (Ministry of Tourism, 2024). During 2024, Cambodia welcomed 6.7 million international tourists, a year-on-year increase of 22.9 per cent, and attracted 22.52 million domestic tourism movements, up 22 per cent from the year 2023. The influx of international tourists generated USD 3.637 billion, reflecting a year-on-year rise of 18 per cent. With effective and responsible marketing and enhanced tourism packages, the potential to increase revenues from tourism is immense. In a bid to attract more international tourists, particularly from China and other Southeast Asian countries, it might be worthwhile to create tour packages along the lines of 'Beyond temples to forests and wildlife' or 'Angkor and tigers of Cambodia'. Currently regional tourists can only view tigers at the infamous (and illegal) tiger temples in Thailand. While there are few wild Indochinese and Malayan tigers left in Southeast Asia including in Thailand (~200 tigers, increasing), Myanmar (~22, deceasing) and Malaysia (<150, declining), sighting them in natural conditions is rare. With tiger reintroduction in Cambodia, and proper safari experiences, tourists will have an extra incentive to visit the country. The Royal Government of Cambodia will need to commit at the

Table 3. Summary of tiger tourism economic projections

Parameter	Projection (first 5 years)	Projection (10+ years)
Annual tiger tourism revenue	USD 5 million	USD 7+ million
Wildlife levy income	USD100,000 – USD 300,000	USD 300,000+
Direct jobs created	300+	500+
Indirect employment	500+	800+
Contribution to tourism GDP	1.5%	2% or more

Note: Projections are based on (i) observed tourism growth trends in Cambodia (2019–2024), (ii) Ministry of Tourism projections to 2030, and (iii) comparative benchmarks from established wildlife tourism destinations (e.g. India and Nepal), adjusted for Southeast Asian conditions. Estimates should be interpreted as indicative scenarios rather than precise forecasts.

Tiger release site © Jimmy Borah

highest levels and pay additional attention to policies of sustainable development. Millions of urban tourists in hubs across the region are within a two-hour flight of the Cardamoms, and could be directed towards Koh Kong, significantly boosting the province and the country's revenues. This would require aggressive and appropriate marketing from the government as well as other stakeholders. The government should encourage product development to expand options for tourists beyond visiting temples, strengthen law enforcement, improve the quality of tourism products and services, and promote the market via digital platforms internationally.

Across Southeast Asia, protected areas such as Cat Tien and Bach Ma National Parks in Vietnam, Khao Yai, Kaeng Krachan, Kuiburi and Huai Kha Khaeng Wildlife Sanctuary in Thailand, and Taman Negara in Malaysia provide useful examples of existing tourism infrastructure and visitor experiences. These sites typically offer a combination of basic to moderately developed infrastructure, including road access, visitor centres, guided tours, forest trails, and accommodation ranging from park lodges to nearby private facilities (Kontogeorgopoulos, 2005; Lynam et al., 2013). Tourism in these landscapes is largely experience-based, focusing on trekking, birdwatching, river-based activities, and occasional wildlife encounters rather than guaranteed sightings of large carnivores (Buckley, 2010; Lynam et al., 2013). For instance, Khao Yai National Park represents a relatively well-developed tourism model with high visitation, while stricter protected areas such as Huai Kha Khaeng emphasise conservation-oriented management with controlled access (Kontogeorgopoulos, 2005). These examples highlight that, in tropical forest systems, tourism models are typically designed around broader nature experiences and regulated access, rather than high-certainty wildlife viewing, offering important lessons for developing tourism in the Cardamom Mountains Landscape.

Tiger tourism will create opportunities and income for local communities directly and indirectly. The income generated will therefore be useful to provide local socio-economic incentives and benefits, such as providing education for the host communities (Higginbottom et al., 2001; Orams, 1995). Besides education, other positive social impacts for local people could be employment, cultural exchanges, better sanitation facilities, improved health services, increased social interactions, entrepreneurship and more motivation towards wildlife conservation. Similarly, the local communities can benefit by promoting their local products and developing their skills in preservation of their culture.

A notable example of conservation-linked tourism in Cambodia is the community-based ecotourism model developed in the Cardamom Mountains with support from Wildlife Alliance. Since 2007, initiatives such as the Chi Phat ecotourism programme have successfully transitioned local communities from activities such as logging and poaching to sustainable livelihoods based on guiding, homestays and nature-based tourism. This model demonstrates how tourism can generate income while incentivising forest protection and wildlife conservation (ASEAN, 2026; Wildlife Alliance, 2024).

Wildlife tourism may also deter poachers through increased human activity (both rangers and tourists); however, its effectiveness as a deterrent to poaching depends on governance, enforcement capacity, and local socio-economic conditions (Banerjee, 2010; Buckley, 2018; Naidoo et al., 2016). Wildlife tourism should increase the value of a flourishing living ecosystem and maintain motivation for Cambodian park rangers. We believe that initiating tiger tourism will attract tourists to lengthen their stay in Cambodia and elevate Cambodia's image as a desirable tourist destination with exclusive wildlife experiences. It will also lift Cambodia's leaders to exceptional conservation heights for their role in restoring the tiger population and contributing to the global goal of doubling tiger numbers.

The findings of this study should be interpreted with caution. The projections are based on trend extrapolation and comparative benchmarks, and actual outcomes will depend on site-specific factors such as infrastructure development, governance effectiveness, and market dynamics. In particular, wildlife visibility in dense tropical forests may limit the immediate tourism appeal of tiger reintroduction compared to open landscapes in South Asia.

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RÉSUMÉ

Le secteur touristique cambodgien a connu une forte reprise après la pandémie, portée en grande partie par ses sites du patrimoine culturel de renommée mondiale. Le réseau d'aires protégées du pays et sa grande biodiversité offrent des possibilités de diversification au-delà du tourisme culturel. Cet article évalue le potentiel de la réintroduction du tigre – en particulier dans le paysage des montagnes des Cardamomes – pour catalyser une nouvelle économie touristique durable axée sur la faune sauvage. Le Cambodge a accueilli 6.7 millions de visiteurs internationaux en 2024, générant 3.6 milliards de dollars américains – des chiffres qui soulignent l'importance d'explorer de nouveaux produits touristiques. Cette étude estime que le tourisme axé sur les tigres dans les Cardamomes pourrait générer entre 5 et 7 millions de dollars américains par an d'ici une décennie, créer de nombreux emplois locaux et contribuer jusqu'à 2 pour cent du PIB national lié au tourisme. Des mécanismes complémentaires – tels que des taxes sur la faune sauvage, un zonage réglementé des safaris, des modèles d'écotourisme communautaire et une gouvernance solide – pourraient garantir un partage équitable des bénéfices et une viabilité financière à long terme. En intégrant la conservation de la biodiversité à une expansion touristique stratégique, la réintroduction des tigres offre au Cambodge une occasion unique de faire revivre une espèce disparue, de stimuler les économies rurales et de se positionner comme une destination d'écotourisme en Asie du Sud-Est.

RESUMEN

El sector turístico de Camboya ha experimentado una sólida recuperación tras la pandemia, impulsada en gran medida por sus lugares de interés cultural de renombre mundial. La red de áreas protegidas del país y su elevada biodiversidad ofrecen oportunidades para la diversificación más allá del turismo cultural. Este artículo evalúa el potencial de la reintroducción del tigre —concretamente en el paisaje de las Montañas del Cardamomo— para impulsar una nueva economía turística sostenible basada en la fauna silvestre. Camboya recibió 6.7 millones de visitantes internacionales en 2024, lo que generó 3.6 millones de dólares estadounidenses, cifras que subrayan la importancia de explorar productos turísticos adicionales. Este estudio estima que el turismo basado en los tigres en las Cardamomos podría generar entre 5 y 7 millones de dólares estadounidenses al año en el plazo de una década, crear un número significativo de puestos de trabajo locales y contribuir con hasta un 2 por ciento del PIB turístico nacional. Mecanismos complementarios —como tasas sobre la fauna silvestre, la zonificación regulada de los safaris, modelos de ecoturismo comunitarios y una gobernanza sólida— podrían garantizar una distribución equitativa de los beneficios y la sostenibilidad financiera a largo plazo. Al integrar la conservación de la biodiversidad con la expansión estratégica del turismo, la reintroducción del tigre ofrece a Camboya una oportunidad única para recuperar una especie perdida, estimular las economías rurales y posicionarse como destino de ecoturismo en el Sudeste Asiático.

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COMMUNICATING CONSERVATION EFFECTIVENESS: BALANCING OPTIMISM, TRADEOFFS AND REALISM IN CONSERVATION SUCCESS NARRATIVES

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ABSTRACT

Communicating conservation 'bright spots' – concrete, demonstrated wins for biodiversity – is vital for inspiring public confidence, mobilising political commitment, and maintaining the long-term financing needed to scale impact, specifically by expanding, replicating and accelerating actions that meaningfully improve biodiversity outcomes. Yet research on how best to frame and share these successes with diverse audiences remains limited. To address this gap, we surveyed 45 Canadian conservation experts on the benefits, challenges and opportunities of communicating positive ecological and social outcomes from protected and conserved area initiatives. Respondents strongly endorsed the value of success stories for demonstrating conservation impact, inspiring action and boosting morale within organisations, particularly in countering conservation grief. Narratives that connect people to landscapes – such as those highlighting Indigenous Protected and Conserved Areas – were viewed as especially compelling. However, experts cautioned against oversimplification, which can obscure the complexity and resources required for effective and urgent conservation. Our findings underscore the need for strategic, evidence-based communication approaches that balance optimism with realism, integrate diverse knowledge systems, and resonate across audiences. These insights can inform efforts to advance national and international conservation goals and targets, including Targets 3 (expanding protected and conserved areas) and 21 (knowledge sharing) of the CBD Kunming-Montreal Global Biodiversity Framework.

Keywords: biodiversity, success, bright spots, protected and conserved areas, knowledge mobilization, Target 3, Target 21, Kunming-Montreal Global Biodiversity Framework

INTRODUCTION

Despite major progress in biodiversity conservation – such as a 6.2 per cent global increase in terrestrial protected and conserved areas (PCAs) and a 13.3 per cent rise in marine coverage since 1999 (now 8.4 per cent) (UNEP-WCMC & IUCN, 2024) – communicating positive ecological and social outcomes remains challenging (Díaz et al., 2018). Success stories are rare due to shifting baselines, inadequate monitoring, resource constraints, and uncertainty about replicating strategies (Post & Geldmann, 2018; Watts et al., 2020). Biodiversity also struggles to attract public attention compared to climate change, as impacts are either gradual and hard to visualise or sudden and crisis-driven (Legagneux et al., 2018). Consequently, negative language dominates biodiversity-related discourse; which is often exacerbated by the integration of climate change narratives (McAfee et al., 2019).

Although none of the Convention on Biological Diversity (CBD) Aichi Biodiversity Targets were met globally (Diaz et al., 2019), conservation has not 'failed' *per se*. Indeed, a landmark study found that two-thirds of conservation interventions improved biodiversity or slowed its decline, with protected areas showing the strongest positive effects – underscoring the need to scale up such interventions (Langhammer et al., 2024). This outcome underscores an implementation gap, rather than a failure of conservation efficacy; individual site-level successes are demonstrably successful, yet their collective

Bison grazing at Elk Island National Park illustrate how protected grassland–forest mosaics can deliver real biodiversity outcomes through sustained stewardship, monitoring, and long-term investment © C. Lemieux

magnitude remains insufficient to counteract global declines. Sharing successes is critical for awareness, programme improvement and financing (Cvitanovic & Hobday, 2018). The CBD's *Kunming-Montreal Global Biodiversity Framework* (GBF), adopted in 2022, reinforces this through Target 3 ('30x30') and Target 21, which call for expanding PCAs and promoting knowledge sharing to inspire urgent action (CBD, 2022). Yet the intersection of these targets remains largely unexplored (Hoesen & Lemieux, 2025).

Environmental communication – the sharing of information to influence relationships with nature – is central to biodiversity mainstreaming and transformation more broadly (Young et al., 2014). It draws on education, outreach and behavioural science to raise awareness and encourage pro-environmental behaviour. Nevertheless, empirical links between biodiversity and communication strategies remain limited (Kidd, Bekessy et al., 2019a). Highlighting positive outcomes can inspire global action, but message framing matters: negative frames capture attention, while optimism sustains engagement when paired with realistic solutions (Doubleday and Connell, 2020; Kusmanoff et al., 2020; McAfee et al., 2019). Emotional states also influence receptivity – optimism fosters openness, whereas fear narrows focus (Coelho et al., 2017). Interdisciplinary approaches are essential to align messaging with values and emotions.

The concept of 'bright spots' highlights cases where conservation outcomes exceed expectations, often due to community involvement, inclusive governance, and Indigenous leadership (Bennett et al., 2016; Cinner et al., 2016; Hoesen & Lemieux, 2025). These examples counter dominant narratives of decline by showing that ecological recovery is possible when social, cultural and ecological benefits align (Hoesen & Lemieux, 2025). Yet brightspot analyses remain limited in the context of PCAs, including in Canada, despite its extensive and expanding network.

Canada's *2030 Nature Strategy* positions communication and knowledgesharing across Western and Indigenous knowledge systems (ECCC, 2024). PCA organisations similarly embed education, research, outreach and storytelling in their mandates, to build ecological literacy and highlight conservation successes. However, little research examines how these efforts shape public perceptions, trust or understanding of positive biodiversity outcomes. Discussions of conservation knowledge systems are often framed as a binary between 'Western science' and 'Indigenous knowledge', yet this distinction can be misleading. Both encompass considerable internal diversity, including different disciplinary traditions, epistemologies and ways of evaluating evidence and outcomes. Moving beyond a binary framing allows for a more nuanced understanding of how conservation successes are identified, interpreted and communicated from multiple perspectives. Significant opportunities remain to understand and strengthen the role of PCAs as hubs for learning, knowledge exchange and public engagement.

This article addresses that gap by examining how conservation success is communicated, with the dual aims of: (1) identifying the benefits and drawbacks of foregrounding success stories; and (2) assessing the risks and opportunities of leveraging success in programming, outreach and management. Our goal is to examine how success-oriented communication can more effectively engage diverse audiences, normalise constructive and hopeful narratives through 2030, and contribute to the implementation of GBF Targets 3 and 21. By analysing current practices across Canada's protected and conserved areas, this research aims to generate insights into when and how communicating success supports collaboration, builds trust, and sustains public and institutional momentum. These findings are expected to inform practical guidance for conservation agencies and partners seeking to design communication strategies that amplify positive outcomes and enhance support for biodiversity action both within Canada and in comparable contexts globally.

METHODS

Survey development and participant recruitment

A mixed methods approach was adopted using a survey questionnaire of quantitative and qualitative questions administered in Qualtrics® (using a 5-point Likert scale) (see Supplementary Online Material 1). The survey was organised into three sections: (1) respondent information (8 questions), (2) 'bright spot' context, relevance and opportunities (5 questions), and (3) communicating conservation successes (6 questions). Respondents considered the advantages and disadvantages of communicating conservation success in relation to PCAs. The survey received ethics clearance for research on human subjects by Wilfrid vLaurier University (REB #7247).

Purposive sampling was used to identify experts in PCA management and conservation issues within the Canadian context. Sampling was informed by a review of publications, institutional profiles, staff directories, and through referrals via long-established organisations, including the Canadian Council on Ecological Areas (CCEA) and the Collective for Parks, Conservation, Innovation and Leadership (CPCIL). Experts invited to participate in the survey included practitioners (e.g. managers from Canadian government and private PCA agencies) and scholars with expertise in Canadian PCA issues. Individuals from a variety of conservation backgrounds were identified to achieve diverse perspectives, ensuring heterogeneity across areas of expertise (e.g. natural and social sciences). While governments responsible for Indigenous Protected and Conserved Areas (IPCAs) were not specifically targeted, researchers with strong Indigenous-led conservation backgrounds were invited to participate to incorporate traditional knowledge perspectives.

Data treatment and analysis

Closed-ended responses were analysed in IBM SPSS version 28, and open-ended responses in NVivo version 12 using Braun and Clarke's Six-Step Thematic Analysis Framework (Braun & Clarke, 2006). Themes were derived inductively from the data, supported by a hybrid coding approach (Braun & Clarke, 2006). Steps 2 and 3 were repeated for consistency, and closely related codes were merged unless rare or irrelevant (Allsop et al., 2022). Codes were refined to capture contextual meaning, especially when responses linked multiple aspects (e.g. biodiversity and social outcomes), which were treated as unified themes. Sub-themes were consolidated into core themes through iterative refinement, ensuring excerpts aligned with question context. Triangulation cross-referenced codes with Likert responses to validate interpretations (Braun & Clarke, 2021).

RESULTS

Expert (respondent) characteristics

Experts were invited to complete the survey via email; 45 completed responses were received (representing a 37.5 per cent response rate). Academics had a slightly higher participation count (45.0 per cent) compared to practitioners (33.8 per cent). The lower response rate among practitioners may have been influenced by the timing of the survey during the summer months (i.e. field work). The organisations represented in the survey included five federal agencies, 12 provincial/territorial ministries, 17 research institutions (e.g. universities), 10 private and non-governmental organisations (NGOs), and one international organisation. On average, respondents were highly educated (87 per cent with a graduate degree) with 17 years of working experience in the PCA sector (ranging from 1 to 50 years). Practitioners reported expertise in research, monitoring and reporting (n = 21), legislation and policy development (n = 11), protected areas selection, evaluation and design (n = 10), and education, interpretation and outreach (n = 8). Researchers and academics reported specialised knowledge in conservation social sciences, ecology, and protected areas policy, planning and management, and have collectively worked across every major ecozone in Canada.

Sharing conservation successes

Most respondents (82 per cent) viewed conservation success as under-discussed, with all respondents (100 per cent) agreeing that sharing success stories brings

tangible benefits to PCAs (Table 1, Supplementary Online Material 2). Additionally, 94 per cent agreed that such stories should be shared more frequently. Nearly all respondents (97 per cent) agreed that promoting conservation success enhances biodiversity education and programming. Effectively communicating these successes poses challenges (Mean = 3.0), and respondents highlighted the need for more resources to support this work (Mean = 4.3). Respondents felt it important that stories balance realism and optimism (Mean = 4.3).

Conservation success statements were compared between practitioners (n = 27) and academics (n = 18) (Table 2, Supplementary Online Material 2). While practitioners and academics generally showed similar levels of agreement or disagreement, only two significant differences ($p<0.05$) emerged regarding statements 1 and 10. For statement 1, practitioners (Mean = 4.7) expressed stronger agreement that sharing conservation success benefits PCAs, compared to academics (Mean = 4.4). Conversely, for statement 10, which addresses the challenge of identifying successful conservation outcomes to highlight, practitioners were less likely to agree (Mean = 2.7), while academics were more in agreement (Mean = 3.5). These findings are returned to in the discussion below.

Advantages and disadvantages related to the sharing of success stories

Communicating conservation success in PCAs offers opportunities to scale positive biodiversity outcomes but requires consideration of both benefits and risks (Tables 3 and 4, Supplementary Online Material 2). Overall, participants emphasised that while success stories can inspire replication, attract funding and strengthen engagement, they must be crafted to maintain urgency and avoid oversimplifying complex conservation realities (Figure 1). Balancing advantages and disadvantages is essential for communication strategies that advance conservation goals without creating unintended pressures or misconceptions.

By highlighting effective approaches, experts noted that these narratives can inspire replication, attract funding, and strengthen public and stakeholder engagement, ultimately advancing conservation goals. Five key advantages emerged from the qualitative analysis related to the sharing of success stories:

1. Raising awareness and appreciation;
2. Improving mental health and well-being;
3. Enhancing engagement;
4. Advancing knowledge of conservation solutions; and,
5. Demonstrating the value of conservation efforts.

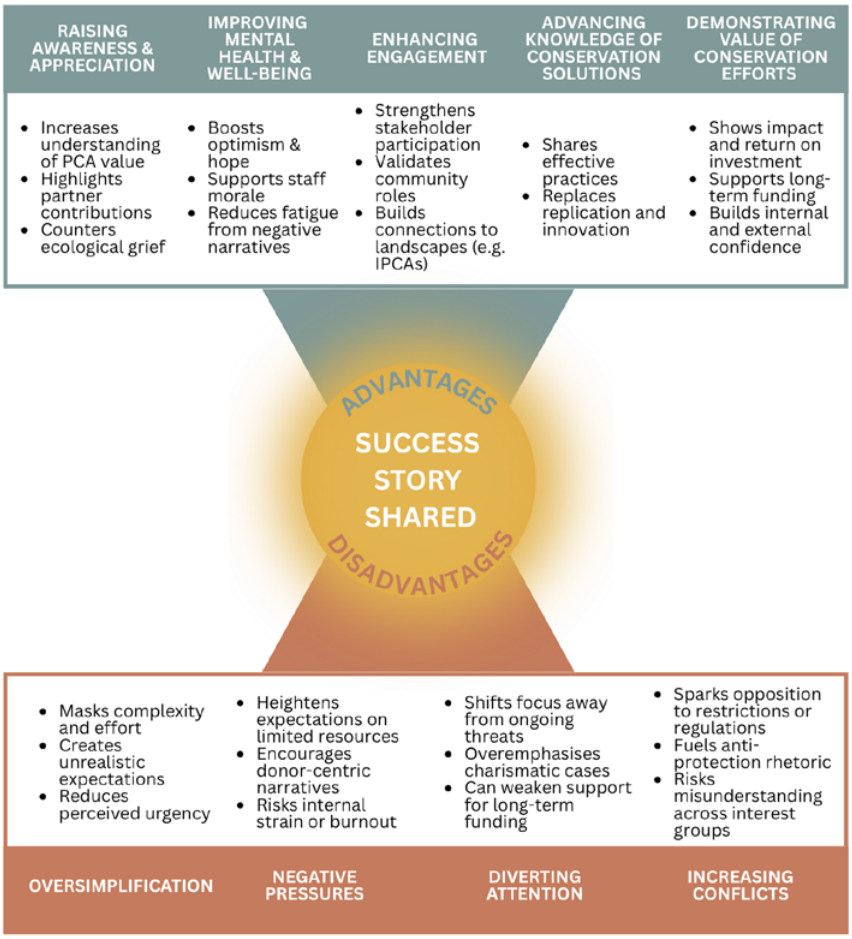

Figure 1. High-order and cascading impacts of communicating conservation success

The most frequently cited advantage involved fostering awareness and support for PCAs as vital conservation tools, and for conservation efforts more broadly. As one respondent noted:

> *"Protected areas are managed with a lot of competing demands. Sharing success stories can help to show appreciation for the efforts of partners (i.e. community groups, volunteers, Indigenous collaborators) … sharing success stories effectively can help to combat conservation grief that can emerge, especially in protected areas staff who often feel like they are swimming upstream."*

Other respondents emphasised that success communication also plays an important internal role within conservation organisations. As one participant explained:

> *"It is necessary to not only build public confidence and support for conservation agencies, but also build confidence and support for conservation within the protected area agency itself. Many conservation agencies are dependent on revenue from recreation (Crown), or from donors (e.g. non-government organizations). Communicating success stories indicates the lead agency is allocating those resources/revenue wisely and effectively."*

Extending this outwards, another participant highlighted how success stories can shape public values and strengthen local engagement:

> *"It increases the value of protected and conserved areas in the public eye and therefore favors their conservation, as people can better understand the benefits gained. It can also validate local support groups and incentivize their efforts as ambassadors for the areas."*

Highlighting conservation success carries inherent risks that PCAs must carefully weigh against potential advantages. Respondents emphasised the importance of effectively communicating success to non-specialist audiences in a way that maintains a sense of urgency and avoids the misconception that successful biodiversity conservation is easy or is limited to PCAs. Four key disadvantages emerged from the qualitative analysis in this regard:

1. Oversimplification;
2. Negative pressures;
3. Diverting attention; and,
4. Increasing conflicts.

While disadvantages were noted less frequently than advantages, respondents nonetheless raised recurring cautions – particularly around the risks of over-simplifying conservation narratives. One respondent worried that an emphasis on solutions could obscure the scale and difficulty of biodiversity loss:

> *"I worry that the public will think the solutions to biodiversity decline are readily available and easy to access. It needs to be a balance between highlighting the needs of biodiversity and how human actions are eroding it, and the ability to mitigate this erosion through success stories."*

Related concerns focused on how donor-centric communication can flatten the complexity of conservation practice and long-term relationship building:

> *"Sometimes the oversimplification of detailed plans and projects to adapt them for communications with a donor-centric approach may seem too general, hyperbolic or too emotional and may miss the nuance required when discussing the decades of work and relationship building and careful inclusion of various communities in getting there. It's not easy work …"*

Beyond concerns about erasing complexity, some respondents warned that success-oriented messaging may also gloss over social trade-offs, particularly where conservation outcomes are achieved through restrictions on access or use. In these cases, communicating success too confidently may risk exacerbating existing tensions or generating new ones among affected stakeholders, as one participant cautioned:

> *"The natural resource industry and recreational land users may oppose restrictions in protected and conserved areas. The natural resource industry would tend to be responsive to the increase of protected and conserved areas, and not to public communications on this. On the other hand, a portion of the public who fear that recreational activities and economic opportunities may be restricted by conservation efforts, may be more reactive to public communications. It could be perceived by a small portion of the population who feel impacted, that conservation efforts are not well balanced."*

This perspective highlights how success stories, when detached from discussions of trade-offs and equity, may unintentionally deepen scepticism or resistance among groups who perceive themselves as bearing disproportionate costs. Collectively, these responses illustrate a persistent tension: success stories can enhance credibility, motivation and support, but only when they are communicated with sufficient nuance and transparency.

Experiences of university students at Pinery Provincial Park (Ontario, Canada) illustrate how connecting people with protected coastal ecosystems enhances ecological literacy and builds public trust and support, particularly when conservation outcomes are communicated realistically © C. Lemieux

Conservation success stories that should be elevated

Respondents offered insights into the types of success stories they believe could be further elevated to support PCA goals and objectives (Table 5, Supplementary Online Material 2). A reoccurring theme was the concept that conservation as a 'work in progress' is a shared endeavour, where everyone has a role to play in success. Stories that highlight the connection between people and landscapes were seen as powerful narratives to foster discussions around ecosystem connectivity and promote broad societal collaboration.

Key areas for storytelling included diverse partnerships, incorporating different knowledge systems, and offering more balanced perspectives. Key informants noted that many recent conservation successes have been exemplified by the resurgence of Indigenous-led conservation initiatives, such as IPCAs in Canada. These success stories serve as valuable communications tools, with implications for elevating Indigenous-conservation approaches (e.g. Indigenous Guardians Programs, etc.). Positive examples of Indigenous stewardship have recently attracted substantial support from funders, as these case studies can inspire success in other regions (Artelle et al., 2019). Indigenous-led conservation approaches are increasingly recognised as critical to conservation success. Experts noted that it remains challenging to blend communication approaches using different forms of knowledge, and that additional resources are needed to support such efforts. It was also recognised that agencies need to be flexible and nimble because they must adapt communications to diverse audiences, contexts and evolving ecological challenges. This adaptability ensures that messages resonate effectively, fostering broader engagement and sustained support for conservation efforts. As one respondent explained:

> *"Communications also need to recognize that there are different audiences or interpretive communities within society who each respond to the issue in their own distinct ways. One of the first rules of effective communication is 'know thy audience', this is where protected area/biodiversity conservation has failed. You need to know who your audience is, what they currently understand or misunderstand about issues, their perceptions of the risks, their underlying values, attitudes, and emotions, where they get their information, whom they trust. This also requires better engagement with other sectors who are also part of the problem but can be part of the solution."*

Respondents also emphasised the importance of shining a light on lesser-known conservation achievements across Canada, such as those about unfamiliar or underrepresented species, remote regions and innovative partnerships. For example, collaborations with industry, community-driven initiatives, new monitoring programmes, and imperfect solutions that balance trade-offs. Emphasis was also placed on sharing these

narratives with diverse audiences, particularly those who may not visit PCAs or work in sectors less attuned to the urgency of conservation. These stories, infused with a sense of hope, were viewed as essential for strengthening long-term relationships between people and nature, and encouraging both public and stakeholder engagement. As one participant stated:

> *"Often, we celebrate success in areas that are well known and close to us, but I think by telling success stories from less frequented and remote areas, we might be able to both highlight the success and increase familiarity and ability to relate to the more remote areas and species of Canada. In a massive country like Canada, I think that it's important to find ways to get people thinking about the 90 per cent of it that's remote and that most Canadians may never see."*

DISCUSSION

Success stories related to PCA investments can provide compelling examples of progress, viable solutions and tangible conservation outcomes. Strategic communication that highlights synergies and mutual benefits can reinvigorate conservation efforts and strengthen public engagement (Cvitanovic & Hobday, 2018; Dietz et al., 2021; Legegneux et al., 2018), particularly in the context of global commitments to halt biodiversity loss, including targets to protect 30 per cent of terrestrial, freshwater and marine areas by 2030 and restore biodiversity by 2050 (CBD, 2022). Our research indicates that communicating conservation successes raises awareness and support, enhances the visibility of PCAs, and improves understanding of pathways to address biodiversity loss. These narratives were also perceived to support mental well-being among both the public and conservation professionals, while strengthening fundraising and collaboration by demonstrating effectiveness and impact.

While fear- and anger-based narratives can effectively capture attention, they may also contribute to fatigue, polarisation and disengagement over time, underscoring the need for complementary communication approaches that sustain long-term engagement. The role of success stories in supporting mental health and well-being – both within the conservation sector and among external audiences – remains underexplored, yet experts emphasised the importance of integrating hope and optimism into conservation messaging. This perspective aligns with existing literature showing that communication strategies are more impactful when they account for emotional states and audience perspectives during message design and dissemination (Coelho et al., 2017; Kidd, Garrard et al., 2019; McAfee et al., 2019; Park et al., 2020). In this sense, evidence-based success stories can serve as important counterweights to the persistent circulation of anxiety-inducing environmental narratives in mass media and public discourse (see Ogunbode et al., 2022).

However, calls for more success stories also revealed tensions in how conservation progress is perceived, particularly when interventions are assessed across mismatched or accelerating timescales. Several respondents suggested that genuine gains may appear insufficient when measured against crisis-oriented narratives, moving targets, or highly visible achievements elsewhere. In this context, progress can represent meaningful success yet still feel like 'not doing enough', contributing to frustration despite real advancements. This dynamic is reflected in growing attention to conservation-related emotional responses among practitioners, including initiatives addressing ecological grief (CPCIL, 2024). Together, these insights underscore the importance of communicating conservation as an ongoing process of *measurable progress* rather than a static end point, ensuring that incremental gains are recognised as success when, and where, they occur.

Our results underscore the need for a strategic approach to conservation messaging, including Western and Indigenous approaches, ensuring that communications resonate with diverse audiences and serve multiple purposes effectively. While strategies from other disciplines can offer useful insights, they must be critically evaluated, as they may lack empirical data necessary to meet the specific goals of area-based conservation (see Bekessy et al., 2018; Kidd, Bekessy et al., 2019b). Further research is required to evaluate the long-term effectiveness of biodiversity communication strategies and message-framing techniques, including the ways in which audience emotions, perspectives and values are integrated (Coelho et al., 2017; Kidd, Garrard et al., 2019; McAfee et al., 2019).

We revealed that although messages of hope and inspiration can foster optimism and momentum, balanced messaging is essential to convey the complexities of conservation with realism. The concept of 'success' also remains inadequately defined (Post & Geldmann, 2018), and communication strategies must acknowledge this inherent uncertainty. Experts emphasised that care must be taken to avoid oversimplifying the work and resources that are required to achieve and maintain 'success', as this can lead to the misconception that conservation is not difficult to achieve, or that solutions are readily available for every challenge.

Early forest regeneration along a Jasper National Park trail shows post-wildfire recovery as a hopeful but incremental process dependent on long-term protection, adaptive management, and collaboration © C. Lemieux

Our results emphasise the need for organisations to be mindful of challenges that may arise when sharing success stories. Without adequate context, such narratives may inadvertently suggest that conservation efforts are complete, reducing urgency and potentially contributing to public disengagement or anti-protection rhetoric. Frequent use of success stories may also create the misconception that sustained long-term funding is unnecessary and raise unrealistic expectations about what can be achieved with chronically limited resources (see Lemieux et al., 2021). Emphasizing milestone achievements as conservation successes risks erasing Indigenous Peoples and local communities by masking their historical and ongoing contributions and perpetuating colonial narratives of conservation effectiveness (Loring & Moola, 2020). Success stories can also be romanticised when positive outcomes are emphasised while ongoing challenges, trade-offs, or internal community diversity are downplayed, risking simplified narratives that privilege symbolic inclusion over substantive changes in power, governance and decision-making authority.

Ensuring that success narratives are community-controlled, context-rich and reflective of lived realities is therefore critical to ethical and effective conservation communication. One constructive step would be establishing an inclusive national working group to co-develop a strategic communication framework guiding how conservation successes are framed, shared and evaluated across audiences. Such a framework could support tailored messaging for policymakers, communities, rights holders, the private sector, and philanthropists, while remaining attentive to plural definitions of success and avoiding overly standardised or donor-centric framings. When done thoughtfully, systematic reporting of conservation outcomes can strengthen public support, enhance transparency and accountability, demonstrate the value of investment, and foster shared responsibility across Canada's diversifying conservation community while supporting the long-term financing and policy commitments needed for effective management.

A complementary step is to collaboratively define how conservation success should be tracked, including the development of metrics that allow comparability across contexts while acknowledging that success is diverse and place-specific (Hoesen & Lemieux, 2025). This is particularly important for initiatives grounded in different knowledge systems, where success in Indigenous-led and community-based conservation may be defined through strengthened governance, cultural continuity, language revitalisation, intergenerational knowledge transfer, or renewed relationships with land and water – outcomes that often fall outside conventional ecological indicators or short-term project timelines (Artelle et al., 2019; M's-t No'kmaq et al., 2021). Because

knowledge systems are internally diverse, complementary, and deeply situated in specific contexts, they resist universal definitions of success. Future research should therefore examine how communication approaches, particularly those blending Western science and Indigenous knowledge, can be co-developed to foster trust, inclusivity and engagement, including guidance for IPCAs where compelling narratives exist but practical framing remains limited (Ens et al., 2022). Exploring audience segmentation and framing strategies, such as balancing optimism and realism or emphasising cultural relevance, would further support behavioural change and policy commitment while respecting diverse cultural contexts (e.g. McAfee et al., 2019).

As a result, externally driven evaluation frameworks risk misinterpreting or undervaluing forms of success that are meaningful within their originating knowledge systems. Shared approaches to documenting results should prioritise clarity and transparency while remaining flexible enough to accommodate community-defined values, plural success criteria, and the situated realities of different knowledge systems and worldviews to avoid 'blending' values in a way that risks oversimplifying perspectives. By prioritising metrics that reflect this diversity, conservation can ensure that community-led priorities are not obscured by generalised metrics, thereby upholding the integrity of the specific knowledge systems involved.

This study shares common limitations of survey-based research. Although experts from diverse conservation fields were purposefully selected to support more holistic perspectives, Indigenous governments and communities were not directly engaged, meaning the findings do not fully reflect Canada's wider conservation community. Additionally, interpreting Indigenous-led conservation initiatives through secondary accounts carries a risk of reinforcing simplified or external framings of success. Future research would benefit from community-led articulation of success narratives and evaluation criteria to ensure authenticity and accountability in conservation communication. Finally, the use of a single coder also introduces potential researcher bias (Braun & Clarke, 2021), as decisions about coding and theme development may have been influenced by individual interpretation (Allsop et al., 2022). Nonetheless, openended responses allowed participants to articulate their views in their own words, providing contextual depth that helped validate the analysis and indicate that the questions were generally well aligned with respondent intent.

CONCLUSIONS

Our results revealed that conservation success stories remain underused within Canada's PCA community, despite their potential to shift attention from sitelevel crises towards landscapescale, communitydriven solutions. This gap matters because conservation is a continuous learning process constrained by limited resources (Lemieux et al., 2021). When narratives focus only on negative outcomes, progress 'beyond hectares' appears rare, reinforcing the misconception that areabased conservation – central to Target 3's 30x30 goal – is a poor investment and diverting resources away from effective PCA management.

Success stories can counter these risks by fostering a connectivity mindset and motivating collective action (McAfee et al., 2019), but they must be crafted carefully to avoid oversimplification or unintended consequences such as overvisitation or reduced funding. Equally important is inclusivity: weaving in diverse cultural perspectives and Indigenous knowledge ensures holistic storytelling aligned with GBF priorities on inclusive decisionmaking (Target 22) and knowledge sharing (Target 21) (Dudley et al., 2022).

Our findings emphasise that success stories must be contextrich and realistic to resonate across audiences and avoid implying that conservation gains are easy. Strategic communication linking conservation action (Target 3) with knowledge sharing (Target 21) can support long-term biodiversity goals and public engagement.

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RÉSUMÉ

La communication des “points positifs” en matière de conservation – c'est-à-dire des avancées concrètes et avérées pour la biodiversité – est essentielle pour inspirer la confiance du public, mobiliser l'engagement politique et maintenir le financement à long terme nécessaire pour amplifier l'impact, notamment en développant, en reproduisant et en accélérant les actions qui améliorent de manière significative les résultats en matière de biodiversité. Pourtant, les recherches sur la meilleure façon de présenter et de partager ces réussites auprès de publics variés restent limitées. Pour combler cette lacune, nous avons interrogé 45 experts canadiens en conservation sur les avantages, les défis et les opportunités liés à la communication des résultats écologiques et sociaux positifs issus des initiatives menées dans les zones protégées et conservées. Les personnes interrogées ont fortement souligné la valeur des exemples de réussite pour démontrer l’impact de la conservation, inspirer l’action et remonter le moral au sein des organisations, en particulier pour contrer le deuil de la conservation. Les récits qui relient les personnes aux paysages – tels que ceux mettant en avant les zones protégées et conservées autochtones – ont été jugés particulièrement convaincants. Cependant, les experts ont mis en garde contre une simplification excessive, qui peut masquer la complexité et les ressources nécessaires à une conservation efficace et urgente. Nos conclusions soulignent la nécessité d’adopter des approches de communication stratégiques et fondées sur des données probantes, qui concilient optimisme et réalisme, intègrent divers systèmes de connaissances et trouvent un écho auprès de tous les publics. Ces informations peuvent contribuer à faire progresser les objectifs et cibles nationaux et internationaux en matière de conservation, notamment les cibles n° 3 (extension des zones protégées et conservées) et n° 21 (partage des connaissances) du Cadre mondial pour la biodiversité de Kunming-Montréal de la CDB.

RESUMEN

La difusión de los “puntos positivos” de la conservación —logros concretos y demostrados en materia de biodiversidad— es fundamental para inspirar la confianza del público, movilizar el compromiso político y mantener la financiación a largo plazo necesaria para ampliar el impacto, concretamente mediante la expansión, la replicación y la aceleración de acciones que mejoren de manera significativa los resultados en materia de biodiversidad. Sin embargo, la investigación sobre la mejor manera de presentar y compartir estos éxitos con públicos diversos sigue siendo limitada. Para abordar esta laguna, encuestamos a 45 expertos canadienses en conservación sobre los beneficios, retos y oportunidades de comunicar los resultados ecológicos y sociales positivos de las iniciativas de áreas protegidas y conservadas. Los encuestados respaldaron firmemente el valor de las historias de éxito para demostrar el impacto de la conservación, inspirar la acción y elevar la moral dentro de las organizaciones, especialmente para contrarrestar el desánimo en materia de conservación. Las narrativas que conectan a las personas con los paisajes —como aquellas que destacan las Áreas Protegidas y Conservadas Indígenas— se consideraron especialmente convincentes. Sin embargo, los expertos advirtieron contra la simplificación excesiva, que puede ocultar la complejidad y los recursos necesarios para una conservación eficaz y urgente. Nuestros hallazgos subrayan la necesidad de enfoques de comunicación estratégicos y basados en la evidencia que equilibren el optimismo con el realismo, integren diversos sistemas de conocimiento y tengan repercusión en todas las audiencias. Estos datos pueden servir de base para impulsar los objetivos y metas de conservación a nivel nacional e internacional, entre ellos la meta 3 (ampliar las áreas protegidas y conservadas) y la meta 21 (intercambio de conocimientos) del Marco Mundial para la Diversidad Biológica de Kunming-Montreal del CDB.

SHORT COMMUNICATION:

PROTECTED AND CONSERVED AREA EFFECTIVENESS – INTRODUCING AN ENHANCED FRAMEWORK FOR REPORTING DATA TO PROTECTED PLANET

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ABSTRACT

Increasing the extent of protected and conserved areas (PCAs), without ensuring these areas are effectively conserving biodiversity, is insufficient to achieve global conservation targets. At the site level, assessing effectiveness is an important part of adaptive management and a wide range of tools have been developed for this purpose. Collating effectiveness data at the global level is important for tracking progress towards Target 3 of the Kunming-Montreal Global Biodiversity Framework (KMGBF). However, the ability to synthesise insights gained through effectiveness assessments has been limited due to one fundamental problem: how to gather meaningful, standardised data given the diversity of tools applied around the world. This paper presents recent enhancements to the Global Database on Protected Area Management Effectiveness that will enable effectiveness information to be reported in a standardised yet flexible manner. While these changes represent an important milestone, a collaborative effort is required to overcome persistent challenges, including funding and capacity gaps. Prioritising the next steps outlined in this paper will help to facilitate the collation of PCA effectiveness data and improve understanding of progress towards Target 3 of the KMGBF.

Keywords: protected areas; OECMs; PAME; Target 3; Kunming-Montreal Global Biodiversity Framework

INTRODUCTION

Globally, the spatial extent of protected and conserved areas (PCAs)[1] has grown significantly over the past decades (UNEP-WCMC & IUCN, 2024), but not all these areas are effectively conserving biodiversity. Target 3 of the Kunming-Montreal Global Biodiversity Framework (KMGBF) therefore highlights that 30 per cent of land and ocean need to be "effectively conserved and managed" and "equitably governed" within protected areas and other effective area-based conservation measures (OECMs) by 2030 (CBD, 2022).

'Effectiveness' in the context of PCAs refers to areas that are well-designed, equitably governed, and managed to successfully deliver conservation outcomes. Various approaches are used to assess these elements, including Protected Area Management Effectiveness (PAME) tools such as the Management Effectiveness Tracking Tool (METT), governance-focused approaches such as the Site-level Assessment of Governance and Equity (SAGE), and frameworks such as the IUCN Green List Standard. There are many more, including nationally specific approaches (UNEP-WCMC, 2025).

Effectiveness assessments are essential for adaptive management and to promote accountability and transparency (Hockings et al., 2006). Gathering data nationally and globally helps track progress towards area-based conservation targets (Geldmann et al., 2021). To date, the Global Database on Protected Area Management Effectiveness (GD-PAME) has provided limited insights into PCA effectiveness as it has only

[1] Protected and Conserved Areas (PCAs) refers to protected areas and other effective area-based conservation measures in this context.

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Garamba National Park, DRC © Kelsey Green

tracked where assessments have taken place (UNEP-WCMC & IUCN, 2024). In 2025, Protected Planet partners implemented changes to allow the GD-PAME to offer insights into the governance, design, management and outcomes of PCAs, while being non-prescriptive regarding the assessment tools or approaches used.

Here, we describe the policy context and evolution of the GD-PAME, outline the benefits of reporting data and highlight remaining challenges. Finally, we provide recommendations for advancing efforts to track PCA effectiveness at the global level.

POLICY CONTEXT

In 2022, CBD Parties adopted the KMGBF to guide action for halting and reversing biodiversity loss by 2030. The KMGBF encompasses four overarching goals and 23 targets, including Target 3 on protected areas and OECMs (CBD, 2022).

The Monitoring Framework of the KMGBF includes headline indicators, which all Parties are requested to report on, plus optional 'disaggregations' (i.e. data broken down by specific characteristics), component, and complementary indicators, which Parties are encouraged to use (CBD, 2025). The headline indicator for Target 3 is "coverage of protected areas and other effective area-based conservation measures" (CBD, 2025). To support consistent reporting, data are collated in the World Database on Protected and Conserved Areas (WDPCA)[2], compiled in collaboration with CBD Parties and other stakeholders, as part of the Protected Planet Initiative. The Monitoring Framework also includes an optional disaggregation of PCA coverage "by effectiveness" (CBD, 2025), and CBD Parties are invited to provide data on effectiveness of PCAs. The GD-PAME provides the mechanism for collating these data, which can be built upon within future post-2030 global target-setting and monitoring approaches.

EVOLUTION OF THE GD-PAME

The GD-PAME was the main source of data for global reporting on the effectiveness of PCAs under Target 11 of the 2011–2020 strategic plan for biodiversity which preceded KMGBF Target 3 and called for PCAs to be "effectively and equitably managed" (UNEP-WCMC & IUCN, 2021).

As of January 2026, the GD-PAME contains 33,206 records for 178 countries, using 77 methods/tools. Of the PCAs in the WDPCA, 21,902 (6.7 per cent) have at least one management effectiveness assessment recorded in the GD-PAME (21,896 protected areas and six OECMs). In terms of spatial coverage, 5.23 per cent of the terrestrial and inland water area, and 1.92 per cent of marine and coastal areas covered by PCAs have been assessed for effectiveness (Supplementary Online Material, Appendices 1 & 2).

As noted above, while the GD-PAME has provided insights into the global application of assessment tools, it has not included data on effectiveness (UNEP-WCMC &

[2] The WDPCA combines the World Database on Protected Areas (WDPA) and World Database on Other Effective Area-based Conservation Measures (WD-OECM), which existed as distinct databases until 2025.

IUCN, 2021). The adoption of the KMGBF highlighted the need for an improved system which enables globally consistent reporting, while allowing local and national flexibility (Geldmann et al., 2021). This was the key underlying principle informing the re-development of the GD-PAME.

As of 2026, the database includes the following data 'types':

1. *Basic data (mandatory for all data submissions)*: relating to the PCA and the assessment method.
2. *Additional data (optional)*: relating to governance, design and planning, management and conservation outcomes (Box 1).
3. *Source data (mandatory)*: details on the data provider to ensure that ownership of the data is maintained and traceable.

The new optional fields represent the key change in the GD-PAME, enabling analyses relevant for global reporting. They are described below.

New optional data fields

The enhanced GD-PAME includes additional fields (Box 1) to capture high-level information in a way that is comparable across sites and countries.

The GD-PAME data submission form provides a drop-down menu of answers to each question and points to relevant sections from some commonly used tools (e.g. METT, SAGE and others) that can be used as a basis for providing answers. (Description of the questions and drop-down menu of answers are provided in Supplementary Online Material, Appendix 3.)

While reporting is optional, countries are encouraged to provide data for these fields. If this is done, Protected Planet will be in a position to share new insights into the quality of PCAs in the form of statistics on the extent to which, for example, actors are involved in decision-making; major biodiversity values are identified; monitoring, evaluation and adaptive management are undertaken; PCAs have sufficient staff resources; and positive trends in conservation outcomes are reported. This will include statistics on the coverage of PCAs with these characteristics, aligning with the requirements of the KMGBF Monitoring Framework and providing vital insights into progress towards Target 3.

There is an important distinction between effectiveness *assessments* (which are designed to capture detailed data and inform adaptive management) and the GD-PAME *reporting framework* (which collates the results of effectiveness assessments in the form of high-level information). The GD-PAME questions do not address every aspect of PCA effectiveness but cover a subset of important issues to consider. They focus on aspects that can be feasibly reported and align with global best practice such as the key 'themes' in the IUCN WCPA PAME Framework and the four components of the IUCN Green List Standard (Hockings et al., 2006; 2019). Data providers are encouraged to submit supporting evidence, though this is not a requirement. In the forthcoming phase of work, the new fields will be tested in collaboration with national governments and other data providers. The fields and other aspects of the reporting framework may be refined following this phase.

Box 1. New GD-PAME fields (UNEP-WCMC, 2025)

To what extent are key actors involved in decision-making relating to the site?

Is governance of the site periodically assessed and is action being taken to advance effective and equitable governance?

What types of biodiversity values have been identified for the site?

Have other values and/or associated functions, services been identified?

Have management objectives been set for the identified values?

Is management undertaken according to the site's objectives?

Are management actions regularly monitored, evaluated and adapted?

Are there enough people to manage the site to achieve its objectives?

Is the current budget sufficient to manage the site to meet its objectives?

Are the threats to the main values of the site being addressed?

Are biodiversity values monitored over time?

Have biodiversity values improved or been maintained since the last assessment?

Reporting process and benefits of reporting

Data can be reported to the GD-PAME by any entity, including governments, international convention and agreement secretariats, regional entities, Indigenous Peoples and local communities and NGOs, following the procedure outlined in Figure 1. The entity reporting should have authorisation from the PCA governance

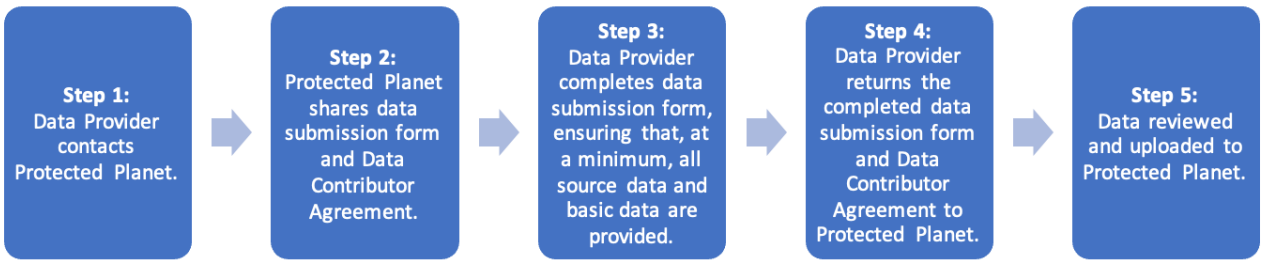

Figure 1. Process for reporting effectiveness data to Protected Planet

authority (UNEP-WCMC, 2025). Data reported by or in collaboration with governments are marked as 'state verified' to support reporting on Target 3 by CBD Parties.

In addition to facilitating global reporting, the GD-PAME offers a centralised data management mechanism. Data on PCA effectiveness are often managed by different entities including private organisations, NGOs, governments and funding agencies. The GD-PAME facilitates the collation of data from multiple sources, providing national governments with an overview. It also offers a data-management option for countries that do not have a system in place.

CHALLENGES

Several institutional, technical and capacity-related challenges continue to limit comprehensive global reporting on PCA effectiveness.

There is well-established global guidance on protected area effectiveness assessments processes and many PCAs and PCA networks have monitoring systems in place (Wells et al., 2026). However, resource and staffing shortfalls are barriers to ensuring monitoring is a standard part of all PCA management (Appleton et al., 2022). Targeted financial and capacity building support is needed.

Knowledge gaps also remain. Assessments of governance quality, including whether governance is equitable for local people, are still rarely undertaken, compared with assessments of management processes (Dehmel et al., 2025). Furthermore, establishing a direct, measurable link between management and conservation outcomes continues to be a challenge. These issues are likely to be amplified for OECMs, given the large spectrum of areas they encompass, and their diversity of objectives and management arrangements.

Effectiveness data remain dispersed among different entities and CBD Parties face technical and financial constraints for reporting (CBD, 2025). Historically, there has sometimes been a hesitancy to share information on PCA effectiveness due to fears that this may impact funding opportunities (Geldmann et al., 2021). These challenges will not be overcome unless reporting is streamlined and incentivised.

NEXT STEPS

Addressing these challenges will require coordinated action by CBD Parties, international organisations, regional bodies, Indigenous Peoples and local communities, donors, and technical partners. The following priorities identify where targeted investment and collaboration could most effectively strengthen global monitoring of PCA effectiveness:

Support PCA assessments and monitoring

Support and encourage authorities responsible for PCAs to make effectiveness assessments and monitoring an integral part of governance and management. This includes ensuring that biodiversity outcomes are better captured, which may involve updating existing effectiveness assessment approaches. The role of remote-sensed data, which can provide important insights into habitat extent and condition and supplement information gained through site-level assessments, should also be explored and piloted (Geldmann et al., 2021).

Streamline data collation and storage

Ensure site-level assessments feed into global reporting. Many countries, territories and regional networks have well-established monitoring and reporting systems, but this does not always lead to reporting to GD-PAME. Offering tailored support and identifying technological solutions that can help simplify the reporting process will facilitate seamless information flow and reduce reporting burdens. It will be important to gather feedback from data providers on the reporting process, identify support needs and respond to these adaptively.

Incentivise reporting

Raise awareness of the value of reporting data. Reporting on effectiveness is optional within the KMGBF, but the target will not be met by increasing PCA coverage alone. This message must be transmitted clearly at the global policy level. It will be important to demonstrate how reporting data allows success to be showcased, whilst also highlighting support needs and shared challenges. National and regional workshops, webinars and knowledge exchanges involving practitioners and policymakers, including from countries with different levels of financial resources and capacity, will be key to providing an opportunity for sharing best practices and lessons learned. They will also help to identify persistent challenges and barriers to reporting. Insights gained through these types of fora can guide future funding proposals and projects relating to assessing and reporting on PCA effectiveness.

CONCLUSION

By operationalising reporting on PCA effectiveness in a flexible yet globally consistent manner, the enhanced GD-PAME provides a critical bridge between site-level assessment and international biodiversity policy. Addressing remaining challenges will require a collaborative effort. It will be important to continue to identify opportunities for improving the GD-PAME to ensure it is fit-for-purpose and responsive to local and national needs. Implementing the next steps outlined here will help advance understanding of progress towards Target 3 of the KMGBF and build a foundation for setting enhanced qualitative PCA effectiveness targets after 2030.

The GD-PAME is available at https://www.protectedplanet.net/en.

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Field trip during METT national adaptation and development in Myanmar © Equilibrium Research

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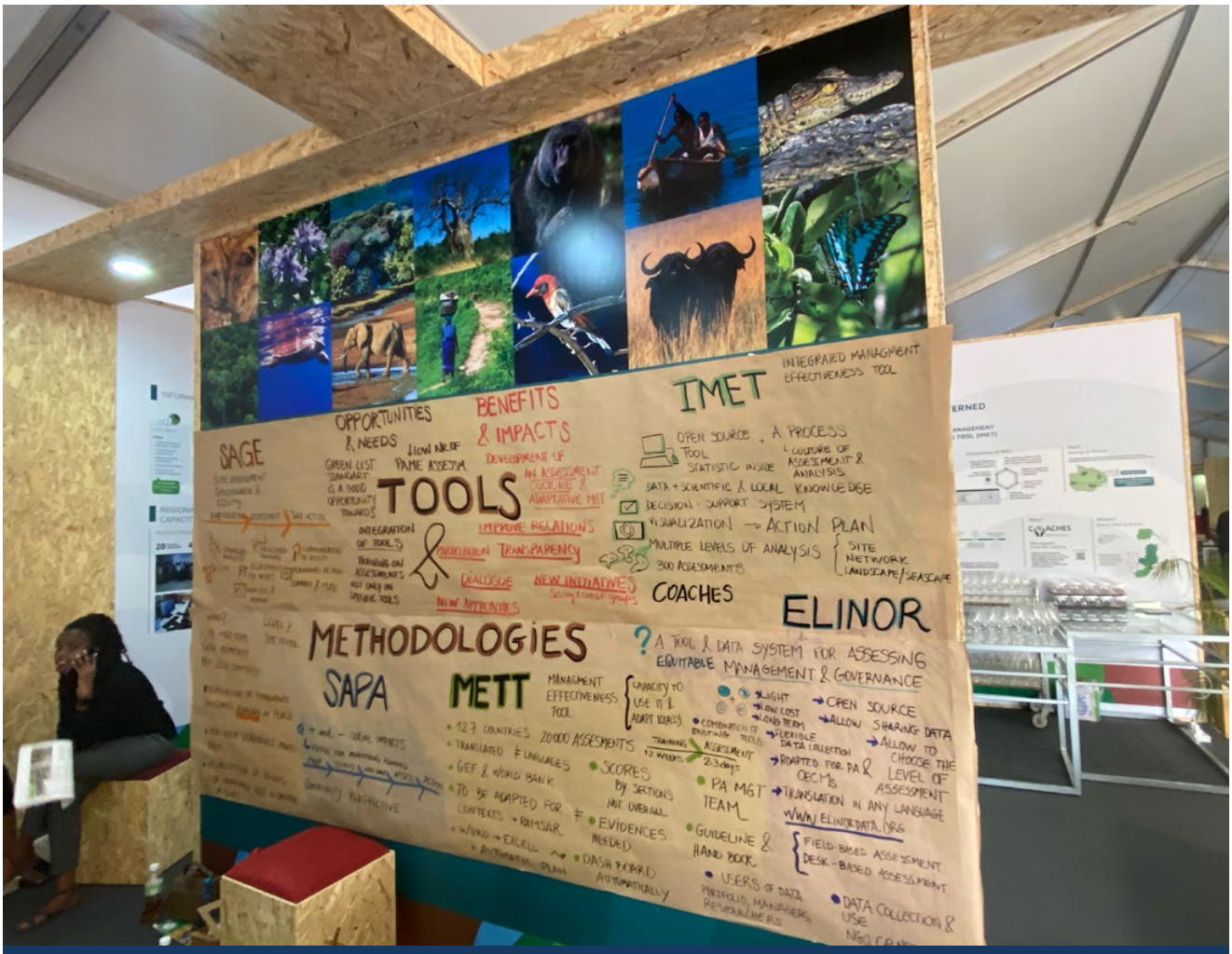

Understanding PAME tools at the African Protected Area Congress, Rwanda © Equilibrium Research

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RÉSUMÉ

L'augmentation de la superficie des aires protégées et conservées (APC), sans garantir que ces zones préservent efficacement la biodiversité, ne suffit pas pour atteindre les objectifs mondiaux en matière de conservation. Au niveau local, l'évaluation de l'efficacité est un élément important de la gestion adaptative et un large éventail d'outils a été développé à cette fin. La collecte de données sur l'efficacité au niveau mondial est importante pour suivre les progrès accomplis dans la réalisation de l'objectif 3 du Cadre mondial de Kunming-Montréal pour la biodiversité (KMGBF). Cependant, la capacité à synthétiser les enseignements tirés des évaluations de l'efficacité a été limitée en raison d'un problème fondamental : comment recueillir des données significatives et normalisées compte tenu de la diversité des outils utilisés à travers le monde ? Le présent document présente les récentes améliorations apportées à la base de données mondiale sur l'efficacité de la gestion des aires protégées, qui permettront de communiquer les informations relatives à l'efficacité de manière standardisée mais flexible. Si ces changements constituent une étape importante, un effort de collaboration est nécessaire pour surmonter les défis persistants, notamment les lacunes en matière de financement et de capacités. La priorisation des prochaines étapes décrites dans le présent document contribuera à faciliter la collecte de données sur l'efficacité des AEP et à améliorer la compréhension des progrès accomplis vers la réalisation de l'objectif 3 du KMGBF.

RESUMEN

Aumentar la extensión de las áreas protegidas y conservadas (PCA), sin garantizar que estas áreas conserven eficazmente la biodiversidad, es insuficiente para alcanzar los objetivos de conservación mundiales. A nivel local, evaluar la eficacia es una parte importante de la gestión adaptativa y se han desarrollado una amplia gama de herramientas para este fin. Recopilar datos sobre la eficacia a nivel mundial es importante para seguir los progresos hacia la meta 3 del Marco Mundial de Kunming-Montreal para la Diversidad Biológica (KMGBF). Sin embargo, la capacidad de sintetizar los conocimientos adquiridos a través de las evaluaciones de eficacia ha sido limitada debido a un problema fundamental: cómo recopilar datos significativos y estandarizados dada la diversidad de herramientas que se aplican en todo el mundo. En este documento se presentan las recientes mejoras introducidas en la Base de Datos Mundial sobre la Eficacia de la Gestión de las Áreas Protegidas, que permitirán comunicar la información sobre la eficacia de manera normalizada y flexible. Si bien estos cambios representan un hito importante, se requiere un esfuerzo de colaboración para superar los retos persistentes, entre ellos las deficiencias en materia de financiación y capacidad. Dar prioridad a las próximas medidas esbozadas en este documento contribuirá a facilitar la recopilación de datos sobre la eficacia de las áreas de conservación y a mejorar la comprensión de los avances hacia la meta 3 del KMGBF.

BOOK REVIEWS

Roam: Wild Animals and the Race to Repair Our Fractured World.

Hillary Rosner. Published by Patagonia Books 2025

Reviewed by Gary M. Tabor MES VMD, Professor of Conservation Practice
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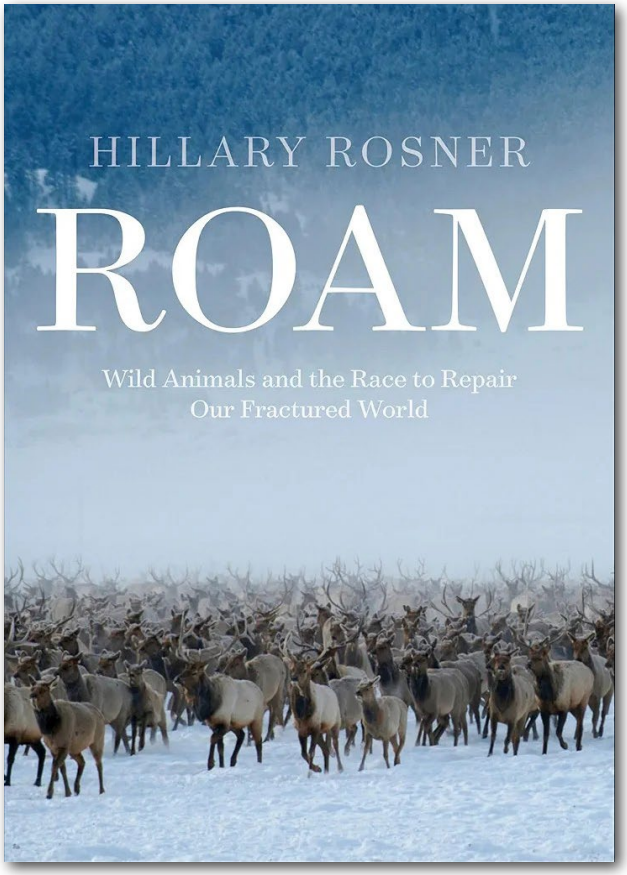
Hillary Rosner is an award-winning science journalist who works on environmental issues. Her work includes articles in *National Geographic Magazine, The New York Times, The Washington Post, Scientific American, Wired* and *The Atlantic*. Her awards include two Kavli Awards from the American Association for the Advancement of Science (AAAS). Raised in New York City, she has migrated to the Flatiron landscape of Boulder Colorado.

Roam is a personal journey across six nations examining animal and plant movement ecology and the ecological processes that sustain life on Earth. Author Rosner weaves together compelling stories and stunning photography to create a beautiful portrait of nature on the move. Published by Patagonia Books, the volume reflects the high-quality design sensibility of the Patagonia brand, setting a new standard for nature books. One notable gap is the lack of maps, which would have powerfully illustrated the wonders of migration.

Though the book addresses global connectivity, *Roam* is predominantly an American tale with a North American focus. Rosner structures the narrative around ecological connectivity conservation – wildlife corridors, crossing structures, large landscape efforts, great migrations, rewilding, and the need for greater human–wildlife coexistence – inviting readers to see the world through the eyes of wild species, from majestic elephants to Monarch Butterflies.

The book opens with Lucky Pierre, a coyote – possibly carrying hybrid wolf and dog genes – that stealthily colonised Central Park in the 1990s. This western canid's eastward expansion, against the tide of European settlement, exemplifies the life history imperative to disperse, migrate and adapt in the face of



unprecedented habitat loss. Rosner uses this story to introduce the emerging field of movement ecology, now spanning nearly all taxa and fuelled by advances in camera traps, satellite collars and microchips.

Roam then examines the Great Acceleration of habitat fragmentation and its cascading impacts – from disrupted hydrology in the Everglades to disproportionate effects on disadvantaged communities. Drawing on the history of redlining in American cities, Rosner describes an 'ecological apartheid' that separates mobile

populations of people, domestic animals and wildlife, ultimately severing human connections to nature.

Rosner also challenges readers to abandon assumptions about species movement. The California Wrentit, a small songbird, refuses to cross a stretch of Ventura Highway – dispelling the notion that birds can simply flit between disconnected habitat patches. Similarly, bats dependent on flowering agaves face growing barriers along their transboundary US–Mexico migration routes. Since agaves flower only once in their lifetime, sustainable tequila and mezcal production – harvesting after flowering – could support bat-friendly habitat along this corridor.

Ultimately, *Roam* is a call to action. Animals are running out of room and have no rights to roam. The pace of environmental change is outstripping the capacity for adaptation, particularly under climate change. Rosner argues that "hope is itself an act of connectivity" – connecting people in order to reconnect nature. After reading Roam, one thing becomes clear: in too many places, fences make bad neighbours.