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SWM SUSTAINABLE WILDLIFE MANAGEMENT PROGRAMME

A practical guide to understanding community hunting systems in the tropics



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A practical guide to understanding community hunting systems in the tropics

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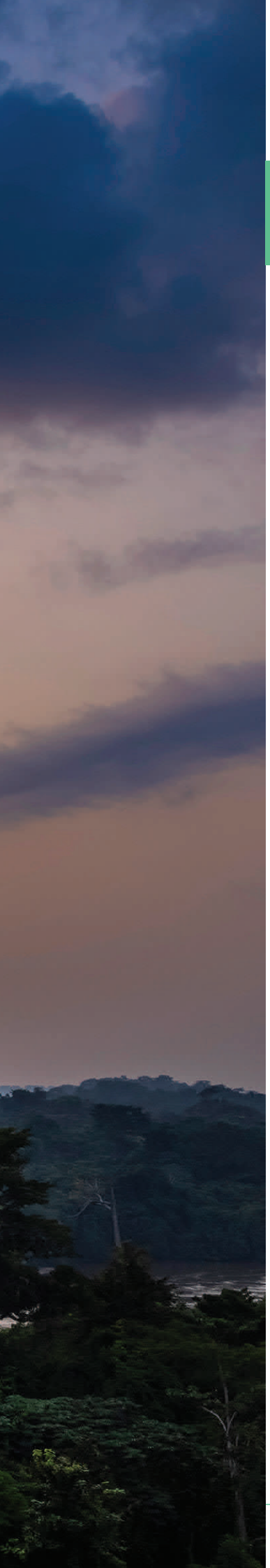
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Abbreviations

AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
AME	Adult Male Equivalent
BNS	Basic Necessities Survey
CBD	Convention on Biological Diversity
CBO	community-based organization
CBSWM	community-based sustainable wildlife management
CHZ	community hunting zone
CITES	Convention on International Trade in Endangered Species
COBA	*communautés de base* (grassroots communities – Madagascar)
COGE	*comité de gestion* (management committee – Madagascar)
CPUE	catch per unit effort
CSP	community support partners
FSC	Forest Stewardship Council
FPIC	free, prior and informed consent
GELOSE	*Gestion Locale Sécurisée* (secured local management policy – Madagascar)
GIS	geographic information system
GPS	global positioning system
ICCN	Congolese Institute of Nature Conservation (*Institut Congolais pour la Conservation de la Nature*)
IWC	International Waterbird Census
K	carrying capacity
MEA	multilateral environmental agreements
MINFOF	Ministry of Forestry and Wildlife (Cameroon)
N	Number of animals (Population)
NGO	non-governmental organization
NR	natural resources
NRGT	Natural Resources Governance Tool
NTFP	non-timber forest products
OWR	Okapi Wildlife Reserve
RESSOURCE	Strengthening Expertise in South Sahara on Birds and their Rational Use for Communities and their Environment (*Renforcement d'expertise au sud du Sahara sur les oiseaux d'eau et leur utilisation rationnelle en faveur des communautés et de leur environnement*)
SWM	Sustainable Wildlife Management
UCT	unmatched count technique
USFS	United States Forest Service
WCS	Wildlife Conservation Society

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INTRODUCTION

Background

Millions of people, especially Indigenous Peoples and rural communities across tropical and subtropical regions of Africa, Latin America and Asia, rely on wild meat for both sustenance and income. We define wild meat as the meat and by-products (e.g. offal) from wild animal species used for human consumption. This includes all non-domesticated mammals, birds, reptiles and amphibians hunted or harvested for food, but not freshwater and marine fish, insects, crustaceans, worms and molluscs. Wild meat serves as a crucial source of protein, fat and micronutrients, often unavailable through other means in certain contexts. Beyond its nutritional value, wildlife use is deeply interwoven with cultural heritage, social pride and community norms, playing a significant role in shaping identities, strengthening connections to place and enhancing the well-being of people coexisting with wildlife. The critical roles of wildlife in supporting livelihoods, culture and ecosystems are increasingly under threat in areas where they matter most to people. Unsustainable hunting practices and habitat transformation have led to significant declines in wildlife populations, undermining food security and disrupting ecological balance. Unmanaged hunting practices and unregulated wild meat value chains are primary drivers of these challenges.

The urgency of addressing hunting sustainability in tropical and subtropical regions has become even more pronounced with the adoption of the Kunming-Montreal Global Biodiversity Framework by nearly 200 countries in December 2022. This framework underscores the importance of promoting sustainable wildlife management while safeguarding and supporting the customary sustainable use of wildlife by Indigenous Peoples and local communities who derive cultural, social, economic and environmental benefits from it.

In this context, local communities and their partners – including government agencies and non-governmental organizations (NGOs) – (referred to as "duty bearers" in the rest of this document) are faced with the complex task of reconciling biodiversity conservation with the needs of people who rely on hunting and fishing as integral components of their livelihoods and food systems. This challenge is compounded by diverse geographical settings, encompassing community-owned lands, protected areas, buffer zones, logging concessions, community forests and customary lands, as well as by

poorly regulated legal frameworks. Balancing these competing priorities requires nuanced, context-specific approaches to wildlife management.

Past efforts to curb unsustainable use have demonstrated that no single approach is sufficient to address the root causes of unsustainable practices. A multifaceted strategy is essential to sustain efforts and achieve tangible, positive impacts in promoting sustainable wildlife use. As such, effective conservation requires a shift towards approaches that place rural communities at the center of wildlife management, ensuring their active participation and ownership. This shift is crucial for fostering long-term socioecological balance and addressing the needs of those who depend on wildlife for their livelihoods. One promising yet underutilized strategy in the tropics is to empower communities to sustainably manage and utilize wildlife resources for their own benefit. This approach may also offer a cost-effective solution to the frequent lack of decentralized public services, particularly in remote areas where wildlife reside, and calls for innovative partnerships between communities, governments and other relevant stakeholders to integrate wildlife management within a broader framework of local sustainable development.

In this context, how can duty bearers effectively support this transformative shift in biodiversity conservation by rights-holding communities over land and associated natural resources? What approaches can be mobilized to design and implement wildlife management strategies that balance the needs of Indigenous Peoples and other rural communities with the imperative to conserve wildlife in tropical and subtropical regions? What conservation models are best suited to balance ecological goals with local realities?

Community-based sustainable wildlife management (CBSWM) emphasizes the pivotal role of local populations in conservation. Often, collaborative management, or co-management, between the government and local communities (as resource users), along with other stakeholders such as civil society organizations, ensures that governance decisions are made by the lowest and most competent authorities, while ensuring a good balance between traditional and scientific expertise. To succeed, such initiatives must deliver tangible benefits to these communities, including strengthened governance and resource/land rights, improved food security, increased income and enhanced resilience to external pressures. Many, if not most, communities that live with wildlife have a long history of doing so and have legitimate traditional claims to access and use wildlife to meet their needs. These rights are often explicit for Indigenous Peoples but rarely for other local communities. In many places the state may not acknowledge, respect or protect these rights to hunt and fish within customary territorial boundaries, and may often explicitly abrogate these rights by providing concessionary rights to private sector companies to commercially exploit resources within the traditional lands and waters of Indigenous Peoples and other local communities.

When well-designed, CBSWM can transform wildlife into a sustainable resource, offering a reliable source of food and income through regulated hunting, fishing and harvesting. In addition to sustainable harvests, communities can also benefit from non-consumptive uses such as ecotourism, which provides a direct financial incentive to conserve wildlife and their habitats. By aligning conservation goals with local needs, CBSWM fosters a mutually beneficial relationship between people and nature, ensuring the protection of biodiversity while supporting the livelihoods of those who depend on it. Co-management within and across national borders is particularly useful for migratory, nomadic and wide-ranging species.

Scope and objectives of this document

This document provides guidance on the key aspects to consider when evaluating the opportunity to support CBSWM systems. It explains what needs to be understood about community hunting and why this information is essential for guiding transformative processes toward sustainable wildlife management, with illustrative examples from the SWM Programme intervention sites. In essence, this document is a unique guiding tool for conducting an in-depth diagnostic, aimed at laying the groundwork to support communities in sustainable hunting management based on a science-based framework. Building on this document, another complementary guide will delve deeper into the practical strategies and tools for implementing effective and adaptive community hunting management systems in tropical landscapes.

This document provides community support partners (CSPs) with guidance for developing a broad and deep understanding of the natural resource area under proposed management including national-level or landscape-level aspects that condition wildlife management locally. It addresses the different aspects of a hunting system that require attention to determine: (1) whether the enabling conditions for the sustainable management of wild animals are in place; (2) which model of wildlife management (i.e. the improved management organization targeted) could be feasible and suitable to meet sustainability in the specific local context; and (3) what changes are necessary in the current management system (if any) to set up the selected model (i.e. the theory of change). Based on this information, communities and their partners may first need to put in place enabling conditions for sustainability as part of their interventions.

This guide is intended for all duty bearers including government agencies, NGOs, and other actors (e.g. private sector such as certified logging companies) seeking or currently providing assistance to local communities to strengthen their efforts to conserve and sustainably manage terrestrial and aquatic wild animals within their customary or formally recognized territories.

Content

This guide is divided into five main sections, each addressing a critical component of sustainable wildlife management in tropical regions:

The first section, *"Prior ethical requirements"* emphasizes the need for to adopt a rights-based approach that prioritizes community rights while addressing social and environmental risks. This approach is essential for effectively supporting Indigenous Peoples and other rural communities in their management efforts.

The second section, *"Governance of natural resources and other enabling conditions"* examines the foundational aspects of community-based wildlife management. It considers governance factors at both the local level (within the community area) and broader scales (landscape, subnational and national levels) that influence existing wildlife management systems, if present. The assessment also evaluates whether the other enabling conditions outlined in the SWM Programme technical brief "What do we mean by community-based sustainable wildlife management?"[1] are met. It includes stakeholder analysis, governance system evaluations and assessments of social cohesion within

[1] See Sustainable Wildlife Management Programme Technical Brief: What do we mean by community-based sustainable wildlife management? https://openknowledge.fao.org/server/api/core/bitstreams/4d915163-6eec-499f-bd96-804ad64e88e6/content

communities. Practical methods and tools are provided to empower communities and uphold their rights in wildlife conservation efforts.

The third section, *"Hunting systems and value chain considerations"* explores the dynamics of hunting and its related value chains. It highlights the importance of understanding the diverse values of wildlife, resource use areas, harvest levels, market structures and socioeconomic dependencies on wild meat. Case studies demonstrate how participatory mapping and market assessments can inform sustainable hunting practices and enhance livelihoods.

The fourth section, *"Key concepts and methods for sustainability"* focuses on the ecological dimensions of sustainable hunting. It covers methods for assessing the population status of hunted species, identifying factors limiting wildlife productivity and determining sustainable harvest levels. This section provides scientific frameworks and monitoring tools to ensure that ecosystem health is balanced with community needs.

The fifth section, *"From understanding hunting systems to the definition of community-based wildlife management models"* offers guidance for translating the results of this multifaceted assessment into a wildlife management model tailored to the specific context in which it will be implemented.

Each section builds on lessons learned from the SWM Programme, providing actionable insights for practitioners aiming to implement or improve sustainable wildlife management systems.



How to use this document?

Given the diversity of contexts, the unique constraints of each project in terms of time and resources and the varying amount of knowledge or information available across different sites, it is important to emphasize that this guide is not intended to be used in a linear or systematic manner. While we stress the importance of a holistic approach to understanding hunting systems, users are encouraged to utilize only the sections relevant to their specific context to complement the available knowledge of the hunting system with which they are working. Users are, therefore, invited to use this guide in a flexible manner and focus data collection on areas requiring more in-depth investigation or up-to-date knowledge.



In remote tropical forest ecosystems, CBSWM systems foster a mutually beneficial relationship between people and nature. Okapi Wildlife Reserve, Democratic Republic of the Congo.

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1. PRIOR ETHICAL REQUIREMENTS

All government agencies, non-governmental organizations (NGOs) and other actors supporting or seeking to support local community efforts to conserve and sustainably manage wildlife and natural resources within their customary or formally recognized territories are either legally obligated under international or national law or ethically bound as duty bearers to: 1) adhere to a rights-based approach to conservation; 2) respect and support community-led or community-consented conservation initiatives; and 3) establish, in collaboration with the community, auditable and locally appropriate social safeguards. Compliance with these standards not only fulfills legal and ethical obligations but also fosters trust with the community.

This trust-building is crucial given the complexities of hunting practices in some communities. For instance, in certain contexts, hunting is deeply personal, and information about it is not shared even among community members, let alone with outsiders. Additionally, some hunters may engage in illegal activities, which can further deter them from interacting with conservation practitioners. Addressing these dynamics requires a sensitive, transparent and respectful approach that prioritizes community agency and confidentiality while promoting sustainable practices.

Rights-based approach to the sustainable management of nature

By adopting the Kunming-Montreal Global Biodiversity Framework in 2022, governments of countries that are parties to the Convention on Biological Diversity (CBD) have committed to apply a rights-based approach to conservation. The Human Rights in Biodiversity Working Group has one of the clearest and shortest definitions of this approach:[2]

[2] See https://www.forestpeoples.org/publications-resources/reports/article/implementing-a-human-rights-based-approach-to-biodiversity-conservation-paper-3/

> *When applied to conservation, sustainable use and benefit-sharing, a human rights-based approach means, in simple terms, that biodiversity policies, governance and management do not violate human rights and that those implementing such policies actively seek ways to support and promote human rights in their design and implementation. This must include supporting duty-bearers to meet their obligations, and rights-holders to claim and exercise their rights. This latter element is particularly important, requiring proactive, concrete measures to ensure full and effective participation of rights holders, including in virtual spaces, and with particular focus on Indigenous Peoples and local communities.*
>
> *A human rights-based approach to conservation and sustainable use of biodiversity is regarded, both in legal instruments and best practices, as a necessary condition for stopping biodiversity loss and degradation in an equitable and sustained manner. It is an essential enabling condition for the resilience of systems of life, good health, and the use, management, restoration, and conservation of natural resources.* (Forest Peoples Programme, 2022, p.5)

This approach prioritizes the recognition and integration of the rights of local communities in conservation efforts. It aligns with contemporary global trends that emphasize equity and justice in environmental governance. However, the implementation of this approach is not universally feasible, as challenges such as weak legal frameworks, political resistance, and varying local governance structures and traditions may hinder its success in some regions. Assessing those contextual aspects will determine the need to first focus on strengthening those enabling conditions (see section 2).

Social safeguards in conservation

NGOs, government agencies and other community support partners are obligated, as duty-bearers (see definition in section 3.1), to safeguard the rights and well-being, individually and collectively, of Indigenous Peoples and other rural communities with which they are allied, and must have policies and procedures in place that are relevant to their compliance with international human rights standards such as the World Bank Environmental and Social Framework,[3] the United Nations Declaration on the Rights of Indigenous Peoples[4] and the Belmont Report[5] on the ethical/moral principles and guidelines for the protection of human subjects of research. Deploying effective social safeguards is not a one-size-fits-all solution but requires meaningful engagement with rights holders to ensure that safeguards are tailored to reflect their traditions and the local ecological, social and historical context.

[3] See https://www.worldbank.org/en/projects-operations/environmental-and-social-framework
[4] See https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf
[5] See https://www.hhs.gov/ohrp/regulations-and-policy/belmont-report/index.html

There are at least five social safeguards that all CSP should be aware of and have the knowledge and capacity to implement. These are free, prior and informed consent (FPIC), ecological and social impact assessment and the associated ecological and social risks management plan, grievance redress mechanisms, ethical protections for people involved in research (i.e. human subjects protections) and gender considerations in project planning, implementation and evaluation. The latter ensures that the voices, interests, and concerns of women and men are incorporated and that project benefits and costs are equitably shared among men and women.

These social safeguards are increasingly subject to specific legal requirements in many countries. Therefore, a thorough review of relevant national legislation is necessary during the project design stage to ensure that appropriate measures and resources (time, funds and expertise) are planned at the right points in the project cycle.

Insight from the Sustainable Wildlife Management (SWM) Programme on practical guidance and material for implementing social safeguards, as well as other recommended practical references that could be useful to field practitioners and project designers, can be found in the Further reading section below.

Further reading

FAO, CIFOR-ICRAF, CIRAD & WCS. 2025. *Novel approaches for engaging Indigenous Peoples and local communities on wildlife and food security – SWM Programme innovation case study.* (This report includes links to an animated video and posters on FPIC developed by the SWM Programme). Rome, FAO. https://openknowledge.fao.org/items/3f62863d-426a-49cc-8440-ce9aec8bc5a7

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2. GOVERNANCE OF NATURAL RESOURCES AND OTHER ENABLING CONDITIONS

Community support partners must gain a thorough understanding of the natural resource governance factors and other numerous social, political, economic, technical and ecological factors that can either enable or hinder the efforts of communities to sustainably manage natural resources. Below is a summary of those key enabling factors (further details are available in the Further reading section):

- **Shared vision:** The community shares a belief in the value of their lands and waters and is committed to preserving natural resources for present and future generations.
- **Social cohesion:** The community has strong social cohesion and trust among its components (families, clans, ethnic groups, etc.) motivating them to work together, invest their labour and contribute resources to address common challenges.
- **Motivation:** The community is motivated to govern and sustainably manage its natural resources.
- **Knowledge:** The community possesses an understanding of sustainable management practices, ecological dynamics and the long-term impacts of resource exploitation. This knowledge enables informed decision-making, the assertion of rights and active participation in governance processes, ensuring that resource use aligns with both environmental and community needs.
- **Devolved authority:** Local governance authority over access to and use of natural resources has been devolved to the local community (i.e. a community of place). This allows a common resource that is non-excludable and rivalrous (i.e. if someone hunts an animal, it is no longer available for anyone else to hunt) to be managed as a private, excludable good, reducing overuse.
- **Support from duty bearers:** The community receives timely and competent support from government and NGO partners.

Because communities do not live in isolation but within a state and broader society, those enabling conditions will need to be looked at both at the site (community, landscape) and at the national level to ensure a comprehensive understanding of internal (intra-community level) and external (supra-community level) constraints and limitations to sustainable wildlife management.

In the context of a rights-based approach, the analyses of those different factors need to be carried out through a human rights lens to clarify the problem (i.e. reconciling wildlife conservation with human rights) and identify the root causes, which often involve the non-enjoyment of certain human rights.

Below are some of the key considerations and practical approaches for gathering essential information on governance and other enabling conditions.

2.1. Identifying and analysing stakeholders

Key concepts and definitions

To apply a rights-based approach, three key groups involved in natural resource (NR) governance must be considered: stakeholders, rights holders and duty bearers.

Stakeholders are any actors with a vested interest in the natural resources in question, including those affected by or with the political authority, responsibility or resources to influence the governance, management or use of those resources. Stakeholders can range from individuals and organizations with varying levels of involvement/participation and interest in NR governance.

Types of stakeholders involved in wildlife management:

- academic organizations;
- businesses (e.g. companies, cooperatives);
- civil society organizations (e.g. national or international NGOs, community-based organizations [CBOs], non-profit associations, professional unions);
- communities;
- consumers;
- donors;
- decentralized authorities;
- farmers (crops, livestock);
- government agencies and local subdivisions;
- health care organizations;
- independent experts, researchers;
- journalists;
- policymakers;
- political groups;
- religious leaders;
- teachers;
- tourists; and
- wildlife traders (including wild meat traders) and other actors of the wildlife-based value chains.

A subset of stakeholders, known as duty bearers, have specific obligations to respect, promote and support communities in realizing their human rights and to prevent human rights violations. While this term is most often applied to state actors, non-state actors, such as conservation and development practitioners, can also be considered duty bearers. Furthermore, community-based organizations formed by members of rights-holding communities, who take on roles supporting the broader community, may also qualify as duty bearers.

In this context, rights holders refer to individuals or groups whose human rights[6] are closely tied to the use of NR and land and/or whoever may be affected by changes in NR management. Rights holders are typically customary land/water owners, though they can also include non-owners, such as hunters or migrant farmers who may have the right to access specific resources. Unlike other stakeholders, rights holders require particular attention, as governance initiatives often occur on their lands or impact their resource access. Rights holders are typically in a weaker position than public and business sector stakeholders, who are often more powerful and established in planning and decision-making. Therefore, it is crucial to address these imbalances and ensure that rights holders play a central role in the governance and management of natural resource use (USFS and WCS, 2019).

Why is it important to conduct a stakeholder analysis?

References to stakeholders and the use of stakeholder analysis reflect a recognition among managers and policymakers of the central role of stakeholders (individuals, groups and organizations) who have an interest (i.e. stake) and their potential to influence the actions and aims of a project or policy.

Mapping and analysing stakeholders clarifies interactions and simplifies complex dynamics. This process is vital for developing actions that promote positive outcomes while avoiding harm, especially to marginalized individuals and groups. It is especially useful in sustainable wildlife management, given the various sectors involved with different levels of influence and power, which require strategic stakeholder prioritization.

A thorough understanding of stakeholders' interests and influences allows project managers to effectively engage them throughout project design, implementation, evaluation and adaptation. By analysing stakeholders, we can better understand their influence on decisions, identify opportunities to shape those decisions strategically, and assess the likely impacts on various stakeholders, and, ultimately, on wildlife management. Comparing the results of the stakeholder analysis with legal roles and responsibilities can help identify gaps and guide revisions to management systems, including the potential need for a co-management framework.

Furthermore, a stakeholder analysis can help identify advocates for the proposed project (i.e. stakeholders motivated to support the project and ensure that it succeeds and attains its goals), but also those stakeholders who have the potential to undermine the project and work against its success.

Finally, segmenting stakeholders by influence and interest enables targeted communication strategies, ensuring each interaction is purposeful and beneficial to the project. In short, stakeholder analysis is not only a tool for clarification but also an essential lever for strengthening collaboration

[6] Human rights – both substantive (e.g. right to adequate food, right to decent work) and procedural (e.g. right to information and participation, access to justice) – are indivisible, interdependent and interrelated, so they should be considered as a whole without any right taking priority over another.

among all stakeholders with multiple benefits, including:

- increased resources and support;
- enhanced project visibility and leadership backing; and
- prevention of costly delays and risks and early issue resolution.

How to conduct a stakeholder analysis?

There are three essential steps in stakeholder analysis:

1. Identifying the key stakeholders and their interests (positive or negative) in the sustainable management of wildlife;
2. Assessing
    a. the influence of each stakeholder on wildlife management decisions,
    b. the social, economic and cultural importance of wildlife to each stakeholder,
    c. the impact upon each stakeholder of any change in business-as-usual management of wildlife; and
3. Identifying how best to engage some or all stakeholders.

Given the wide range of potential stakeholders at any site, strategies for identifying them are crucial. Internal brainstorming or collaborative input can help pinpoint relevant stakeholders. We recommend starting with the primary group: those most directly involved or impacted. Create a list, then use the snowball principle to identify others who might be affected by wildlife management and note why.

As the stakeholder list can become extensive, prioritization may be necessary to distinguish between:

- primary stakeholders – directly concerned, such as target audiences or beneficiaries;
- secondary stakeholders – indirectly affected; and
- key stakeholders – critical to the change process.

In the analysis, stakeholders' positions, interests, influence, relationships and networks are considered to assess how a conservation effort might impact them, both positively and negatively. This approach considers their past, present and future roles.

A strategic visual grid can help organize and assess each stakeholder's impact and interest, facilitating quick identification of key actors – those who need immediate attention or have significant influence on the project's success.

Example of stakeholder analysis in the SWM Programme Cameroon site management site, Mintom arrondissement, South Dja Reserve

Context

The Sustainable Wildlife Management Programme in Cameroon operates in the Mintom arrondissement, adjacent to the Dja Reserve, covering 20 villages (10 Baka Indigenous People and 10 Bantu), which forms the bulk of the rural settlements in the region. Its goal is to promote sustainable hunting practices by involving local communities, with a focus on self-identified Baka and Bantu territories. In partnership with the Ministry of Forestry and Wildlife (MINFOF) and other national entities, the project ensures hunting management plans are tailored to the distinct needs of these groups. At the project's start, before defining the management model, a stakeholder analysis was conducted to map key stakeholders and assess their potential involvement and impact.

What did we do?

A comprehensive listing of stakeholder groups was developed, categorizing them as rights holders, duty bearers and others. Each group was evaluated on: (1) level of interest; (2) influence; (3) decision-making roles; and (4) expectations and concerns. An engagement strategy was then devised for each group, defining the necessary level of interaction between the community support partner, communities and the different stakeholders, outlining the engagement processes to be maintained throughout the project.

What did we learn?

The stakeholder analysis identified 25 distinct groups, including:

- six rights holder groups, comprising representatives of 28 villages (Bantu) and 23 Baka community villages, their leaders, hunters and women;
- five governmental institutions – key ministries including MINFOF (both central service and local antenna) and the Ministry of Territorial Administration, each holding high interest, influence and decision-making power;
- the Mintom district municipality (territorial administration);
- two local civil society organizations;
- eight international non-governmental organizations or development agencies;
- one private company (logging);
- one donor organization; and
- *Groupement de la filière bois au Cameroun*.

The analysis highlighted that while the rights holders (Bantu and Baka communities) have considerable influence on community members' perceptions about wildlife management, they play a more limited role in direct decision-making about management compared to governmental bodies. The ministries, particularly those related to forestry and wildlife management, demonstrated substantial authority and interest, influencing the overall success of the hunting management plan. Although there is only one logging company in the landscape, the *Groupement de la filière bois du Cameroun* shows interest in being involved in the process.

How was this information useful for management decision-making?

The detailed mapping and assessment of stakeholders allowed for:

- **targeted engagement strategies** – ensuring that rights-holders, even those with limited decision-making roles, could contribute effectively and see their perspectives reflected in management plans;
- **enhanced coordination** – tailoring interactions with powerful stakeholders like MINFOF to align with their interests and expectations, fostering smoother collaboration and better compliance;
- **inclusive management plans** – integrating the concerns and values of the Baka and Bantu communities, building trust and encouraging active participation;
- **balanced oversight** – identifying high-influence government institutions to anticipate approval needs and streamline processes, mitigating conflicts: and
- **private sector** – in relation to logging companies, the stakeholder analysis demonstrated the need to actively engage with the private sector.

Overall, the stakeholder analysis laid the foundation for effective and collaborative wildlife management, emphasizing shared responsibility and sustainability among all parties.



As the foundation for effective and collaborative wildlife management, the SWM Programme in Cameroon conducted a stakeholder analysis which identified 25 distinct groups, including Baka and Bantu communities.

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Lessons learned from the SWM Programme

- **Ensure inclusion and protect the rights of vulnerable groups:** Stakeholder analysis helps identify vulnerable and marginalized groups, ensuring that management decisions enhance rather than undermine their rights. This strengthens a rights-based approach by making sure all groups are considered in conservation efforts.
- **Design wildlife management models that reflect local realities:** By understanding the roles, interests and relationships of stakeholders, the analysis supports the development of context-specific wildlife management models tailored to the unique social, ecological and institutional dynamics of each site.
- **Identify opportunities for collaboration and co-management:** The stakeholder analysis uncovers potential partnerships across different stakeholder groups, helping determine where co-management agreements may be appropriate for managing shared lands and landscapes more effectively.
- **Recognize and integrate customary governance structures:** Identifying legitimate customary authorities and governance bodies offers critical entry points for engagement. This supports the design of management systems that align with local governance structures and biocultural scales.
- **Leverage key individuals to build local leadership and influence:** The process helps identify respected individuals – both within and outside the immediate project area – who can serve as champions or influential decision makers. Supporting these individuals can improve community engagement and policy support, particularly where central authority remains strong.
- **Document stakeholder analysis to support adaptive management:** While often done informally, systematically documenting stakeholder analysis ensures transparency and enables a more thorough, ongoing assessment. Maintaining an updated stakeholder matrix helps track governance changes and emerging actors, providing a valuable tool for monitoring, evaluation and adaptive management.

Further reading

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2.2. Understanding the determinants of stewardship for wildlife within a community

Key concepts and definitions

Fundamentally, a community is a group of people with something in common. It is this essential concept of commonality that turns a group of people into a community.

In the conservation sector, communities are often categorized as:

- communities of place – people living together in the same area, such as a camp, village or city, often including kinship ties;
- communities of practice – people who share a common profession or way of life or who use the same resources, such as fishers, farmers, hunters, wild meat traders or teachers; and
- communities of interest – people united by common traditions, perspectives or passions, such as fans of a music group, members of an ethnic or religious group or conservation advocates.

Communities – whether of place, practice or interest – are dynamic and constantly evolving. People move in and out, older members pass on, younger members become elders and new ones emerge. Communities may split or recombine, and the same applies to staff in government agencies or NGOs that support these communities. Given their dynamic nature, communities must regularly reassess their goals and collective actions to address common challenges.

Stewardship for wildlife within a community relates to the actions taken by individuals or groups within a community, with various motivations and levels of capacity, to protect, care for or responsibly use wildlife in pursuit of environmental and social outcomes.

Enabling conditions for stewardship for wildlife at the community level

Stewardship is grounded in care and agency

Stewardship is deeply connected to care. Care is rooted in traditional knowledge and shaped by long-standing interactions with the environment, which are deeply embedded in cultural and livelihood practices. This bond is fostered through multigenerational activities like hunting and resource management, which create emotional attachment to the land and to the resources. Stewardship emerges from a strong sense of place, motivating sustainable practices rooted in cultural and spiritual values and directed towards achieving positive outcomes for the common good through a virtuous cycle. When individuals see their well-being as intertwined with the land, stewardship becomes both a personal and communal responsibility. The ongoing practice and adaptation of traditional ecological knowledge reinforces sustainable habits, while mentorship in knowledge acquisition builds essential skills for resource management and strengthens community identity.

Stewardship also depends on the ability of communities and their leaders to exercise agency – the capacity to influence decisions and governance structures. Agency emphasizes active participation in governance, rather than passive compliance, highlighting the importance of empowered actors in creating responsive and accountable systems. Effective agency requires supportive governance, recognition of territorial rights and opportunities for involvement in decision-making. Without these structures, even communities with strong connections to their environment may struggle to implement effective stewardship. Social capital and collaborative resource use are also key

components of local agency. Social capital refers to the capacity of local communities to maintain communication and dense social networks as a basis of trust, which can be incentivized and facilitated by good or virtuous leadership in favour of generating positive outcomes for the common good.

Virtue serves as the essential glue that transforms motivation and agency into positive outcomes. Motivation for environmental stewardship can be categorized as intrinsic or extrinsic. Intrinsic motivations arise from actions that bring personal pleasure or satisfaction. They are often driven by an alignment with personal ethics, morals, values and beliefs, as well as psychological needs for self-determination or self-actualization. Extrinsic motivations stem from the expectation of achieving external outcomes. These may involve assessing the direct costs and benefits of stewarding natural resources or responding to external rewards or sanctions, such as economic, social, physical or legal factors.

Stewardship may be limited by external factors that can exert pressures on diverse components of the hunting system, such as the existence of a corporate resource extraction company on community lands granted by the government with consent at the community level, environmental degradation due to deforestation or pollution, and political, legal or economic changes with impacts on the way community members relate and build an attachment to place. These disruptions affect the sense of place, erode cultural practices, reduce knowledge transfer and weaken motivations for sustainable resource management.

How do we assess stewardship for wildlife?

Evaluating stewardship within a community involves several key elements. First, it requires assessing the existence and adherence to common norms and values, such as respect for traditional practices or equitable resource sharing. It also examines the extent to which beliefs and goals align. Equally important is the quality of social capital and interpersonal relationships, including trust, mutual respect and support, with a focus on intergenerational ties – crucial for passing down hunting knowledge – especially in communities undergoing transformation where those ties are often weakened. A strong sense of belonging and solidarity, where members are willing to support one another or take decisions for the common good, is another critical factor. Active engagement and participation in collective activities is also a key indicator. The level of maintenance of local ecological knowledge and skills across generational groups, as well as the nature and frequency of practice and use of wildlife as part of daily lives, are other important indicators. The level of legal recognition of customary territories and structures is an important element. Moreover, the level and frequency of conflicts within the community and the existence of resolution mechanisms demonstrate the capacity of communities to deal with internal differences and engage in peace-building processes.

To measure these dimensions, various tools can be used. Recent studies have developed conceptual process models for environmental stewardship, such as Values-Tools-Outcomes (Romolini *et al.*, 2012; Vaske and Donelli, 1999) and Context-Actors-Motivations-Capacity-Actions-Outcomes (Bennet *et al*., 2018). Interviews and focus groups can provide insights into individual perceptions on a list of predefined prompts that cover the different facets of stewardship as explained above. Direct observation helps assess group interactions and cooperation. Mapping local social networks can identify central or isolated members and highlight conflict management dynamics. Collective performance is another indicator: cohesive groups tend to achieve goals more effectively. External factors, such as political or environmental pressures, should also be considered, as they may influence cohesion. Once data is collected and analysed, the project can seek to develop or enhance local environmental stewardship efforts. It can do so by implementing specific policies, programmes and

market mechanisms that support stewardship potential and improve outcomes through various leverage points. Leverage points for environmental stewardship are strategic areas where targeted interventions can drive significant change. One key leverage point is introducing new actors, such as individuals, organizations or networks, to facilitate collaboration and resource sharing. Providing incentives, whether financial, social or regulatory, can also encourage participation in stewardship activities. Strengthening local capacity and institutions is another critical approach, enhancing skills, knowledge and governance structures to support long-term environmental management. Supporting the implementation of specific actions, such as community-based monitoring, directly contributes to stewardship efforts.



Participatory consultation meetings facilitated collaboration among clans who successfully signed conservation deeds regulating the use of natural resources and wildlife. Miruma, Papua New Guinea.

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Example of understanding knowledge and use of the territory linked with social cohesion and care for wildlife in Papua New Guinea SWM Programme site – Bismarck Forest Corridor

Context

Papua New Guinea is one of the world's most diverse countries both in terms of biodiversity and culture, with around 840 languages spoken. Most of the population lives in rural areas, organized into clans that primarily own natural resources. Customary law governs 97 percent of the land and adjacent coastal areas, with local landowners managing much of the land and wildlife in an autonomous, often idiosyncratic manner. In Papua New Guinea, culture and nature are closely intertwined, reflected in traditional body adornments and costumes called bilas worn during cultural events.

However, increasing population density is straining the country's forests and wildlife. Ongoing tribal conflicts and disputes over land often escalate into large-scale warfare. Conservation efforts in Papua New Guinea's highland forests cannot be achieved by individual families or clans, as their traditional territories are too small. The appropriate social scale for effective conservation is the community. Therefore, a key first step in community engagement is understanding the connections between clans, assessing social cohesion and determining the collective willingness to manage natural resources sustainably.

What did we do?

The Sustainable Wildlife Management (SWM) Programme team in Papua New Guinea began by identifying key stakeholders and conducting in-depth discussions with them, both individually and collectively. Women-only meetings were held to ensure their voices were heard. This engagement protocol also helped gather information on traditional wildlife practices, local decision-making processes and historical conflicts, forming part of the free, prior and informed consent process. Discussions around land use continued throughout the engagement process, particularly during the meticulous participatory land-use mapping. The goal was to build consensus among local stakeholders in targeted communities, agreeing on common rules and clearly defined areas where these rules will be enforced by the community itself.

What did we learn?

While this approach has successfully led to the signing of conservation deeds (legally binding contracts between clans regulating resource use) at three project sites, it has shown that in some communities, social cohesion was too fragile at the time to support collective action. This absence of social cohesion was evident from conflicts within communities, often arising from disagreements on land ownership and boundaries. In other instances, competing groups within communities insisted on leading the partnership with the Wildlife Conservation Society, creating challenges in establishing a clear way forward to working with the community. Another important lesson was the need to consider stakeholders who may not reside at the project sites but have ties to the land through family lineage.

How was this information useful for management decision-making?

Social cohesion has been a key factor in shaping the SWM Programme's approach for community engagement in Papua New Guinea and in determining suitable sites to pilot the foreseen sustainable wildlife management model. For instance, in early 2020, the team had to suspend engagement with a community due to ongoing internal conflicts and violence.



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Lessons learned from the SWM Programme

- **Tailor support to different levels of stewardship capacity:** Communities vary in their readiness and capacity to manage wildlife. Some may need technical and financial support to act on existing motivations, while others may benefit more from efforts to revive lost knowledge, reconnect with cultural values and rebuild care for the local environment.
- **Align interventions with local values and motivations:** External support should respect and reinforce local ethics, cultural practices and motivations related to nature. Stewardship efforts are more successful when they build on what already matters to communities rather than imposing external priorities or models.
- **Strengthen social cohesion to support collective action:** Environmental stewardship depends on strong social cohesion. Projects should allocate time and resources to rebuild trust, resolve tensions and foster inclusive dialogue, especially where communities have experienced conflict or fragmentation.
- **Clarify representation and accountability mechanisms:** A clear understanding of who legitimately represents the community and who is responsible for enforcing collective decisions is critical. These elements underpin FPIC and are necessary for co-designing credible and enforceable wildlife management plans.
- **Address internal and intercommunity conflicts proactively:** Where conflict exists within or between communities, additional steps are needed to ensure the legitimacy of governance arrangements. Conflict-sensitive mechanisms can help recognize and support trusted authorities and prevent disputes from undermining wildlife governance.
- **Invest in stewardship to foster long-term social and ecological gains:** Strengthening stewardship can lead to a virtuous cycle where improved natural resource management contributes to greater social well-being, and vice versa. Recognizing this dynamic helps frame stewardship not just as an ecological objective but also as a pathway to community resilience.

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2.3. Understanding community governance systems

Key concepts and definitions

Governance is generally defined as a social system in which communities define and decide which behaviours are acceptable, how to monitor and regulate them, and how the group ensures that community members and others comply with associated policies, rules and regulations.

Natural resource governance follows the same decision-making process but focuses specifically on behaviours related to the access and use of plants, animals and the environment that supports them.

The terms "governance" and "management" are often mistakenly used interchangeably, even though they are distinct. In the context of natural resources, governors are those who: 1) decide how resources within their jurisdiction (i.e. the lands and waters over which they have formal or customary authority) can be used by community members and outsiders; and 2) are accountable for implementing these rules. Managers, however, are responsible for executing and enforcing the policies, rules and regulations (i.e. institutions) set by the governors.

This ambiguity often arises because governors and managers can be the same individuals or groups.

Components of an effective and equitable natural resource governance system

Organizational structure: As noted earlier, community-based natural resource management is a social process that brings together individuals, families or communities to collectively address shared concerns. Depending on the group's size, there are typically three pathways for making natural resource access and use decisions:

1. For small, ethnically similar groups with few differences in education or wealth, decisions can be made through group discussions that reach a broad consensus. This approach is common among small clans of Indigenous hunters, fishers and foragers.
2. For larger groups (of more than 20 to 50 people), achieving an equitable consensus can become challenging, so a governance body is often created to make decisions on behalf of the group. This body is typically composed of a small number of representatives chosen by the group to represent their shared interests.
3. In cases where multiple communities share common areas of use, and self-identify under a single umbrella identity, they often form a representative body to manage shared interests.

In many cases, legal frameworks do not fully grant land and management rights to community-level structures, particularly when the managed area overlaps with state land or private concessions. In such cases, co-management and co-governance structures may be established to define shared responsibilities within the same jurisdiction. The absence of these structures in areas with multiple governing entities can create management gaps and lead to conflicts over resource use.

Necessary attributes of the governance body: Regardless of its organizational structure, to ensure successful and equitable yet sustainable governance, a body assigned to govern must have authority, capacity and power, which are three attributes that mutually support each other. Together, these characteristics allow the governance body to fulfill its role regarding wildlife and other natural resources in an efficient manner.

1. **Authority:** Authority is the basis for good governance. It means the governing body has legitimacy allowing it to decide and enforce rules based either on formal or customary grounds. For the authority to be credible, resource users must see this authority as legitimate; that is, decisions are accountable, transparent, participatory and fair. Authority is further strengthened when a governance body can say it acts in the best interests of the community and the community's rights. In this capacity, the users can make rules to ensure compliance with regulations about resource use and conservation.

2. **Capacity:** Capacity refers to the governance body's ability to plan, implement and monitor actions effectively. This includes having the technical knowledge, skills, resources and institutional support needed to manage resources sustainably. Key components of capacity include:

   - knowledge and skills – the understanding of ecological, social and economic issues that must be factored in when monitoring resource sustainability and conservation outcomes;
   - resources – the financial, physical and human inputs into the work of the governing body.
   - institutional framework – the norms, rules and regulations that support the performance of the body in doing its work; and
   - motivation – the knowledge of the willingness and commitment of the group members working in either direct or indirect governance roles.

   In the absence of sufficient capacity, having authority is not enough for a governance body to be able to enforce rules or attain long-term sustainability.

3. **Power:** Power encompasses the governance body's ability to uphold its authority and resist interference from external actors. Unlike authority and capacity, power is relational and depends on the interactions between the governance body and other groups, agencies or organizations. A governance group must have the power to enforce its decisions, prevent its rules from being undermined externally, and maintain its legitimacy and capacity in the face of challenges. Understanding power requires not only assessing the governance group's influence but also examining how power is distributed and exercised by external stakeholders.



The SWM Programme in Madagascar operates through local governance structures called "*Communautés de base*" (COBA) around Makira Natural Park.

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Why is it important to understand local governance systems?

Understanding local governance systems is crucial for sustainable community-based wildlife management because they reveal how power, decision-making and responsibility are distributed within a community. Governance systems dictate who holds authority over resources, how rules are enforced and how conflicts are managed. By understanding them practitioners can identify key stakeholders, local norms and potential power imbalances that may affect wildlife management outcomes. This also ensures that initiatives align with local governance structures, making them more relevant, culturally appropriate and sustainable. Additionally, understanding these systems supports better negotiation between community interests and external actors, fostering respect for local decision-making processes and enhancing community participation without undermining local authority or excluding important voices.

To understand how and by whom wildlife management decisions are made, we need to answer the following questions.

1. Within a community, who makes decisions about wildlife use (e.g. who can hunt, what, where, when and how much)? Is it:
   - **a.** by universal consensus? or
   - **b.** through a representative body?
2. Who enforces these decisions?
3. What influence does the government and its agencies have on community decisions and enforcement?
   - **a.** Does it limit or reinforce the community's authority, and, if so, how?
   - **b.** What changes, if any, could enable the government to provide more timely and competent support for community governance of natural resources?
4. Are existing governance systems achieving desired outcomes (as outlined in the ecological considerations section); if not, why and can changes be made to improve effectiveness?

Questions 1 and 2 can be explored through stakeholder analysis using focus groups with community members. Question 3 can be addressed in focus groups with government agency staff (and other duty bearers where government has delegated authority to other stakeholders), focusing on their knowledge of community governance systems and the agency's current support. Discussions with lawyers can clarify whether statutory law conflicts with customary law. Question 4 is best answered through a survey using the Natural Resources Governance Tool[7] (NRGT), which can be done during stakeholder analysis or independently at any time.

[7] See https://doi.org/10.19121/2020.Report.38367

Example of local governance assessment from the Madagascar SWM Programme site green belt around Makira Natural Park

Context

In Madagascar, the GELOSE law (n° 96-025, 30 September 1996) (*Gestion Locale Sécurisée* or secure local management policy) delegates the management of renewable natural resources to local communities through associations called *communautés de base* (COBAs). Over 80 COBAs are established around Makira Natural Park, where the Sustainable Wildlife Programme (SWM) Programme has been working with eight of them since 2018. These COBAs are managed by a management committee, or a *comité de gestion* (COGE), typically composed of 8 to 12 elected members, and operate based on statutes, internal regulations and customary rules (dina). While the law covers forests, wildlife, aquatic and terrestrial flora, water and pasturelands, prior to the SWM Programme these associations focused primarily on timber management, mainly contributing to preserving wildlife forest habitats but not addressing wildlife use directly.

What did we do?

At the beginning of the SWM Programme, focus groups and interviews were held to determine whether other formal or informal community bodies were involved in wildlife management. The aim was to identify the most appropriate structure for wildlife governance. Simultaneously, the Natural Resources Governance Tool (NRGT) was used to assess the strengths and weaknesses of COBAs and COGEs in the project sites. There were 180 people who participated in the survey, providing feedback on their agreement with various natural resource governance practices.

What did we learn?

Key findings:

- hunting and fishing are primarily individual activities with no collective organization;
- while customary authorities play key roles in land and resource access, as well as conflict resolution, their influence in SWM Programme sites is not fully reflected in the dina, which mainly reflects national laws and the decree establishing Makira Natural Park, rather than customary usage rights, rules and institutions; and
- existing governance structures, like COBAs and COGEs, do not adequately address wildlife management, especially hunting and fishing.

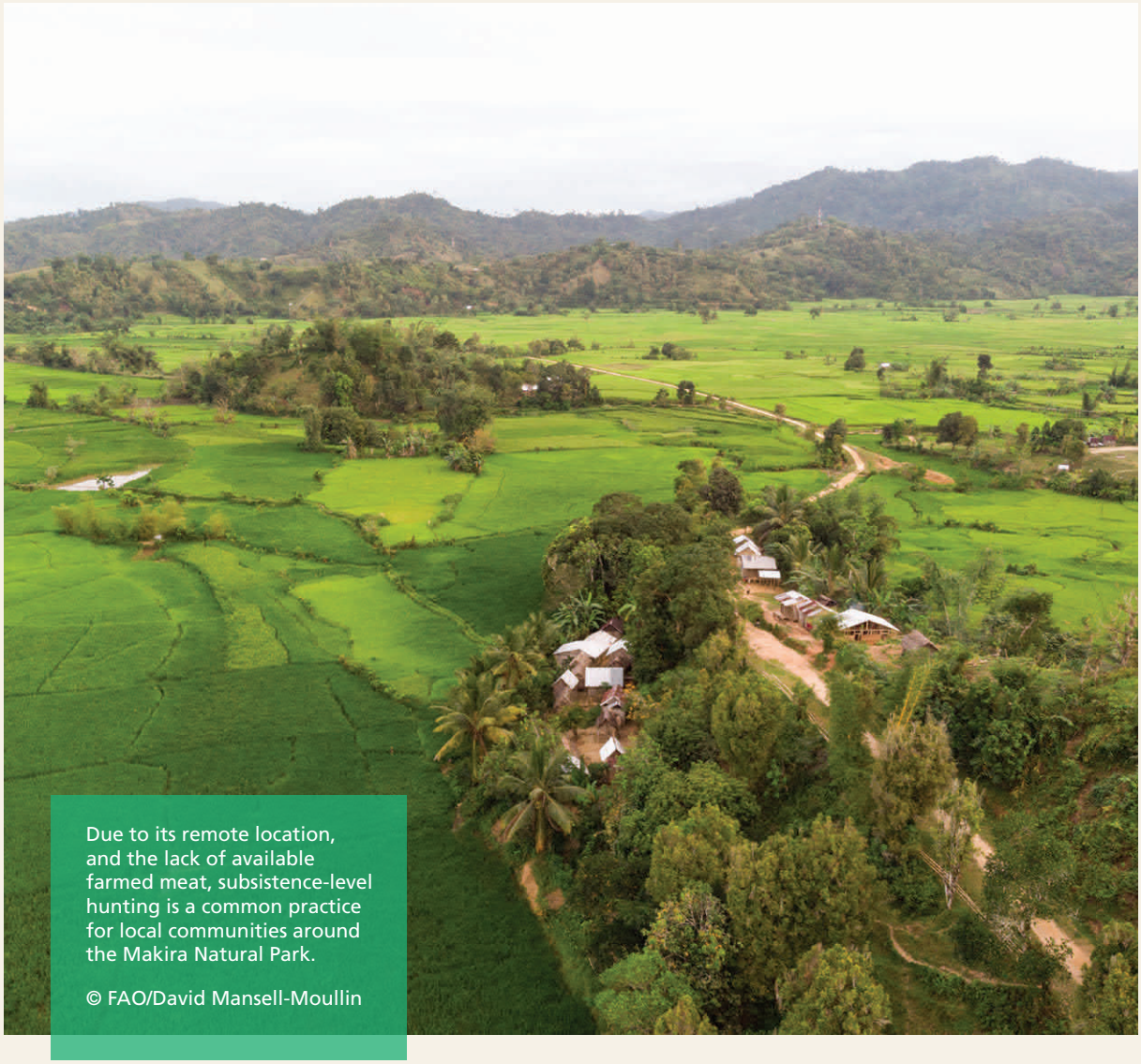
How was this information useful for management?

Based on these insights, two options for community-based wildlife management were considered and discussed with communities:

1. **Strengthening existing structures** – enhance the governance capacity of COBAs and COGEs, integrate customary law into the dina during contract renewals and in governance frameworks, expand their scope to include wildlife management (hunting and fishing) and improve gender representation within management committees; and

2. **Creating new structures** – establish new governance bodies specifically for wildlife management.

After community consultations, the first option was preferred due to its reliance on existing, legally recognized structures. The decision was made to incorporate customary law more effectively in contract renewals, appoint representatives of hunters and fishers to COGEs and involve them in preparing a wildlife management plan to attach to management transfer contracts. Ultimately, strengthening COGEs and COBAs is expected to improve overall natural resource management across all sectors of the green belt formed by COBAs around Makira Natural Park.



Due to its remote location, and the lack of available farmed meat, subsistence-level hunting is a common practice for local communities around the Makira Natural Park.

© FAO/David Mansell-Moullin

Lessons learned from the SWM Programme

- **Clarify the distinction between governance and management:** Establishing a shared understanding among stakeholders of the difference between governance (decision-making authority) and management (implementation of decisions) is essential. Clearly defining these roles improves coordination, accountability and collaboration in wildlife governance.
- **Invest in governance training for field teams:** Working effectively with Indigenous Peoples and local communities requires field teams to be well-trained in governance concepts. This foundational training demands both time and resources but is crucial for building respectful and effective relationships.
- **Facilitate the recognition and integration of customary authorities into formal systems:** Customary leaders often hold significant authority over land and resource use but are frequently excluded from formal governance structures. Aligning statutory frameworks with customary laws, such as integrating dina in Madagascar, enhances legitimacy, increases compliance and ensures stronger community ownership.
- **Strengthen and adapt existing local governance bodies:** Rather than creating new structures, projects should prioritize reinforcing existing governance institutions. These bodies are often legally recognized and better understood by communities. Where needed, restructuring them to improve inclusivity and representation helps ensure legitimacy and functionality.
- **Equip local institutions for their governance role:** Local governance bodies must be provided with the tools, knowledge and support needed to fulfill their responsibilities effectively. This includes legal awareness, technical skills and clear mandates for integrating wildlife management into broader natural resource governance.
- **Adapt governance models to community size and complexity:** Governance approaches should be tailored to the scale and diversity of the community. Smaller, cohesive groups may succeed with consensus-based decision-making, while larger or more diverse communities often require representative systems to ensure fairness and effectiveness.
- **Use governance assessment tools to identify and address gaps:** Tools such as the NRGT provide a structured way to assess governance quality, highlight weaknesses and guide improvements. These tools support evidence-based decision-making and adaptive management.
- **Balance community autonomy with constructive external support:** Successful governance requires striking a balance between respecting community authority and providing external support. Co-management arrangements can foster trust, share responsibilities and align state and local interests, as demonstrated in Madagascar where inclusive planning improved both governance and compliance.

Further reading

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2.4. Understanding policy and legal frameworks in relation to hunting, fishing and wildlife trade

Why is it important to understand the policy and legal framework?

Identifying and analysing applicable policies and legal frameworks is essential for understanding the level of sustainability of wildlife management. These frameworks must be coherent and aligned across sectors and governance levels to support a long-term vision for biodiversity conservation and responsible use. Policies outline a government's strategic direction, typically over a 10- to 15-year horizon, either for national development as a whole or for specific sectors such as natural resource management. Laws and regulations are the tools through which these policy goals are implemented.

Indeed, the law plays a pivotal role in wildlife management. By recognizing substantive rights (e.g. land and wildlife tenure, benefit sharing, access to food and food safety), procedural rights (e.g. access to information, participation in decision-making and access to justice), individual and institutional responsibilities (e.g. human–wildlife conflicts, animal health), and enforcement mechanisms, the law establishes the conditions for the protection and use of wildlife. Ultimately, it should determine the roles of individuals and communities in the governance of resources by establishing fair, transparent and inclusive mechanisms. In this regard, understanding the content of legal frameworks, through legal and policy analysis, helps to identify gaps, overlaps and inconsistencies in what is regulated. Such an analysis, when disseminated through the appropriate channels and tools, provides a valuable opportunity to foster dialogue among diverse stakeholders (including government authorities, the private sector, national civil society organizations, and Indigenous Peoples and local communities) regarding the alignment of existing procedures and practices with statutory law, as well as the potential recognition of relevant customary norms and practices. It helps develop a more inclusive legal framework that supports conservation goals while addressing social equity.

To remain relevant and effective, wildlife legal frameworks must evolve in line with international and national policy developments. Indeed, there is a growing shift away from narrow, top-down regulatory approaches in favour of more inclusive, systemic models that are based on conservation, sustainable use and community involvement. This reflects the need to address environmental, social and economic challenges holistically, in view of their interconnected and ever-increasing interdependence.

In short, analysing the broad range of sectoral laws and policies that are directly and indirectly relevant to the sustainable management of wildlife and making these analyses accessible will provide a clearer understanding of the enabling environment for wildlife governance.

How do we carry out a policy and legal analysis in the context of wildlife management?

A legal expert should lead the legal and policy analysis, supported by scientific expertise and local knowledge. The analysis should assess the internal coherence of each legal and policy instrument governing wildlife and natural resource management, as well as its consistency with other statutory instruments, in accordance with the hierarchy of norms.

The process should begin with the identification and collection of all relevant instruments. These include policies, strategies, laws, regulations, plans and programmes related to multiple sectors, which may vary from one country to another, but which should generally cover protected areas, forests and wildlife, biodiversity, land, agriculture and animal production, hunting, fishing, food safety, and tourism, among the most important.

To this end, a preliminary country-specific online legal database should be developed if one does not already exist. To facilitate cataloguing and searching, this database should be coded with metadata such as file names and the country of origin, as well as classifications based on title, sector and legal type. Chronological data such as the date of issue, publication and entry into force should be recorded, as well as details of amending or enabling instruments. Moreover, including contextual elements such as notes, website references and unique identifiers ensures that the database is both comprehensive and user-friendly.

Once the material has been collected, it should be analysed to gain an understanding of the scope and depth of the legal framework, including its necessary sectoral interconnections and/or potential conflicts. This broad understanding is indeed instrumental in informing discussions on policy and law reform processes that reflect key national priorities, international standards, and those customary norms and practices that are deemed appropriate.

In this regard, the analysis should also focus on how national policies reflect global biodiversity and sustainable development goals, and on how national laws and regulations implement these policies. A critical component of this task is to review the country's commitments under key multilateral environmental agreements (MEAs), including the Convention on Biological Diversity (CBD), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Ramsar Convention on Wetlands of International Importance and the Convention on Migratory Species. These commitments should be analysed in terms of their integration into, and implementation within, the national policy and legal framework. Finally, the analysis should also encompass regional binding (or non-binding) instruments that are directly applicable, identifying how they shape or influence national law.

In order to conduct a comprehensive analysis, legal diagnostic tools (LDTs), such as those developed by the SWM Programme and available on the Legal Hub, could be used to cover all relevant sectors of the wildlife value chain and related agrifood systems. These LDTs consist of a set of structured questions incorporating the key principles of the relevant MEAs, as well as questions relating to the most relevant human rights, such as the right to food and right to a healthy environment, as well as the right of Indigenous Peoples and local communities, and the recognition of customary norms and practices. To achieve a more comprehensive and accurate assessment, it would be beneficial to conduct interviews with national focal points for international and regional conventions and agreements. This would provide insight into the implementation and coordination of the legal framework. Meanwhile, interviews with Indigenous Peoples and local communities could offer a better understanding of existing customary norms and practices, which in certain circumstances, particularly in rural areas, are the source of order and harmonious relationships.

This analysis should primarily result in a preliminary diagnostic report developed in close collaboration with national and local authorities. It should highlight legal gaps, overlaps and inconsistencies, as well as identifying opportunities and areas for improvement. It should include: an institutional organigram mapping relevant entities and their roles; a summary of the wildlife tenure rights of local communities and Indigenous Peoples; and an overview of legal rules governing land, water and forest tenure, wildlife use, including human–wildlife conflicts, animal health, and the production of alternative proteins (notably at small and medium scale) that could potentially reduce human pressure on wildlife. The report should also present an initial review of existing procedural rights in natural resource governance, such as co-management and delegated management arrangements. Additionally, it should evaluate the implementation of international environmental conventions, the recognition of customary norms and practices and the degree of cross-sectoral policy coherence in biodiversity and natural resource management.

This analysis provides the basis for an open discussion on how to improve and update the existing policy and legal framework through a participatory approach that allows for inclusiveness and shared responsibility. Indeed, such an approach enables all relevant constituencies (government, private sector and civil society organizations) to gain a shared understanding of the applicable enabling policy and legal framework, and to discuss how to improve it most effectively.

Examples: Who can benefit from policy and legal analysis, and how?

The improved understanding of the country's multisectoral policy and legal framework deriving from this analysis is a key ingredient to facilitate and encourage dialogue between ministries and departments that rarely interact, thereby breaking down institutional silos. In this regard, the policy and legal analyses developed by the SWM Programme and published in the Legal Hub inform legal reforms and encourage participatory processes in wildlife and natural resource management. Some examples of these practical outcomes are provided below.

In Zimbabwe, the analysis informed the government-led reform of the Parks and Wildlife Act by identifying, among others, key gaps and inconsistencies for the implementation of the community conservancy model. The Government has also since recognized it as a reference tool for reforming the Community-based Natural Resource Management Policy and the Communal Land Forest Produce Act. The Department of Livestock and Veterinary Services also use the relevant analysis in training courses for food inspectors, demonstrating its relevance to scientific and practitioner communities alike.

In Gabon, the analysis informed the development of a national strategy for the wild meat sector, leading to legislative and regulatory reforms regarding community hunting and trade. This has reinforced community rights over wildlife resources by recognizing traditional hunting



The Legal Hub is a user-friendly platform that provides easy access to legal texts and insightful analysis on all sectors related to sustainable wildlife management in over a dozen countries.

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techniques for subsistence hunting and reviewing hunting quotas and periods in line with both ecological sustainability and right to food. Government bodies, local communities and civil society organizations currently use it as a shared foundation for reform through multistakeholder platforms and working groups.

In Madagascar, the legal analysis, besides triggering the development of the first ever national policy on wildlife and the subsequent review of the hunting legislation, has also played a key role in improving the implementation of the *Loi Gelose* for the decentralization of management of natural resources, by supporting better recognition and embedding the customary norms and practices (dina) in the relevant contracts with local communities.

In Guyana, the analysis supported a participatory process to draft amendments to the Fisheries Act and develop new co-management regulations for inland fisheries. It also helped prepare the Aquaculture Bill, providing policymakers with valuable tools and giving communities a stronger voice.

Ultimately, legal and policy analyses are practical tools that not only inform technical exercises, but also help governments to design better laws, empower communities to manage their resources, support investors in understanding risks and opportunities, and provide scientists and practitioners with the evidence needed to guide sustainable action.



A community consultation, informed by the Legal Hub, was held to support legislative reforms in Binga District, Zimbabwe.

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Lessons learned from the SWM Programme

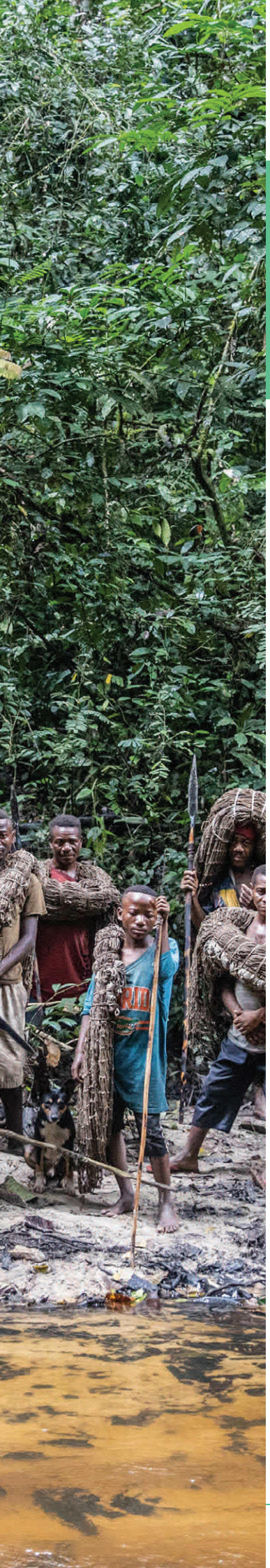
- **Develop a comprehensive and exhaustive legal database by country:** Use available online resources, supplemented where necessary by research at the various competent public bodies (ministries, agencies, parliament, etc.) for additional legal instruments in force and compile all of them into a database where all files are coded with key metadata.
- **Conduct comprehensive legal analyses to identify gaps and conflicts:** Comprehensive, thorough and cross-sectoral analyses of national legal and policy frameworks are essential for identifying legal inconsistencies, gaps and institutional weaknesses. These require sector specific legal diagnostic tools covering the full range of relevant issues, also including international environmental and human rights principles and standards. Such activity forms the basis for any strategic, effective and targeted reforms.
- **Promote a shift towards inclusive, people-centred legal approaches:** Legal frameworks developed according to rigid command and control logic should give way to participatory processes that support conservation through social demands, promoting inclusiveness, benefit-sharing and local stewardship. This shift helps build trust, enhance compliance and improve outcomes for both biodiversity and communities.
- **Ensure cross-sectoral coherence in legal reforms:** Wildlife management intersects with multiple legal domains, including land tenure, food safety, health, animal production and environmental regulation. Policy and legal reforms must, therefore, be aligned across these sectors to prevent conflict and promote an integrated, sustainable approach to natural resources governance.
- **Promote recognition of customary norms and practices by statutory law:** Effective wildlife governance requires a coherent and consistent legal framework to apply throughout the national territory. Legal analyses should assess how statutory and customary frameworks interact with each other and identify the legal enablers that allow both national policy goals and local management realities to be integrated. Recognizing customary norms and institutions is indeed crucial to fostering community engagement and legitimacy in wildlife governance.
- **Use pilot projects to inform and drive legal reform:** Pilot initiatives play a vital role in testing the effectiveness of legal frameworks in real-world settings. They can provide bottom-up insights to inform targeted legal reforms, as well as validate whether newly adopted laws are workable under dynamic field conditions.
- **Recognize that legal frameworks influence the potential for community-based management:** The success of community-based wildlife management is fundamentally influenced by the enabling environment established through policy and legal frameworks. Inadequate or outdated legislation remains a key barrier that must be addressed to ensure long-term sustainability.
- **Institutional dialogue, access to legal information and awareness raising:** Political will is fundamental to trigger policy and law reform processes. To get there, decision-makers and the public must understand the shortcomings of the existing legal framework and how they could be improved. This requires making legal analyses publicly available and accessible including through a regular institutional dialogue and awareness raising activities for the public.

Further reading

SWM Programme. nd. Legal hub. In: *FAO.* [Cited 09 July 2025]. https://www.fao.org/in-action/swm-programme/legal-hub/en



© FAO/Thomas Nicolon



3. HUNTING SYSTEMS AND VALUE CHAIN CONSIDERATIONS

3.1. Understanding the values and costs associated with wildlife

Why is it important to assess the values and costs associated with wildlife?

Successful wildlife management and conservation must generate benefits for a diverse range of stakeholders, who must also recognize that wildlife is valuable in multiple ways and its presence may not benefit everyone equally. However, living with wildlife may also represent costs, for example, those associated with human–wildlife coexistence (e.g. agricultural pests, predators of livestock, infrastructural damage) and the opportunity costs derived from conservation and wildlife management interventions (e.g. refraining from hunting a given animal may bring costs associated with the purchase or production of equivalent food). Understanding the values and costs associated with wildlife by rights holders and duty bearers is key to the development of a management model that maximizes wins and minimizes losses in an equitable way. Indeed, the diverse values associated with wildlife may compete with one another, for example, where wildlife has both consumptive values and non-consumptive values. Moreover, different stakeholders may prioritize certain values over others or bear a disproportionate share of the associated costs. Identifying the diversity of values, assessing how different stakeholder constituencies prioritize these values and discussing the impacts of different management scenarios on these different values, helps build equitable management scenarios and facilitates collective discussion and decision-making with regard to the most appropriate management model.

How to assess values and costs associated with wildlife

The framework illustrated in Figure 1 provides a conceptual approach to categorizing the values associated with wildlife, including use values, option values, and non-use values, alongside the costs incurred by living with wildlife. This framework serves as a tool to facilitate participatory processes, enabling stakeholders to collectively evaluate and articulate the various values they attribute to wildlife and the associated costs they experience. Additionally, it can guide scenario-building exercises, encouraging stakeholders to envision how they ideally wish wildlife to contribute to their well-being. By fostering dialogue and understanding, the framework supports negotiation processes in situations where conflicting values arise and informs management decisions grounded in the diverse values and beliefs of different constituencies.

Figure 1. Framework to assess wildlife values and costs

Values +					Costs –	
Use values				Non-use values	Direct costs	Indirect costs
Direct values		Indirect values	Option values			
Consumptive medicinal nutritional material/ income recreational genetic aesthetic sociocultural scientific	Non- consumptive recreational charismatic/ aesthetic educational/ scientific sociocultural/ spiritual	Ecological pollination decomposition water purification erosion and flood control, indicator species, carbon storage and climate regulation	Future use as direct and indirect values	Intrinsic/ existence biodiversity	Human injuries or deaths predation of livestock or crops property damages spread of diseases traffic collision invasive species	Opportunity costs transaction costs (e.g. bureaucracy) Non materials costs (e.g stress, anxiety)

Source: Adapted from Gomez, J., van Vliet, N. & Canales, N. 2022. The values of wildlife revisited. *Ecology & Society,* 27(4). https://doi.org/10.5751/ES-13571-270423



The SWM Programme analysed the wild meat trade value chain in coastal Guyana and launched several behaviour change campaigns. Guyana

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Example from SWM Programme site in Guyana: eating turtles and conserving them too in the Rupununi

Context

The Rupununi region, the largest in Guyana (Region 9), is characterized by a diverse landscape including savanna grasslands, wetlands, forests and river systems, notably the Rupununi River, which flows north through the Kanuku Mountains National Park. The river's banks provide critical nesting sites for freshwater turtles during the dry season. Six species inhabit this area, with the Giant South American Turtle (endangered) and the Yellow-spotted River Turtle (vulnerable) facing significant risks of extinction. Indigenous communities, such as the Makushi and Wapichan, have historically relied on turtles for their meat and eggs, which are integral to their diet and cultural practices. However, community observations indicate declining populations of key species over the past two decades. This decline prompted conservation efforts. In 2011, the village of Yupukari initiated a turtle conservation programme, which grew through the Sustainable Wildlife Management (SWM) Programme to include more community-driven initiatives. This expansion led to the collaborative development of a Regional Turtle Management Plan involving neighbouring communities.

What did we do?

To draft the management plan, grassroots non-governmental organizations (Caiman House and the South Rupununi Conservation Society) organized workshops with community representatives, wildlife monitors and local and national authorities. The workshop began with a brainstorming session on stakeholders' values related to turtles and their habitats. These values were grouped and ranked according to the framework provided in Gomez, van Vliet and Canales (2022). Participants then identified potential costs associated with turtles and considered other factors impacting turtles, their users and habitats. This joint analysis of values, costs and threats helped guide the development of the management plan.

What did we learn?

Primary values: Turtles are valued in a range of ways for local communities. They provide essential sources of food and income. Their meat and eggs are used for subsistence, while ecotourism activities such as turtle sighting and release programmes contribute to household earnings. Beyond their economic value, turtles carry deep cultural significance. Traditional practices include crafting tools from turtle shells, and community elders highlight turtle meat as an important element of Makushi and Wapichan heritage. Turtles also play a key role in education and local development. Events like the Turtle Festival serve both as platforms for environmental education and as opportunities for income generation, creating jobs for local monitors and caretakers.

Costs: Although turtles occasionally damage fishing nets when they become unintentionally entangled, fishers do not view them as a significant problem. They are considered by-catch rather than a direct threat to fishing activities.

Threats: Turtles face mounting threats from both human activities and natural pressures. Increased commercial fishing, boat traffic and sand extraction for construction are contributing to habitat disturbance. Climate variability, including more frequent and intense droughts and floods, further threaten turtle populations by impacting nesting sites and the survival of hatchlings.

How was this information useful for management?

The analysis highlighted the importance of aligning conservation strategies with the cultural and economic values of local communities. By promoting broad participation and addressing potential conflicts, the management plan fosters inclusive stewardship that supports turtle populations while benefiting local livelihoods. This approach enhances local ownership, compliance and collaboration for sustainable conservation in the Rupununi.

Based on the high acceptance of living with river turtles and the insignificant associated costs, the management plan emphasized the need to increase turtle populations for sustainable consumption and conservation. The management plan outlines actions such as:

- **setting aside beaches** – designating areas for conservation and monitoring to reduce disturbance;
- **nest rescues and hatchling releases** – protecting eggs during extreme weather events;
- **quota allocation for consumption** – managing the use of rescued eggs for community needs;
- **pilot ranching facility** – testing sustainable semi-intensive turtle farming to support cultural practices; and
- **educational initiatives** – expanding environmental awareness through programmes like the Turtle Festival and educating external fishers to reduce beach disturbances.



River turtle management plans emphasize the need to increase turtle populations for sustainable consumption and conservation. Guyana

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Lessons learned from the SWM Programme

- **Understand stakeholder values to reveal synergies and conflicts:** Analysing the diverse values stakeholders attach to wildlife helps uncover where interests align or clash. This understanding is essential to anticipate potential conflicts and design management strategies that navigate trade-offs effectively.
- **Use value analysis to guide inclusive and responsive decision-making:** Identifying the range of stakeholder values supports the creation of policies and management plans that genuinely reflect the priorities of different groups, increasing legitimacy and support for wildlife governance.
- **Ground legal and policy frameworks in community realities:** Incorporating stakeholder values ensures that laws and policies are not abstract mandates but are rooted in the lived experiences and needs of the people they affect, leading to more practical and sustainable outcomes.
- **Employ comprehensive frameworks to capture hidden values:** Utilizing detailed analytical tools, like the framework from Gomez *et al.* (2022), helps reveal "silent" or less visible values that might otherwise be missed. Recognizing these subtle dimensions enriches the understanding of human–wildlife relationships and informs more holistic management approaches.

Further reading

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3.2. Understanding hunting practices and harvest levels

Diversity of hunting practices

Hunting practices are remarkably diverse, shaped by cultural, ecological and socioeconomic factors specific to each region. This diversity is reflected in the broad definition of a hunter, which includes any individual who captures animals, regardless of their hunting practices. Hunting methods include modern practices such as shooting and trapping using snares or steel cables. In some regions, traditional techniques like hunting with spears or bows, as well as net hunting, are still in use. The use of dogs for hunting is also observed in certain areas. Finally, gathering involves capturing less mobile species such as land turtles or pangolins and eggs, often taken directly or killed with a machete.

Hunting can be conducted either individually or collectively, depending on local practices. It may take place year-round or seasonally, with peaks sometimes linked to social or cultural events such as traditional weddings, mourning ceremonies or the return of students to the village during holidays. Hunting frequency can also vary depending on the day of the week, sometimes influenced by agricultural or religious practices. Hunting trips differ in duration and time of day, with some occurring during the day and others at night. In some cases, hunters set up temporary camps to extend their activities in the field.

Why is it important to understand hunting practices and harvest levels?

The study of hunting practices and the monitoring of harvests provide valuable insights into the hunter population in the study area, the techniques and equipment employed, the spatial and temporal dynamics of hunting activities, the harvest levels of various species and the income generated from hunting. This information serves as a crucial foundation for understanding the management model currently in place and for fostering a shared vision among all stakeholders. This includes hunters, who sometimes have a limited perspective on the system due to what is often the individual nature of their activities. Moreover, if hunters collectively commit to the sustainable management of hunting in the area, these insights will be instrumental in developing management strategies that are both effective and adapted to local conditions.

How do we assess hunting practices and harvest levels?

Understanding hunting practices is a two-step process.

The first step is to identify the hunter population and create a census. This process generally begins with stakeholder analysis and may be complemented by interviews or focus group discussions. When possible, additional data on the age, socio-professional category and affiliation of hunters with the targeted community should be gathered to provide a more comprehensive profile. Since the hunting population can fluctuate over time because of employment opportunities, unemployment or holidays, the census is regularly updated to reflect these changes.

The second step involves surveying hunting practices with volunteer hunters. Once identified, hunters are invited to participate voluntarily in the monitoring of their hunting activities and harvests. For this purpose, a semi-structured questionnaire can be developed to gather insights into their hunting practices. The questionnaire is used to collect detailed information on hunting trips, including dates, times, methods, means of travel, camp usage and the involvement of other people, such as porters. It documents the species hunted, the method of capture, the state of the catch (e.g. alive, fresh, smoked, rotten) and the sex, age and weight of the animal as well as its use

(consumption, donation, sale) with the sale price specified when applicable. For animals that are cut up, the form records the specific parts removed. In this questionnaire, the hunter is identified by a numerical identifier to guarantee anonymity. This type of questionnaire can be adapted to reflect the specific characteristics of the hunting system being studied. A preliminary phase of discussion with hunters may be necessary to understand the general hunting system and then develop a more detailed and relevant individual survey.

Monitoring hunting practices can be achieved through two main approaches: using facilitators and/or relying on hunters to self-report, each with its own advantages and challenges. The first approach involves assigning facilitators specifically trained in data collection by duty bearers. These facilitators must be literate and ideally should be members of the monitored community to foster trust and ensure effective communication. In some cases, where hunters prefer to keep their catch secret from their neighbours, it may be more appropriate to use external facilitators. To maintain continuity, it is recommended to train two facilitators per community, providing coverage during absences due to travel, illness or other reasons. This method ensures consistent and structured data collection, as facilitators follow standardized procedures. However, it requires regular follow-up by the CSP, ideally once a week, to verify the quality of the data and address any issues that may arise.

The second approach relies on hunters to self-report their catches. For that purpose, it is possible to provide hunters with logbooks to record details of their hunting trips upon returning. However, the self-reporting method using standardized forms depends heavily on the hunters' literacy and numeracy. An alternative option for self-reporting in a low-literacy environment is the use of low-tech systems such as boxes in which hunters can put a stone, a bean or matches for every animal they hunted. Hunters can decide to have different boxes for the different animal species they hunt. They can also record the number of hunting trips they made or the places they went to with other boxes. At a regular time (e.g. every week or every month), the project team or the hunter governance group will open the boxes, count the numbers of animals they hunted and register the number.

Both approaches have distinct benefits and limitations. They can be used alone or combined. Facilitators provide structured data collection but require ongoing oversight and resources. Self-reporting engages hunters directly but risks data inaccuracy and, depending on the method, may be contingent upon their literacy. With both approaches there is a risk of fabricated data or incomplete records if motivation wanes. Even financial incentives, such as a daily wage for maintaining a diary, may not ensure accurate reporting. A combination of these approaches, adapted to the specific context and available resources, may offer the most comprehensive solution for effectively monitoring hunting practices.

The methods described above may not produce credible information on the level of hunting, when hunting is prohibited by the community or the government (entirely, or for certain species or periods). This is particularly true when the hunters who agree to be interviewed fear social sanctions, retribution or arrest and punishment, if their illegal activities were somehow discovered. In those cases, the unmatched count technique[8] (UCT) has proven quite effective for determining what proportion of a population of people is engaged in undesired or unlawful activities.

[8] See https://besjournals.onlinelibrary.wiley.com/doi/epdf/10.1111/2041-210X.13137

To effectively characterize a hunting system, to monitor hunting practices should be monitored over an entire one-year cycle to capture the temporal variability. If resources for monitoring are limited and do not allow for complete and continuous monitoring, a sampling approach can be used, such as monitoring the hunting practices of a random or stratified sample of the hunters during one or two weeks per month. We recommend that facilitators ask the community's hunters once a day to declare their catches over the previous 24 hours. Visits more than 48 hours apart (with a recall of catches over 48 hours) should be avoided, particularly for monitoring the harvest of common species.

Additionally, when conditions allow, hunting practices can be recorded using innovative technologies, enabling data collection from each hunting trip via smartphone applications. Several tools, such as KoboCollect,[9] are available, and the SWM Programme teams have developed standardized forms specifically to facilitate structured data collection. Facilitators and/or hunters can be trained to use digital devices with intuitive user interfaces, featuring icons to simplify the entry of different types of information. One significant advantage of electronic data recording is its ability to minimize errors by preventing incorrect date entries and automatically capturing the date, time and geographic location of each record. However, while these tools effectively reduce unintentional mistakes, they cannot prevent the deliberate misreporting of data. They are also not easy to deploy in areas where people are unfamiliar with smartphones, and where there is limited access to electricity and poor internet coverage.



Hunting and gathering remain central to the cultural identity and livelihoods of the Mbuti in Ituri Province, where traditional practices continue in the Okapi Wildlife Reserve. Democratic Republic of the Congo

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[9] See https://www.kobotoolbox.org/

Examples of assessing hunting practices and harvest levels

Example 1. Assessing hunting practices and harvest levels in Gabonese hunter communities

Context

Since 2019, the SWM Programme has supported 10 communities in east-central Gabon in monitoring hunting practices and wildlife offtake. Together, these communities comprised 25 villages with a total population of approximately 3 500 people.

What did we do?

More than 300 hunters voluntarily participated in the monitoring programme, each assigned an anonymous identification. While they received no direct payment, small gifts were provided occasionally as encouragement. Supported by three paid data collectors per community, hunters reported their trips daily upon returning to the village. The project documented over 14 000 hunting trips, involving 18 500 animal offtakes. Global positoning system (GPS) devices, used on 7 800 trips tracked hunters' movements, spatial extent and kill locations. Data from paper forms were semi-automatically integrated into a central database using character recognition software, verified through control rules. Semi-automated R scripts (a language and environment for statistical computing) generated dashboards from the combined data, shared quarterly with communities to support sustainable hunting management.

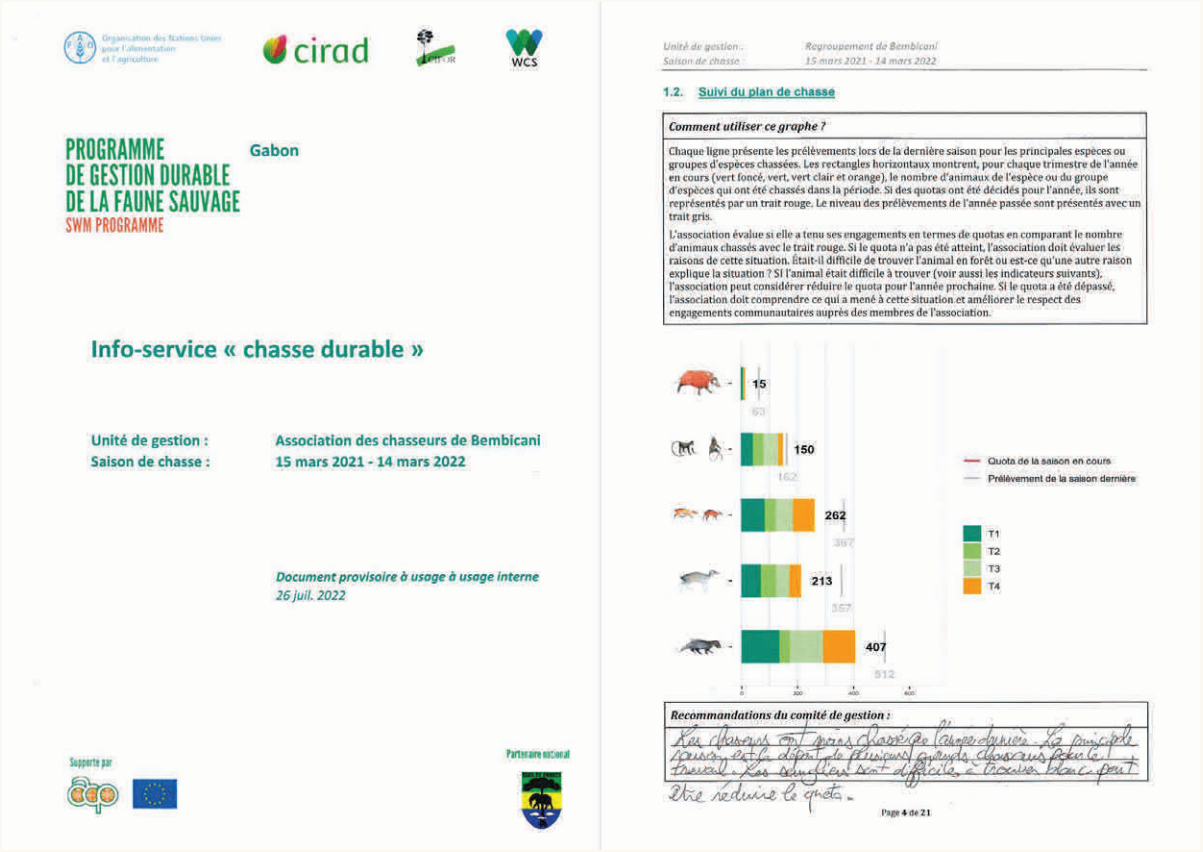
What did we learn?

The monitoring system provided a wealth of information on hunting patterns, including the frequency and spatial extent of hunting trips, the types and numbers of animals hunted and the timing and locations of kills. The GPS data offered priceless insights into the hunting range, boundaries between adjacent hunting areas and hunting effort, highlighting hotspots of wildlife offtake and seasonal variations.

How was this information useful for management decision-making?

The dashboards (Figure 2) served as a vital tool for communities, enabling them to visualize and understand their hunting activities comprehensively. Based on these insights, communities were able to design and implement tailored hunting management plans. The regular feedback loop fostered by the dashboards also strengthened community engagement and accountability in resource management.

Figure 2. View of two pages of the dashboard presenting the results of the offtakes monitoring in communities in the SWM Programme site in Gabon



Source: Authors own elaboration

Example 2. Estimating waterbird harvest in large Sahelian wetlands – Lake Fitri (Chad) and Khor Abu Habil (the Sudan)

Context

Waterbirds constitute a significant part of wild meat in the Sahel (Deniau *et al.*, 2022). While their harvest is primarily used as food by local communities, trade also occurs occasionally or in certain areas or for specific seasons. The sustainability of this exploitation remains largely unknown (Vickery *et al.*, 2014). Except for the Inner Niger Delta in Mali (Kone, Diallo and Fofana, 2002: Kone *et al.*, 2007), hunting practices and harvest estimates for migratory waterbird communities have been poorly documented. But the RESSOURCE Project, a component of the SWM Programme focusing on Sahelian wetlands and waterbirds, has begun addressing this knowledge gap, including in two major Ramsar wetland complexes: Lake Fitri in central Chad and Khor Abu Habil in central Sudan. A necessary first step to assess the sustainability of this exploitation is measuring harvest levels. The RESSOURCE Project has implemented such monitoring in both areas covering 1 500 km² (Lake Fitri) and 9 000 km² (Khor Abu Habil).

What did we do?

In large wetlands, the easiest method for harvest surveys is to sample volunteer and anonymous hunters (Fonteyn *et al.*, 2024) and conduct short-term recall interviews, with full informed consent from local community leaders and interviewees. Waterbird hunting for subsistence is opportunistic, with most catches being bycatches from fishermen. Given the random distribution of fishermen across the wetlands, sampling is a critical challenge in estimating harvest in such remote, rugged areas. To at least optimize spatial sampling balance, interviews were conducted with fishermen in most cells of a geographic information system (GIS) grid covering Lake Fitri and in all cells of the grid covering Khor Abu Habil. Once estimated at the hunter sample level, harvest data can be extrapolated at the entire study area, provided the total hunter population is known or can be reliably estimated.

What did we learn?

Most of the waterbird harvest is used as a source of food for local communities, though it can also be traded. It plays a significant role in food security for rural communities of these Sahelian wetlands. In both areas, the RESSOURCE Project estimated the average harvest per sample unit and then extrapolated or modelled the overall harvest level for the Ramsar wetland. However, harvest levels are difficult to interpret without an unbiased estimate of the corresponding game stock, which is often challenging to obtain. Therefore, both game stock and harvest must be carefully compared, typically within dedicated models (see example on waterbird population size assessment in section 5.2), as applied to Lake Fitri. The Lake Fitri study suggests the wetland may lack sufficient resources to support displaced civilians fleeing armed conflict in the medium term. In the Khor Abu Habil Ramsar wetland, harvest modelling indicated that hunting generates around USD 11 000 in annual income per sampled village.

How was this information useful for management decision-making?

Harvest level is a necessary input parameter for any basic population dynamics model (Eraud *et al.*, 2021) to evaluate the sustainability of waterbird bycatch, as demonstrated in its application to Lake Fitri by Carenton *et al.* (2024). The Lake Fitri study suggests the wetland may lack sufficient resources in the medium term to support displaced civilians fleeing armed conflict. In the Khor Abu Habil Ramsar wetland, harvest modelling indicated that hunting generates around USD 11 000 in annual income per sampled village (Allajabu and Ibrahim, 2021). These findings can guide adaptive management of natural resources, including waterbirds, in Ramsar site management plans. Those plans should incorporate integrated monitoring of natural resources, particularly waterbird species impacted by subsistence hunting or facing unfavourable conservation status. This is crucial given the rapidly changing conditions in the Sahel, including security crises, food insecurity, wetland conversion and climate change.

Sources: Deniau, C.P., Mathevet, R., Gautier, D., Besnard, A., Cornu, G. & Le Bel, S. 2022. Flyways to hell? An empirical assessment of Palearctic migratory waterbird harvest practices in key wetlands of Sahel-sub-Saharan Africa. Biological Conservation, 265, 109419. https://doi.org/10.1016/j.biocon.2021.109419; Vickery, J.A., Ewing, S.R., Smith, K.W., Pain, D.J., Bairlein, F., Škorpilová, J. & Gregory, R.D. 2014. The decline of Afro-Palaearctic migrants and an assessment of potential causes. Ibis International Journal of Avian Science, 156(1): 1–22. https://doi.org/10.1111/ibi.12118; Kone, B., Diallo, M. & Fofana, B. 2002. L'exploitation des oiseaux d'eau (The exploitation of water birds). In: Delta intérieur du fleuve Niger (Inner Niger River Delta). Mali-PIN publication 2002. Sevare, Mali, Wetlands International and the Kingdom of the Netherlands, Altenburg & Wymenga; Kone, B., Fofana, B., Beilfuss, R. & Dodman, T. 2007. The impact of capture, domestication and trade on Black Crowned Cranes in the Inner Niger Delta, Mali. Ostrich-Journal of African Ornithology, 78: 195–203. https://doi.org/10.2989/OSTRICH.2007.78.2.13.93; Fonteyn, D., Fayolle, A., Fa, J.E., Vanthomme, H., Vigneron, P., Vermeulen, C., Malignat, R., *et al.* 2024. Hunting indicators for community-led wildlife management in tropical Africa. Npj Biodiversity, 3:15. https://doi.org/10.1038/s44185-024-00048-4; Eraud, C., Devaux, T., Villers, A., Johnson, F.A. & Francesiaz, C. 2021. popharvest: An R package to assess the sustainability of harvesting regimes of bird populations. Ecology and Evolution, 11(23): 16562–16571. https://doi.org/10.1002/ece3.8212; Carenton, N., Defos du Rau, P., Wachoum, A.S., Ducros, D., Suet, M., Deschamps, C., Betoloum, M.R., *et al.* 2024. Migration of humans fleeing conflict in the Lake Chad region may increase pressures on natural resources in Lake Fitri (Chad): A case study on waterbirds. Journal of Applied Ecology, 61(9): 2231–2243. https://doi.org/10.1111/1365-2664.14700; Allajabu, H.A. & Ibrahim M.A. 2021. The socio-economic importance of wetlands in the Khor Abu Habil alluvial fan for agriculture, livestock, hunting and fishing. Sudan. Internal Consultancy Report. RESSOURCE Project. Rome, FAO.

Lessons learned from the Sustainable Wildlife Management Programme

- **Separate monitoring from enforcement to build trust:** To encourage honest participation, hunting should be monitored by neutral parties rather than by anti-poaching groups. This separation reduces fear of reprisals and fosters open communication with hunters.
- **Establish clear objectives and build relationships with hunters:** Transparency about the purpose of monitoring and building trust through awareness sessions are essential. Ensuring hunters understand the benefits promotes their willingness to provide accurate information.
- **Protect participant anonymity to encourage openness:** Using non-identifiable codes instead of names safeguards hunter privacy, which is critical to obtaining reliable data without fear of negative consequences.
- **Keep data collection simple and relevant:** Limit surveys to essential information that will directly inform management decisions. Simplifying the process respects the hunters' time and improves data quality.
- **Use interactive tools to enhance engagement:** Games and social learning techniques can help hunters grasp the importance of monitoring and increase their active participation.
- **Understand sampling and reporting completeness:** Accurate extrapolation requires knowing the proportion of the hunter population involved and ensuring that participants report all catches within the monitoring period to avoid underestimations.
- **Employ appropriate location tracking methods:** Where possible, use global positioning system (GPS) technology to help hunters accurately record kill locations. Alternatively, participatory mapping with locally meaningful place names can support spatial data collection.
- **Adapt monitoring approaches to local hunting practices:** Recognize that individual surveys may not suit contexts where hunting is collective or extended over time. In such cases, methods must be tailored to capture data realistically, considering community-specific hunting patterns.
- **Leverage low-tech, participatory systems when resources are limited:** Simpler, community-driven monitoring can still yield valuable data and be more feasible in resource-constrained settings.

Note: Methods for collecting hunting harvest data will be available in the future on the WILDMEAT platform Toolkit section: https://www.wildmeat.org/toolkit/

Further reading

Cornélis, D., Vigneron, P. & Vanthomme, H.P.A. 2022. *Gabon: Vers une gestion durable de la chasse villageoise. Diagnostic approfondi du département de Mulundu et recommandations stratégiques.* (Gabon: Towards Sustainable Management of Village Hunting. In-depth Assessment of the Mulundu Department and Strategic Recommendations.). SWM Programme. Rome, FAO, Cirad, CIFOR and WCS. https://doi.org/10.4060/cb9765fr

Spira, C., Raveloarison, R., Cournarie, M., Strindberg, S., O'Brien, T. & Wieland, M. 2021. Assessing the prevalence of protected species consumption by rural communities in Makira Natural Park, Madagascar, through the unmatched count technique. *Conservation Science and Practice,* 3(7): e441. https://doi.org/10.1111/csp2.441

Sandrin, F. & Wilkie, D., eds. 2024. *Kuwinda Nyama: a multiplayer hunting game for social learning and sustainable use.* Rome, FAO. https://doi.org/10.4060/cc9856en

3.3. Understanding hunting space use practices

Key concepts and definitions

People who hunt, fish and gather wild resources do so in specific geographic areas. The size of these areas can be small or vast depending on the density, productivity and spatial distribution of the wild resource being exploited. These areas can be static, or they can change location during different seasons or over years (e.g. hunters abandon a place when catch rates decline and return to a place they hunted many years earlier where they hope wildlife populations have recovered). Typically, hunting areas are claimed by individuals or groups of people for their exclusive use, and they commonly defend their customary rights to these areas actively and sometimes violently.

These rights-holders should have the authority and capacity to determine who can use how much of which resources through a variety of governance processes. In many communities all members have the same rights. In other communities some members have elite privileges (e.g. village chiefs may reserve the right to hunt in certain areas and prohibit others in the community from doing so).

Why is it important to map hunting areas?

As hunters explore specific areas to locate and harvest the resources they need and value, the conservation of these resources inherently becomes a place-based endeavor. Understanding the distribution of hunting areas is crucial for grasping the scale and ecological characteristics of the landscapes that require management. This knowledge provides a foundation for developing targeted conservation strategies that address the unique needs of both the ecosystem and the people who depend on it. Mapping hunting areas offers valuable insights into the spatial dynamics of resource use. It can highlight the potential existence of shared hunting grounds, which may require collaborative management strategies among different stakeholders. Such collaborative efforts are essential in regions where resource use overlaps, and conflicts or competition may arise, necessitating clear agreements on sustainable practices and equitable access. Hunting areas, however, are not static. They shift over time due to various factors, including seasonal changes, wildlife movement pattern and environmental conditions. Additionally, current hunting areas may differ substantially

from those used in the past. Changes in land use, habitat availability, population pressures and socioeconomic factors can reshape the spatial patterns of hunting over time.

How to conduct a participatory mapping of community hunting areas?

Typically, there are two ways to map hunting areas. The first and most commonly used method is participatory mapping. This method[10] was developed by Mac Chapin and Bill Threlkeld at the Center for the Support of Native Lands in 2001. The steps to undertake a participatory mapping exercise are quite well described by the Rainforest Foundation UK[11] based on their work in Central Africa.

The second is more recent and involves tracking the movements of hunters using a GPS device that keeps a digital log of where they have been. This involves either physically accompanying a hunter or group of hunters on their hunting trips or asking hunters to wear a GPS device (see details in the example below).

Once the current hunting areas have been mapped in space and over time, they can be used to determine how many people within the community use each area and whether their frequency of use differs. The maps can also be used to ask community members which, if any, areas are used by outsiders without community permission. If these outsiders were not identified during the stakeholder analysis, they need to be added as stakeholders.



The SWM Programme in Gabon is helping local communities secure formal hunting rights over their customary lands through the existing community forest regime.

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[10] See https://www.eli.org/sites/default/files/eli-pubs/d18_23.pdf
[11] See https://www.mappingforrights.org/wp-content/uploads/2020/04/RFUK-mapping-for-rights-methodology.pdf

Example of participatory mapping of community hunting areas in the Gabon SWM Programme site, Mulundu Department, Ogooué Lolo

Context

The SWM Programme in Gabon aims to help local communities secure formal hunting rights over their customary lands through the existing community forest regime. The process to establish such a formal community forest includes a participatory mapping exercise to delineate clear boundaries and separate territories used by different communities. However, while formal boundaries are essential for legal purposes, they do not fully align with how the communities traditionally perceive and organize their territory. For them, the landscape is more about paths and camps rather than rigid territorial limits.

What did we do?

To achieve the mapping objectives, two complementary approaches have been used. The first involved a traditional participatory mapping exercise that brought together members of the target community and neighbouring communities. This was carried out in two phases: a village-level mapping to identify community spaces, followed by forest mapping with global positioning system (GPS) in collaboration with neighbouring groups. This participatory process provided useful data on the general areas currently used by hunters, but it did not offer detailed insights into individual hunting patterns.

To fill this gap, the second method involved tracking hunters with GPS devices. Starting in 2019, 234 hunters from ten rural communities within the SWM Programme area – representing 74 percent of the identified hunter population – participated in a self-monitoring initiative. Each hunter carried a GPS device during hunting trips to record his movements. Over 42 months, this method documented 5 595 hunting trips, providing more detailed information on the movement patterns of hunters within the hunting territories.

What did we learn?

The mapping of hunting areas showed that a large part of the forest in that region is not used by hunters, potentially allowing for a small-scale source dynamic to take place between hunted and non-hunted sites. It also led to the delineation of ten partner communities covering a combined area of 2 749 km^2. It clarified boundaries with neighbouring communities, revealing minimal overlap in resource use. Importantly, the establishment of boundaries did not lead to significant conflicts, suggesting it merely formalized pre-existing territorial arrangements. This outcome was critical because it laid the foundation for these territories to be officially recognized, enabling communities to secure usage rights over their lands.

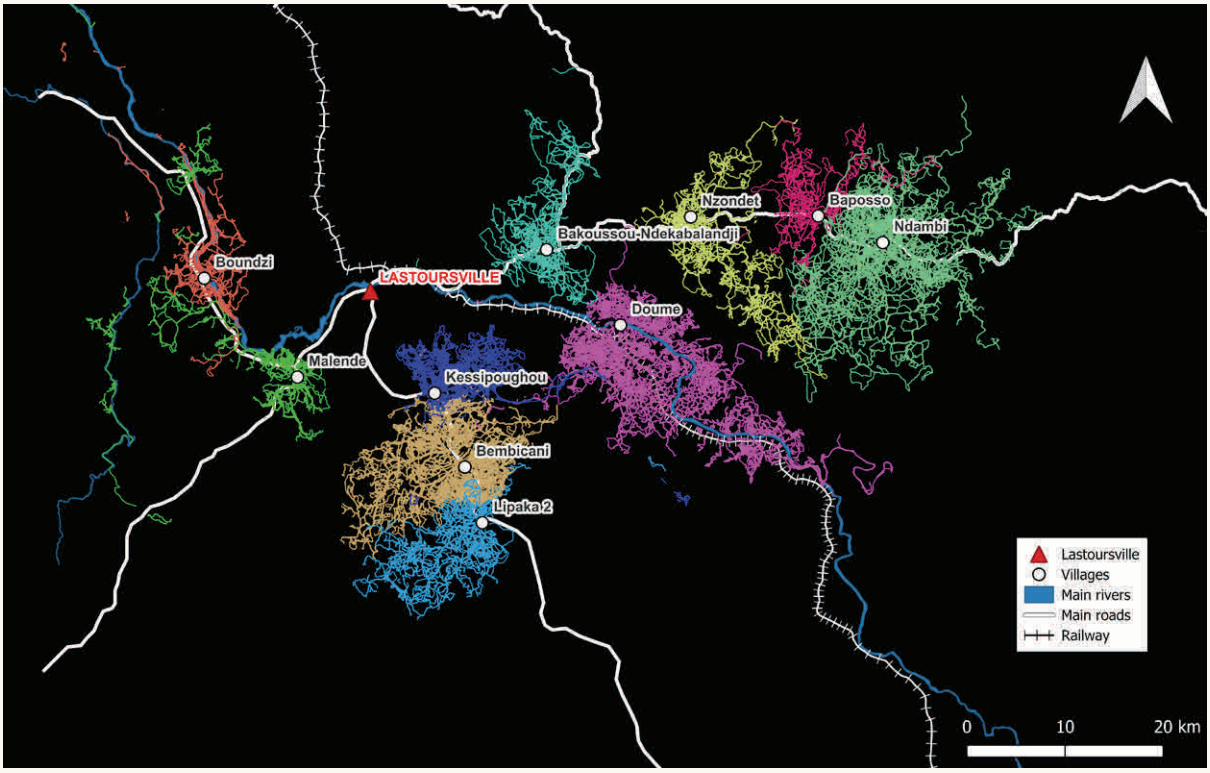
The GPS data provided valuable insights into where individual hunters were looking for wildlife and the spatial arrangement of individual hunting areas within a community. Combined with records of animals captured (see details in section 4.3), the data offered hunting indicators, such as hunting efficiency, that are useful for monitoring wildlife populations and hunting sustainability. These indicators were integrated into community management decision-making tools, enhancing their ability to manage hunting practices effectively.

How was this information useful for management decision-making?

A key lesson from the mapping process emerged during the community mapping of the Nzondé village group, where it was discovered that their territory overlapped with Moumba, a neighbouring village outside the formal group. This overlap stemmed from a historical event in which the village of Boundzoumba was displaced, with some inhabitants settling in Nzondé and others in Moumba. Despite the separation, both groups continued to hunt together, using overlapping hunting grounds. As a result, the engagement process had to be restarted, with the hunting community eventually renaming itself Boundzoumba and establishing governance mechanisms to reflect the new reality.

The mapping process revealed that administrative boundaries do not always align with how communities use their land, a crucial consideration for governance and legal recognition of management units. It also provided a clearer understanding of overlaps between community territories and areas used by economic operators, highlighting the need for mediation between these groups. The GPS data collected by hunters (and potentially other users) over time can provide tangible evidence that the areas claimed by communities are actively used and essential for their livelihoods.

Figure 3. Currently used hunting areas across the ten villages supported by the Sustainable Wildlife Management Programme in Gabon



Notes: Currently used hunting areas across the ten villages supported by the Sustainable Wildlife Management Programme in Gabon over a 42-month period (April 2019 – September 2022) and the network of paths hunters used. Tracks made by hunters from the same village were similarly coloured, showing little overlap between hunting zones.

Source: Elaborated by CIRAD. GPS data provided by hunters. 2025.

Refer to the disclaimer on page ii for the names and boundaries used in this map.

Lessons learned from the SWM Programme

- **Include neighbouring communities in boundary discussions:** When conducting participatory mapping, create space for neighbouring communities to agree or disagree with boundaries set by the rights-holding community. This fosters transparency and reduces potential conflicts.
- **Use GPS mapping to validate and understand area use:** GPS-based mapping effectively confirms boundaries agreed upon by stakeholders and reveals how hunting areas are shared among users. This information is crucial for designing fair and cooperative management strategies.
- **Ensure sampling reflects diversity and seasonal variation:** To capture an accurate picture of hunting practices, use random sampling of hunters and monitor their activities throughout the year, for example, for one or two weeks per month. This approach accounts for different hunting methods and seasonal changes.

Further reading

Chapin, M. & Threlkeld B. 2008. *Mapping Indigenous Lands, A Practical Guidebook.* Center for the Support of Native Lands. Washington, DC, Environmental Law Institute. https://www.eli.org/sites/default/files/eli-pubs/d18_23.pdf

Rainforest Foundation UK. 2015. *The Mapping for Rights Methodology: A new approach to participatory mapping in the Congo Basin.* London, Rainforest Foundation UK. https://www.mappingforrights.org/wp-content/uploads/2020/04/RFUK-mapping-for-rights-methodology.pdf

3.4. Understanding wild meat markets and value chains

Key concepts and definitions

In the context of non-timber forest products (NTFPs), a value chain refers to the full range of activities, actors, processes and relationships involved in the production, collection, transformation, distribution and consumption of these products. Most importantly, it highlights the value created, added and extracted at each stage by different actors, from the producers to the consumers. It encompasses the journey of NTFPs from their source (such as forests, agroforestry systems, or community-managed landscapes) to their end use, whether as raw materials or finished goods, while emphasizing the economic and social benefits generated along the way.

Why is it important to understand the wild meat market and value chain?

Understanding the wild meat market and value chain in the context of sustainable wildlife management is essential for addressing key questions that inform decision-making and management strategies. A value chain analysis offers insights into how wildlife products, particularly wild meat, move from their origin to end consumers. It helps uncover dynamics that influence sustainability, equity and health considerations. Market studies allow us to assess which species are being sold, their relative abundance and their respective prices.

First, it is critical to map the length of the value chain, identifying where the meat originates and its destination. Understanding the geographic flow of products can shed light on the ecological impact of sourcing and help pinpoint critical areas for conservation interventions. For instance, identifying which catchment areas contribute the most to the trade and understanding the specific species involved allows managers to target the areas or species that are under the greatest pressure.

Quantifying the volume of meat being traded and assessing the proportion of different species provides some insights into the scale of exploitation. However, this will only be a minimum volume of exploitation as trade does not account for wild meat that is hunted and consumed but not traded. Nevertheless, this data is essential to monitor trends over time. Additionally, identifying the stakeholders involved – hunters, middlemen, traders and end consumers – and understanding the power dynamics among them, reveals which groups have more influence along the chain. This information can guide efforts to ensure fairer benefit distribution and mitigate exploitative practices.

Another important consideration is whether markets and prices are driven by supply or demand. Understanding the economic drivers of the trade can highlight whether overhunting is influenced more by consumer demand or by hunter behaviour and market access. Evaluating profitability along the chain also helps determine whether the benefits are equitably distributed. Identifying who profits most – whether it's hunters, traders or retailers – can guide interventions to ensure that communities bear less of the cost while retaining greater benefits.

Opportunities to enhance benefits or add value along the value chain can also be identified through this analysis. This might include introducing sustainable hunting certifications, promoting alternative livelihoods, or improving processing and storage methods to reduce waste and increase income for local communities. Identifying barriers, such as regulatory hurdles or market inefficiencies, further helps streamline interventions to improve the functioning of the chain.

The shape of the value chain, as conceptualized by frameworks such as Phelps, Biggs and Webb, (2016), provides a structural view of how stakeholders interact and where critical nodes of influence or vulnerability exist. Identifying bottlenecks is important in trade because it is easier to regulate actors within a bottleneck rather than a diffuse set of actors. For instance, identifying where value disproportionately accumulates can inform targeted reforms to reduce inequities and inefficiencies.

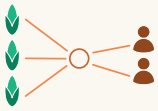
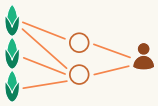
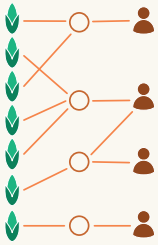
Finally, the practices used to conserve, transport and handle wild meat are crucial for both conservation and public health. Poor handling practices may increase risks of zoonotic disease transmission or foodborne illnesses. Identifying where along the chain these risks are highest allows for targeted interventions, such as promoting better hygiene standards, implementing traceability systems, or providing education to stakeholders on safe practices.



A value chain analysis offers insights into how wildlife products, particularly wild meat, move from their origins to the end consumer. Mambasa, Democratic Republic of the Congo

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Figure 4. Typology of wildlife value chains

Type of network	Illustrative architecture:	Explanation
(a) Subsistence and local use		Harvest principally for household or very local use
(b) Harvester directly to consumer		Harvesters have direct market access, usually due to geographic proximity
(c) Restricted access		Access to resources at source is limited by species distribution, required harvest technology, user group rights and/ or enforcement
(d) Gatekeeper		Access to markets is limited by a few intermediaries, potentially because of their ability to circumevent legal restrictions, access to technology or market monopolization
(e) Market space restricted		Access to markets relies on a limited number of sites or platforms (e.g. markets, internet sites)
(f) Multiple barriers to market		Access to markets is limited by multiple barriers, such as geographic distance, high enforcement and/or processing demands
(g) Redundant channels		Few barriers to participation in illegal trade exist, potentially because the resource is abundant or widely distributed, and/or enforcement is low

Harvesters
Intermediaries
Consumers

Note: The network types listed (a–g) can refer to either the structure of entire networks or to the building blocks of more complex, compound networks.

Source: Phelps, J., Biggs, D. & Webb, E.L. 2016. Tools and terms for understanding illegal wildlife trade. *Frontiers in Ecology and the Environment*, 14 (9): 479–489. https://doi.org/10.1002/fee.1325

How do we assess the wild meat market and value chain?

There are several key components to an analysis of value chains, particularly in the context of wild meat. Due to limited availability of resources and practicality, project teams usually assess only two components.

1. **Functional analysis:** This evaluates the activities of different actors (e.g. hunters, traders, consumers) in the chain, mapping interactions, technical processes, inputs and outputs at each stage.

2. **Financial analysis:** Quantifies costs, profits and monetary value at different stages of the value chain. It examines pricing mechanisms, cost structures and value added through production and distribution.

Also, other analyses can be realized, such as social analysis, environmental analysis, governance analysis, political economy analysis and sector-specific analyses. Each component may provide insights into the efficiency, sustainability and inclusivity of the value chain, offering recommendations for improvement.

When studying and monitoring wild meat markets, it is also useful to collect information on domestic protein availability and prices. This will allow for comparisons and provide insight into customer choices. If possible, it is recommended to visit the market both early and later in the day, as the offer may shift significantly - not merely in prices, but in the actual composition of products, which can change as vendors sell out and replenish their stock. Data is usually collected through simple observation or by asking the vendors questions. Data collected often included information on the different species sold, their price per quantity/unit and the state of the meat (fresh, smoked, alive, frozen).



According to value chain studies, rural consumers in remote areas of Gabon prefer consuming wild meat that they or their families have hunted.

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Example of a legal game meat value chain assessment in Zambia

Context

Game meat comes from wild animals legally hunted in the wild or on extensive ranches. In Zambia, demand for game meat, particularly in urban areas like Lusaka, exceeds supply, fueling illegal hunting in the Greater Kafue Ecosystem. To address this, Zambia is promoting legal game meat consumption and discouraging illegal activities through public awareness campaigns. The aim is to develop the legal sector to boost supply, stimulate the economy, support rural livelihoods and curb unsustainable hunting.

Challenges include administrative barriers, low awareness of procedures, and processing and marketing issues. Despite this, there are opportunities to improve sustainability, food safety and socioeconomic benefits. In 2023, the Sustainable Wildlife Management (SWM) Programme conducted a value chain study to guide policy, identifying opportunities and challenges for sustainable growth.

What did we do?

Research began with a review of literature and nine expert interviews with stakeholders from the Department of Veterinary Services, the Department of National Parks and Wildlife, non-governmental organizations and associations. These interviews explored regulations, challenges and opportunities, identifying key actors in the value chain.

This was followed by semi-structured interviews with 77 stakeholders, including 31 game ranches, 21 licensed hunters and 25 retailers, to understand practices and challenges in game meat handling and processing. Findings were validated in a workshop with key stakeholders.

What did we learn?

The legal game meat value chain in Zambia is structured with clear regulations that govern hunting, transportation and sale of game meat. Game meat comes from Game Management Areas (GMAs), unfenced private land and mainly fenced game ranches, but is also imported from Namibia and South Africa. The value chain includes producers (ranchers and hunters), transporters, retailers (butchers, grocery stores, restaurants), consumers (urban and rural) and regulators. Supporting organizations promote legal game meat consumption and sustainability.

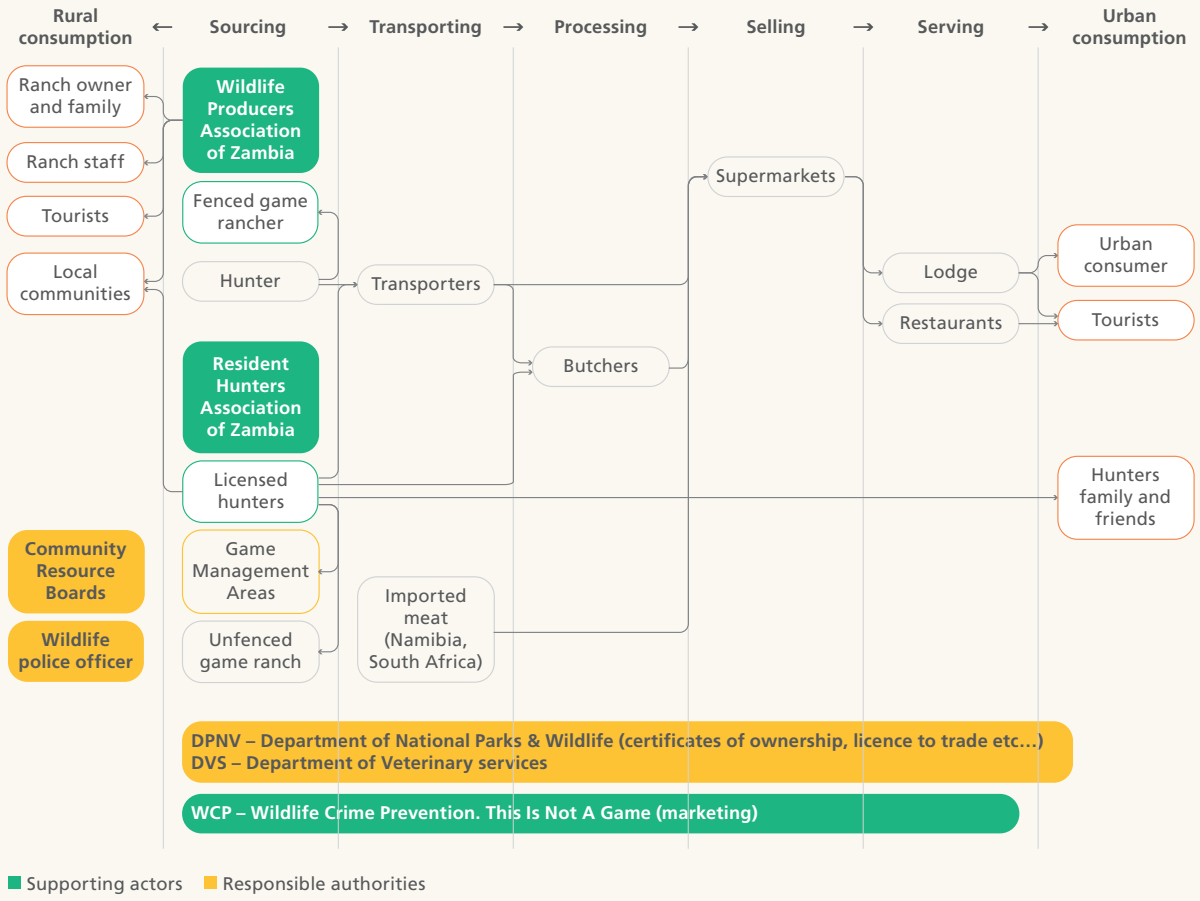
Fenced game ranches are the main source, producing 390 tonnes of meat in 2023 from species like impala, warthog and kudu. Resident hunters, limited by licences, produced 330 tonnes annually. The retail market is growing but faces supply challenges, regulatory barriers and knowledge gaps concerning game ranching and trade.

How was this information useful for management decision-making?

The study identifies key challenges in sustainability and equity in Zambia's legal game meat sector. High land costs limit broader participation, and the Wildlife Act, 2015 excludes communal ownership, restricting rural involvement. Integrating communal lands could benefit rural areas and reduce illegal hunting by creating alternative livelihoods.

Expanding wildlife ranching on private, communal and game management area lands could meet demand and support conservation. Next steps include frameworks for community participation, capacity-building in wildlife management, food safety, zoonotic disease monitoring and wildlife-based business skills.

Figure 5. Structure of the legal game meat value chain in Zambia



Source: Bersaglio, B., Enns, C., Hichoonga, E., Masse, F., Sommerville, M. & van Vliet, N. 2025. How uneven access shapes the socio-economic and environmental potential of game meat value chains: The case of legal game meat in Zambia. *People and Nature*. https://doi.org/10.1002/pan3.70021

Legal game meat in Zambia is certified by the Department of National Parks and Wildlife with this easily recognisable mark.

Lessons learned from the SWM Programme

- **Interpret market surveys with caution:** Market surveys often measure stock levels, not actual sales, and vendors may not know or disclose the origin of wildlife products. Illegal or hidden products and distant sourcing can skew results, so use these surveys carefully.
- **Understand the complex relationship between prices and hunting decisions:** Price changes do not always directly influence hunting behaviour due to labour limits, alternative incomes and unclear demand elasticities. More research is needed to fully grasp these dynamics.
- **Focus on optimizing the value chain while ensuring ecological sustainability:** A value chain analysis helps identify key opportunities to improve benefits while maintaining wildlife populations and habitats.
- **Account for seasonal and irregular financial flows:** Since costs and revenues can vary widely over time, shorten the recall period when asking about finances and capture fluctuations throughout the year to get more accurate data.
- **Collect detailed pricing data for better analysis:** Develop survey forms that capture specifics like unit of sale, price and condition of the meat (fresh, smoked, quantity) to improve data quality and clarity in reporting.
- **Include gender perspectives in the value chain analysis:** Ensure that both women and men are involved and that differences in their roles and contributions are assessed to create inclusive and accurate value chain insights.

Note: Methods for collecting wild meat market data will be available in the future on the WILDMEAT platform Toolkit section: https://www.wildmeat.org/toolkit/

Further reading

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3.5. Understanding wild meat consumption

Key concepts and definitions

Wild meat consumption refers to the use of wild animals, mostly as food. Other uses of wild animals also include medicine, social–cultural or aesthetic practices, etc. (Coad *et al.*, 2019; Ingram *et al.*, 2021). The consumption of food includes a wide range of species from small mammals, birds and reptiles to large ungulates and primates. Wild meat, also known as bushmeat, is particularly important in rural areas where it is often the primary source of protein, fat and essential micronutrients. However, in urban areas, where other sources of protein are available, it is increasingly consumed as a luxury item or for cultural reasons (Chausson *et al.*, 2019).

Why is it important to understand wild meat consumption?

Understanding the motivations for and the patterns of wild meat consumption is key to developing sustainable wildlife management strategies for multiple reasons:

- **Sustainability of wildlife resources:** Without proper management, overharvesting wildlife to meet consumption demands can lead to species decline or local extinctions, disrupting ecosystems and biodiversity. Coupled with other information such as wild meat origin, an assessment of consumption levels can provide useful insights on the sustainability of offtakes.
- **Food security:** For many Indigenous Peoples and other local communities, wild meat is not only a cultural or dietary preference but also a necessity for survival. In that case, understanding consumption helps balance wildlife conservation with food security needs.
- **Public health concerns:** The consumption of wild meat is linked to the risk of zoonotic diseases, making it important to monitor how wild animals are processed, handled and consumed.
- **Economic implications:** For many Indigenous Peoples and local communities, wild meat provides significant economic benefits, either through trade or direct consumption, highlighting the need for economic alternatives if consumption is to be reduced or better regulated in order to be sustainable.

How do we assess wild meat consumption?

Studying wild meat consumption involves addressing several key questions to understand its ecological and socioeconomic impact. These include identifying which species are consumed, the quantity and frequency of consumption, and the seasonal variations in wild meat intake. It's also crucial to understand the source of the meat, who consumes it and the reasons for its consumption, such as cultural, nutritional or economic factors. Comparing wild meat with other protein sources helps gauge its importance in the diet. Tracking trends in consumption over time and assessing health perceptions, especially regarding zoonotic risks, will further inform the study.

Methods to answer these questions are like those used to assess the harvest level.

Recall surveys: This is the type of survey we recommend when wild meat is consumed frequently and it is socially accepted. These surveys ask participants to recall their consumption over a specific time frame (often 24 or 48 hours). These surveys can be used for both rural and urban populations and adapted to the context. They can be used at the household or at the individual level. Information collected can target only wild meat consumption or also include other types of food, like domestic protein, sea fish or plant-based protein. In order to help participants estimate the quantity of protein

they consumed, it is possible to use plasticine. Participants will select the volume of plasticine that corresponds to the volume of protein they consumed. The data collector will weigh the plasticine and the estimate of the weight of the actual protein can be obtained with a conversion factor.

Home surveys: These surveys require the data collector to record the type and quantity of food brought or prepared and eaten in one household during daylight hours. This is highly labour intensive unless the data collector can observe multiple homes at once. This method does not account for food consumed by household members outside the home. Gender considerations must also be accounted for (interviewee–interviewer perceptions).

Self-reporting: Participants are asked to document daily food intake, including the types and amounts. Conducting a home survey during the first few days of a self-reporting survey can help determine if the diarist is keeping accurate records, though this offers no assurance that they will continue to do so. Providing a daily wage for keeping a diary is also no assurance of accurate record keeping.

Unmatched count technique: In some contexts, the consumption of wild meat or certain specific species for wild meat is highly illegal. For this reason (or another), people can be reluctant to admit that they consumed it. This is where the UCT can be useful as it allows for the prevalence of undesired or illegal activities to be assessed.



Understanding the motivations for and the patterns of wild meat consumption is key to developing sustainable wildlife management strategies. Kabo, the Republic of the Congo

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Example of wild meat consumption assessment in the Democratic Republic of the Congo SWM Programme site – Okapi Wildlife Reserve, Ituri

Context

Indigenous Peoples and other local communities in the Democratic Republic of the Congo consume wild meat for food, depending on their environmental, socioeconomic and cultural context. In the Okapi Wildlife Reserve (OWR), the *Institut Congolais pour la Conservation de la Nature (ICCN)* and the Wildlife Conservation Society (WCS) management team sought to understand meat consumption habits and the relative importance of wild meat in the local diets. This information is crucial for developing a strategy for conserving wildlife without jeopardizing the food security of resource-dependent populations.

What did we do?

We conducted studies to quantify animal protein consumption habits in communities living within the reserve boundary and in two nearby urban centers. These involved standardized interviews on the types and quantities of animal protein consumed by households (in rural areas) and individuals (in urban areas) the day before the interview. Where possible, the study was repeated monthly for one year with the same respondents to assess daily consumption levels, calculated according to the standardized nutritional and energy needs of an adult male equivalent (AME).

What did we learn?

The studies revealed that a significant portion of respondents (63 percent in OWR villages and 39 percent in urban centres) reported not consuming any animal protein the day before the interview. Fish, the most commonly consumed animal protein, was sourced locally or imported from lakes in the western African Rift. However, daily consumption levels varied: urban respondents consumed significantly more animal protein, especially fish and domestic meat, which were consumed at rates two and six times higher than in rural areas, respectively. Wild meat consumption was similar in both settings, with rural respondents consuming 26 g/AME/day and urban respondents consuming 22 g/AME/day. However, wild meat represented a three-times larger share of daily animal protein intake in OWR villages compared to urban centres.

How was it useful for management decision-making?

These studies found that animal protein consumption is generally limited in the OWR and surrounding areas, yet wild meat remains a key component of rural households' food security. As a result, alongside collaborating with Indigenous Peoples and other local communities on sustainable hunting management, the SWM Programme team in the Democratic Republic of the Congo prioritized projects aimed at enhancing local domestic protein supply through individual or semi-intensive poultry farming and insect farming. These initiatives aim to strengthen food security in both rural villages and urban centres, while reducing pressure on wildlife for food. Additionally, repeating the studies over time in both target and control sites will help assess the impact of these protein production efforts on local diets.

These findings also informed the project's theory of change. Initially, the project included behaviour change campaigns to reduce the demand for wild meat. However, as the studies showed that local protein needs were unmet due to limited availability, these campaigns have been postponed until animal protein production projects are successfully implemented.



The SWM Programme conducted studies to quantify animal protein consumption habits in communities living in and around the Okapi Wildlife Reserve. Democratic Republic of the Congo

© FAO/Thomas Nicolon

Lessons learned from the SWM Programme

- **Keep it simple:** Avoid long questionnaires to ensure better engagement and higher-quality responses.
- **Consider secondary data:** Use existing data when possible to reduce the need for extensive primary data collection.
- **Select appropriate interviewers:** Choose interviewers who are trusted by the community and trained in handling sensitive topics, especially related to protected species.
- **Adapt methods to sensitive data:** Use techniques like UCT to ensure accurate data collection for sensitive information.
- **Define survey objectives clearly:** Tailor the type of survey and level of detail in the survey to the specific objective (e.g. food security vs identifying species consumed) and to the local context. For example, recall surveys are more appropriate when your focus is the consumption of items that are frequently consumed and socially acceptable.
- **Adjust data collection to the focus:** For food security, collect general data on consumption frequency; for species identification, gather detailed data on the frequency per species.

Note: Methods for collecting wild meat market data will be available in the future on the WILDMEAT platform Toolkit section: https://www.wildmeat.org/toolkit/

3.6. Understanding nutritional, economic and cultural dependency

Why is it important to understand how dependent people are on wild meat?

Globally, more than one billion people rely on small-scale fisheries, wild meat and living wildlife (wild caught animals) for food, income and cultural identity. For many, these wildlife resources are basic necessities, essential to a family's daily wellbeing. For others, wild meat and body parts (e.g. skins, teeth, feathers) are a luxury, consumed or used rarely and mostly for status or prestige, to retain links to a rural past, or to participate in cultural events. For others still, wild meat and fish are only used as a last resort to provide food and income during an environmental, health or civil strife crisis.

Determining how dependent families are on wild caught animals is essential for understanding how best to ensure that efforts to halt unsustainable hunting or fishing a) do not undermine the well-being of natural resource dependent families, and b) deploy the most appropriate levers to alter unsustainable use practices.

It is extremely important to recognize that when families are dependent on wild caught animals, if the level of use is unsustainable, at some point in the future the resource they depend on will be so depleted it will no longer meet their needs in terms of food, income and cultural identity. Unsustainable use provides a short-term supply of food and income, but it is a disaster to dependent families over the long term. When the over-exploited wild animals are gone, what will dependent families eat and sell? Perhaps they could switch to another source of food and income, but most likely they will become far more food and income insecure. Moreover, when an animal becomes extinct a community cannot simply shift their cultural identity to a new species: the leopard clan cannot switch and become the genet clan.

How do we assess dependencies?

There are many questions of relevance to supporting communities to sustainably manage their natural resources. The following are questions that we have found useful to answer using targeted, lowest cost but reliable data collection:

- What proportion of people in a community-of-place produce, consume or sell wild caught animals?
- How does the dietary, income and cultural importance of wild caught animals vary for families along the value chain from producer to consumer?
- Within a hunting area, how many different categories of animal users (e.g. local communities, non-local people, government agency staff, private sector employees) are there, and how does the dietary, income and cultural importance of use vary across categories of users?
- What proportion of a family's daily protein requirements are met by the consumption of wild caught animals?

To understand the dietary, income and cultural importance of wild caught animals to families, we should conduct surveys along the value chain from producers to consumers. A stakeholder analysis (described above) will help to identify communities of practice (e.g. hunters and fishers, transporters, retailers and consumers) along the value chain that should be interviewed. It is important to remember that individuals may play more than one role along the value chain. For example, hunters can also be consumers. Transporters might also be retailers and consumers.

Card sorting

The card sorting method offers an easy, qualitative assessment of dietary and income dependence on wild-caught animals.

For dietary dependency, create a set of cards representing different types of food. Give the cards to a subject and provide instructions like:

- look through the cards and pull out all that represent the foods they have eaten in the last two days; or
- sort the cards into the order of what they most like to eat, placing cards that represent their favourite food on the top and least favourite food on the bottom.

For income dependency, create a set of cards representing different types of work (e.g. hunting, farming, teaching, market selling, transporting, taxi driving). Give the cards to a subject and ask them to:

- pull out the cards that represent the work they did during the last month;
- sort these cards according to how much time they spent on each type of work, with the cards representing the most time intensive work on the top and the least on the bottom; and
- resort to these cards based on how much money they generated from each type of work, with the most lucrative work on the top and the least on the bottom.

Quantitative methods

Quantitative methods are valuable, but not always necessary for supporting CBSWM.

To determine the role that wild animal source foods play in helping families meet their daily dietary requirements, it is essential to understand the nutritional content of various food sources (e.g. through resources such as the United States Department of Agriculture [USDA] FoodData Central). In this case, daily nutrient requirements should be assessed according to an individual's age, gender, height, weight and activity level (for which the USDA daily required intake calculator can be used). For instance, the average human requires approximately 1 gram of protein per kilogram of body weight per day. According to the USDA food composition tables, wild meat contains roughly 20 percent protein, and the waste during carcass dressing is generally no more than 40 percent of the initial weight. Based on these figures, an individual with a body weight of 60 kg would need an estimated 183 kg of undressed wildlife biomass per year to meet their annual protein requirements if wild meat were their sole protein source.

Measuring income is considerably more complex. Income is typically classified into two categories: permanent income (or wealth) and transitory income (or cash income). Wealth can be assessed more easily by asking households to identify assets from a predefined list and report how many of each item they own. This inventory of owned assets can then be converted into a total wealth value by multiplying the number of items by their current market price. The Basic Necessities Survey (BNS) manual provides a clear methodology for accurately surveying household wealth.

Determining cash income is far more challenging due to the diversity of income sources within a household, each varying in amount and frequency. Through hunting and value chain surveys, it is possible to estimate how much money households derive from wildlife-related activities. However, calculating the precise proportion of total income attributable to wildlife-related cash income is

more difficult. For instance, a household may generate income from a range of activities, such as selling coffee as a cash crop, running a small shop, engaging in seasonal wage labour, and producing and selling banana beer during local festivals. Income from coffee sales occurs once a year, while shop sales generate small amounts daily, and wage labour and banana beer production occur on an irregular basis, depending on local events.

A single recall period will not adequately capture all sources of cash income. For example, a one-year recall period would be appropriate for documenting coffee income but would be too long to capture the income from shop sales. Similarly, the irregular nature of wage labour and banana beer production makes it challenging to determine the ideal recall period for these activities.



Value chain surveys and stakeholder analysis identify key players and help estimate household income from wildlife activities. Kabo, the Congo

© FAO/Cindy Côté-Andreetti

Example of economic, nutritional and cultural dependency assessment in the Democratic Republic of the Congo SWM Programme site – Okapi Wildlife Reserve, Ituri

Context

Indigenous Peoples and other local communities in the Democratic Republic of the Congo have deep ties to natural resources, particularly wildlife, which are essential for their livelihoods, food security and cultural identity. Assessing these communities' economic, nutritional and cultural dependencies on natural resources is crucial for any project impacting their access to management of these resources. This approach helps gauge their reliance on local resources and informs the design of community-based wildlife management solutions that align with their needs and values, ensuring sustainable resource use.

What did we do?

Since 2015, the Wildlife Conservation Society (WCS) has conducted a Basic Necessities Survey (BNS) every two years in the Okapi Wildlife Reserve to assess community economic status and the impact of conservation efforts. The BNS is structured around a list of essential goods and services defined by the local communities themselves. Each participant who consents to take part in the study is asked two questions for each item on the list: a) Do you possess or have access to this item?"; and b) "Do you think every family should have it?

The survey calculates a well-being index to measure household access to locally deemed essentials and a wealth index for each household. It also includes questions on household livelihoods, the frequency of collecting and using natural resources, perceptions of conservation benefits and changes in community dynamics over time.

What did we learn?

Since 2015, the BNS has monitored the impact of projects with communities engaged in conservation activities, including those by the Sustainable Wildlife Management (SWM) Programme. Between 2019 and 2021, over 57 percent of households in SWM target villages of the OWR saw improvements in their well-being index scores. However, external challenges in the region, such as security issues, zoonotic disease outbreaks and pervasive poverty, negatively affected scores, with the OWR communities experiencing an overall score decline between 2021 and 2023. Additionally, the percentage of Bantu interviewees reporting hunting as their household's primary activity dropped from 47 percent to 28 percent between 2019 and 2021 in the SWM target villages. By 2023, 52 percent of Bantu community members reported changes in their interactions with Indigenous Peoples, indicating a shift toward greater cultural inclusion.

How was it useful for management decision-making?

This data allows OWR to identify communities with lower scores and higher hunting dependence, and to use that information for targeted projects, including sustainable livelihood initiatives and increased engagement in conservation activities. More broadly, by continuously monitoring the socioeconomic context of these communities, the OWR management can evaluate whether activities carried out as part of projects such as the SWM Programme are effectively improving community living standards and reducing hunting pressures.



The value of wild meat extends beyond dietary needs, often symbolizing wealth, status or identity. Okapi Wildlife Reserve, Democratic Republic of the Congo

© FAO/Thomas Nicolon

Lessons learned from the SWM Programme

The frequency of wild meat consumption does not always accurately reflect its importance within a community. While wild meat may be consumed infrequently, it can still play a vital role in diversifying diets, serving as a safety net during lean seasons and holding cultural significance during social events and traditions. Its value extends beyond dietary needs, often symbolizing wealth, status or identity. Therefore, evaluating the importance of wild meat requires considering its broader role in food systems and cultural practices, rather than focusing solely on the frequency of consumption.

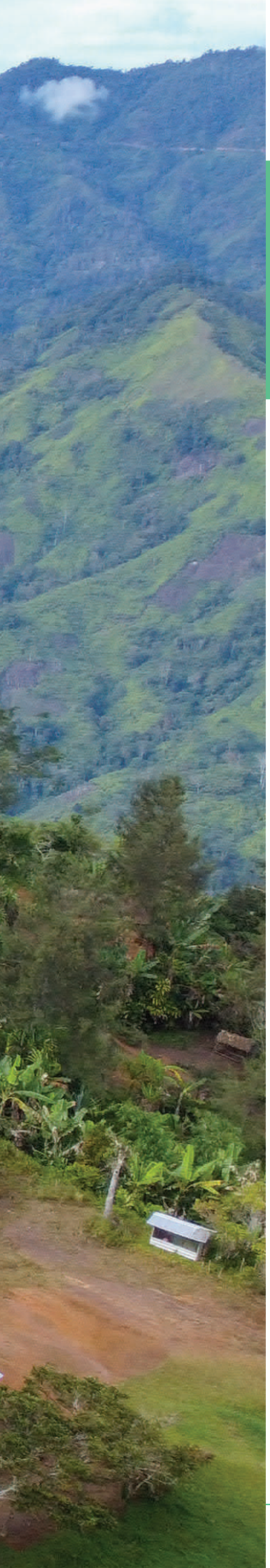
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4. KEY CONCEPTS AND METHODS FOR ECOLOGICAL SUSTAINABILITY

4.1. Concepts and definitions

What do we mean by ecological sustainability?

Wildlife populations can be considered to be at ecologically sustainable levels when the number of individuals removed does not continuously exceed annual production, meaning that each targeted species population does not decline continuously over time. Most importantly, offtake/use of wildlife should not cause the decline of a hunted population to a level where stochastic events (e.g. floods, droughts, disease outbreaks) will have a very high probability of driving the species to local extinction. In reality, the size of a wildlife population typically rises slightly above or dips slightly below the average level, based on changes in ecological conditions that influence a wild animal's food supply, shelter, breeding areas and natural predators.

Sustainable hunting is an activity that has negligible or no deep ecological effect (that does not alter ecosystem functioning and services), and is an activity that does not alter species richness, abundance or composition.

The two main anthropogenic factors that cause declines and extinction of wildlife populations are habitat degradation and loss, and unsustainable use. For wildlife populations to be managed sustainably two conditions must be met: 1) habitat extent and quality must be sufficient to meet the needs of a population that is large enough to minimize the risk that a stochastic event causes the local extinction of the species; and 2) the level of additional mortality caused by human use does not deplete the population so that it no longer fulfills its ecological roles, nor risks local extinction as a result of a stochastic event.

Sustainable use can, at times, mean no use. For example, when a culturally important species is reintroduced into an area where it was eradicated as a result of overuse, there may be too few animals to contribute meaningfully to the diet or income of

families within a community. But having these animals roaming freely within the community's territory may have enormous cultural significance, even if people are not exploiting them for food or income.

Ecological sustainability and population dynamics

Albeit simplistic compared to real-life situations, the logistic growth model, as illustrated in Figure 6, provides a powerful theoretical framework for understanding and managing hunting sustainability. It offers a simplified representation of how wildlife populations grow, respond to environmental pressures, and achieve equilibrium, which is crucial for determining sustainable harvest levels. Central to this model is the concept of carrying capacity (K), defined as the maximum population size that an environment can sustainably support over time, based on the availability of resources such as food, water and shelter, as well as pressures like predation and disease.

At its core, the model highlights the relationship between population size and growth rate, suggesting that populations have a maximum growth potential when they are around half of their carrying capacity (0.5K). This is called the maximum sustainable yield and it is the point where the population replenishes itself most rapidly, offering the highest surplus of individuals that could theoretically be harvested without compromising the long-term stability of the population. For hunting to be sustainable, the harvest rate must not exceed this surplus; otherwise, the population could decline below the threshold needed for recovery.

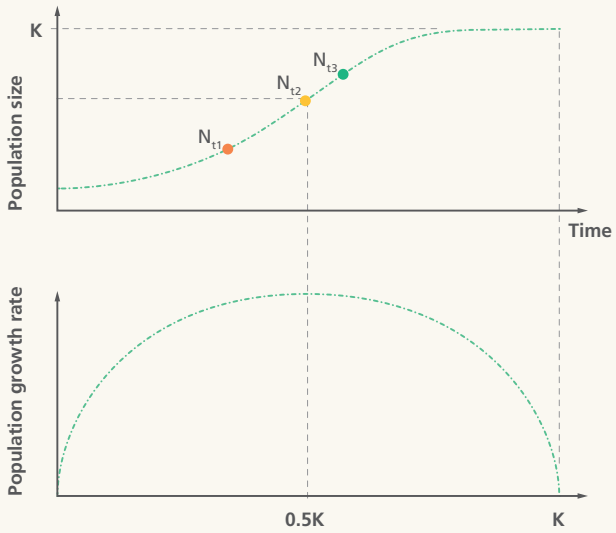
However, K is very difficult to measure in variable tropical forest environments over a short period of only a few years, where K may change in El Niño or La Niña years: most hunted taxa in the forested tropics are frugivores, and interannual fruit production can vary from almost zero to a masting event within a decade. Theoretically, if a population of animals is between 0.5K and K, and it is a species that is a common, widely dispersed taxon, it could be reduced to 0.5K if year-specific K can be measured.



Wildlife populations can be considered to be at ecologically sustainable levels when the number of individuals removed does not continuously exceed annual levels of reproduction. Namibia

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Figure 6. Logistic growth model for understanding wildlife population dynamics and approaches to harvesting



Source: Adapted from Verhulst, P. F. 1838 Notice sur la loi que la population suit dans son accroissement. Corresp. Math. Phys. A. Quetelet 10, 113–121.

Using this framework, wildlife managers can adapt offtake based on the population's current size relative to its carrying capacity. For instance, if a population is well below 0.5K (N_{t1}), hunting pressure should be minimized or halted to allow recovery. On the other hand, if the population is nearing K (N_{t2}), controlled hunting could theoretically be permitted to maintain the population around an optimal level. It all depends on the management objectives assigned to the hunting ground. If the objective is to maximize meat production, the target would theoretically be to achieve 50 percent stock density (0.5K). However, wildlife populations in the tropics experience important environmental fluctuation, so to avoid the population crashing due to stochastic events, we recommend maintaining populations fairly above 0.5K (N_{t3}). However, if the main purpose of the area is hunting tourism, the management objective will be to maximize stock density.

Moreover, this graph underscores the importance of monitoring and adaptive management. Environmental conditions and carrying capacities are not static; they can fluctuate due to habitat changes, climate variability or human activities. Thus, sustainable hunting strategies must be dynamic, regularly reassessing population sizes to adjust harvest levels accordingly.

Finally, this theoretical framework also emphasizes the risks of overharvesting, particularly when populations are pushed below critical thresholds. Once the population dips too low, recovery becomes slow, and further harvesting could lead to collapse. The model thus serves as a warning system, illustrating the fine balance between sustainable use and overexploitation.

Not all hunted species are equally susceptible to overexploitation. Animals such as elephants, tapirs and primates have slow growth, long life, highly dependent offspring and delayed reproduction. Such species tend to be rare because the habitat can only support a few large-bodied individuals, and they also tend to be slow to replace themselves. At the other end of the continuum, smaller

animals are generally short lived, with rapid growth, early reproduction, often small body size and producing many self-supporting, independent offspring.

These differences in demographic traits mean that large, slow-growing species like elephants, tapirs and primates are highly susceptible to overexploitation and require stringent hunting regulations or complete protection to ensure their survival, whereas smaller, fast-reproducing species can often sustain higher levels of hunting pressure, making them more suitable targets for sustainable harvest strategies.

The logistic growth model has several limitations, as it overlooks environmental variability, migration, interspecific interactions (such as density compensation) and source-sink dynamics. Nevertheless, its heuristic value lies in its simplicity and ability to capture the fundamental principles of population regulation. It serves as a foundational tool for understanding ecological processes and provides a starting point for more complex and nuanced investigations into population dynamics.

On a more practical note, a key question for wildlife managers is whether a particular species is being used sustainably. To answer this, they must consider the size of the hunting area and gather information on: 1) trends in the abundance and distribution of the species; and 2) trends in offtake levels. While it is possible to infer sustainable or unsustainable use from either of these approaches separately, having both provides a more reliable and comprehensive assessment. The following sections will delve deeper into these two approaches, exploring how they inform sustainable wildlife management.

4.2. Assessing sustainability by quantifying population trends over time

Why calculate abundance rather than an indicator of population size?

Many practitioners in the past have sought an easy fix to the problem of monitoring wildlife trends across space and time. Estimating absolute animal abundance uses human and material resources, and it is generally more costly (both in time and in resources) than monitoring a simpler index (often a version of an encounter rate of animals per unit effort recorded).

Unfortunately, this assumes that the relationship of animal abundance is tightly correlated to encounter rate, and it remains so over time – essentially, it demands a leap of faith. According to Milner-Gulland and Rowcliffe (2007), "the less direct the approach to understanding the current status of a population is, the more assumptions are required, and the more risk arises of being incorrect in the sustainability assessment". Trends in simpler indices do not always reflect actual trends in abundance and may even go in the opposite direction (Parsons *et al.*, 2017). A steep decline in actual abundance may not show up in the indicator until the prey population is severely depleted. This is mostly because the detectability of the animals or objects of interest are unknown in encounter rate studies, and thus it is not known what proportion of the population is missed each time a survey is undertaken, nor how this proportion varies over time – by season, by changes in hunting pressure that may change the behaviour of the target species, by vegetation type or by other factors.

The second issue with using a relative abundance indicator rather than absolute abundance is that the starting state of the prey population is unknown. It may be close to carrying capacity, or it may already be quite depleted. If a population is quite depleted, with stochastic deaths and births, the population may quickly drop below the minimum viable population size and become locally extirpated.

Occupancy is a method that includes detectability and is more reliable than the use of simple encounter rates/ photographic rates and the like. However, trends in density are sometimes not mirrored by trends in occupancy and, like encounter rates, can even go in the opposite direction (Parsons *et al.*, 2017; Sollmann *et al.*, 2013).

Although it is always tempting for time and resource-saving reasons, we caution against using relative abundance indicators to track wildlife populations.

Distance sampling along line transects (either on foot, in a vehicle or from an aircraft) is a wildlife assessment method that has been used successfully across a large variety of species and habitats to estimate density and abundance (Buckland *et al.*, 2001, 2015). In forest habitats, the transects are generally walked, and in savanna areas, are often flown (using planes, helicopters or drones). Foot line transect surveys are necessarily slower than aerial line transect surveys, but both estimate the density of animals across large landscapes efficiently. Distance sampling involves walking or flying a series of transects, systematically recording and measuring the perpendicular distances of all wildlife seen from the transect line. These distances are subsequently used to calculate the detection probability of each species, giving the proportion of animals missed during the survey and allowing one to estimate absolute density within the area of interest. Densities are then multiplied by the total surface area of the surveyed site to give the estimated total population size



During the first phase of the RESSOURCE Project more than 150 professionals from national administrations and local communities were trained in waterbird identification and counting techniques. Senegal

© FAO/Bruno Portier

(absolute abundance). The survey design must be representative of the area to be surveyed, it must have sufficient sampling units (transects) to provide a robust estimate of density, usually around 30 lines per survey stratum, and the lines are best systematically placed across the area of interest with a random start point. This method is used both for direct observations of animals (monkeys, all savanna animals, birds) or their sign (usually dung or great ape nests). A long-established (and free) distance software for both the design and analysis of distance sampling surveys is used for this (Thomas *et al.*, 2010).

Line transects within forest habitats often rely on two factors to convert the density of objects seen (dung, nests) to animal density: the creation and degradation rates of the proxy object (number of objects created per day, and number of days during which the object decays to become "invisible" from a transect). The latter factor – decay rate – is highly variable across time and space, and generally cannot be obtained for ungulates due to cost constraints, for which the highest variability in decay rates occur. Ungulates are generally one of the commonest hunted species across the world. Unless a site- and time-specific retrospective decay rate study (Laing *et al.*, 2003) is carried out for every single study, for every single species of interest, the density of ungulate dung in tropical forests is almost meaningless as a metric for following trends in animal abundance.

The use of point transects, where a camera trap replaces the human observer at each point, obviates the need for creation and decay rate studies. This method is known as camera trap distance sampling (Cappelle *et al.*, 2019, 2021; Howe *et al.*, 2017 2019) and is a version of point transect distance sampling, which is typically used for estimating bird density or in rugged terrain. Just like for line transects, a systematic survey design with a random start point is created across the entire area of interest, ensuring that there are sufficient replicates (usually around 75–100 points). Camera traps are placed at each point and are deliberately all oriented in the same direction, in order to avoid the bias created by orienting them towards features that might attract animals and cause an overestimation of the species population density. The videos created by animals triggering each camera trap over a period of weeks or months are then used as the data source. As for line transects, the distances between each animal detected and the observer (camera trap) are measured post hoc, and these, and other metrics are used to calculate the detection probabilities and estimate animal density and hence absolute abundance, as above.

Some savanna areas still rely on strip transects flown across the area of interest (Systematic Reconnaissance Flights [SRF]: Norton-Griffiths, 1978), but these do not take detectability into account (animals tend to be less visible at increasing distances from the plane, even though these strips are fairly narrow) and thus systematically underestimate animal density (especially smaller species in less open habitat). Human observers also tend to miss smaller species rather than larger species, from an aircraft. A version of SRF using oblique cameras is now applied in some Eastern African sites, where the resulting videos are carefully examined either by humans after the flight, or by using machine learning, to count the animals within each strip (Delplanque *et al.*, 2023, 2024; Lamprey *et al.*, 2020a, 2020b; Wu *et al.*, 2023).

How do we use population data to assess the status of wildlife?

Adaptive hunting management relies on long-term wildlife monitoring to track population trends in order to guide decision-making. In this context, initial surveys provide a first baseline of the status of wildlife within the hunting area, which can be used as the basis for management guidelines. As we saw above, the assessment of the status of a hunted species is based on the current size of the population relative to its carrying capacity.

The concept of carrying capacity originated in cattle ranching and was later adapted to wildlife management in savanna areas in Africa and in boreal habitats in the north (e.g. Mentis and Duke 1976; Hobbs and Swift, 1985; Potvin and Huot, 1983). Assessing carrying capacity involves a combination of forage, water and animal-based approaches. Forage assessments focus on measuring biomass production and plant quality through field surveys and remote sensing. Water availability, especially crucial during dry seasons, is assessed by monitoring waterholes and analysing water distribution in relation to the water dependency of different wildlife species. In this context, population data can provide insights into the balance between wildlife densities and available resources, helping to determine whether current populations are within sustainable limits or if overgrazing and resource depletion are occurring.

For closed habitats like dense rainforests, little is known about the carrying capacity of various species or how it fluctuates over time. These ecosystems feature high biodiversity, intricate food webs and dense vegetation, making it difficult to observe and quantify wildlife populations and resource availability. Additionally, factors like limited accessibility, lack of long-term data, and the influence of subtle (or strong) environmental changes further complicate the assessment of carrying capacity and its fluctuations over time. In this context, assessing the carrying capacity – and thus the status of a hunted species – relies on population estimates from non-hunted control areas, where populations are assumed to be at their maximum capacity (K). These control areas should match hunted areas in size, habitat composition and environmental conditions to ensure comparability. However, identifying true control areas can often be challenging, due to the difficulty of finding untouched ecosystems. Alternatively, control zones can target areas known to have very low hunting pressure (Fonteyn *et al*., 2024).

Examples of hunted wildlife populations assessment for sustainable use

Example 1. Waterbird stock in Lake Fitri (Chad)

Context

As mentioned in the harvest assessment example in section 4.2, the RESSOURCE Project has begun addressing the knowledge gap regarding the sustainability of migratory waterbirds exploitation. To inform sustainability models (Carenton *et al.*, 2024), harvest estimates must be combined with waterbirds population size estimates. The RESSOURCE Project conducted such monitoring at Lake Fitri in central Chad. Again, the large size of Sahelian wetlands present specific challenges for waterbirds population surveys, necessitating a tailored methodology.

What did we do?

In large wetlands like Lake Fitri, road access is often limited, and the terrain is extremely slow, rough and shallow, with dense vegetation hindering both terrestrial and boat surveys. As a result, the only viable option is aerial surveys with planes, as drones are not yet cost-effective or equipped to cover such vast areas. Several aerial surveys of waterbirds at Lake Fitri were conducted between the 1980s and 2008 (Jarry and Roux, 1987; Trolliet *et al*., 2008). These surveys all used a total count method, flying low over the entire wetland, which had several drawbacks: risk of air-sickness, potential for double-counting, missing areas, and uncertainty in detectability and final estimate. The RESSOURCE Project used aerial distance sampling, based on transects (cf. map.) flown straight at 90 m above ground level with one observer on each side of the aircraft. The total transects area was divided into four distance bands materialized by streamers fixed on the aircraft's wing struts. Observers recorded counts in each band on a digital sound recorder, and final models extrapolated density estimates from the bands to the entire wetland area (Ducros *et al.*, 2023).

What did we learn?

This methodology, applied for the first time in the Sahel at Lake Fitri accounted for detection biases, and it produced a record estimate of 700 000 (+/– 80 000) waterbirds – far exceeding previous estimates. This ranks Lake Fitri as the third most important Sahelian wetland ever surveyed for waterbirds.

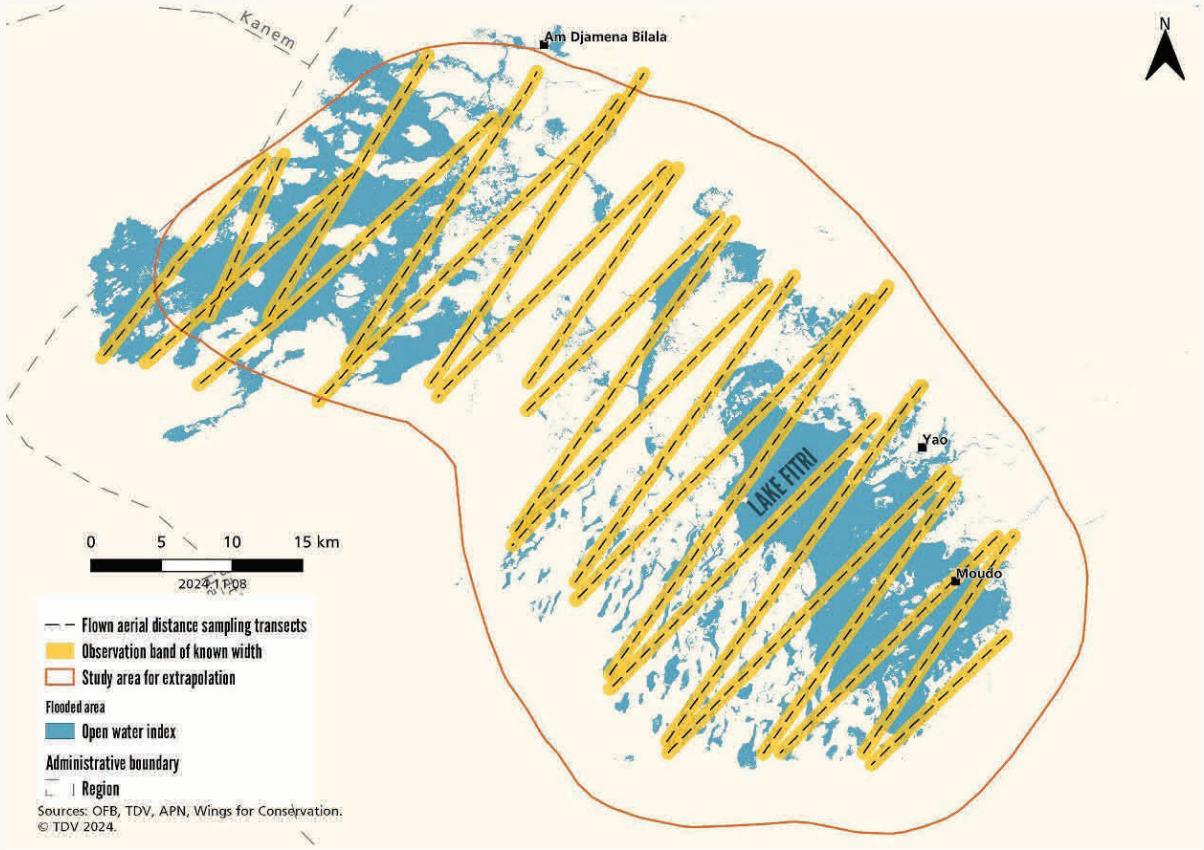
How was this information useful for management?

Because population of migratory waterbirds cannot be managed at the site level, waterbird census data, whether or not collected with the support of the RESSOURCE Project, are shared by national responsible authorities with Wetlands International, which oversees the International Waterbird Census (IWC).* This database, part of a global monitoring programme that conducts annual synchronized counts of all waterbird species, provides critical information to support international policy frameworks, including the Agreement on the Conservation of African–Eurasian Migratory Waterbirds (AEWA) and the Ramsar Convention. This enables the assessment of waterbird population sizes and trends, providing species-specific guidance for management decisions on a global scale. For further information, see the IWC, AEWA and Ramsar.**

Notes: *See https://iwc.wetlands.org/; **See https://iwc.wetlands.org/index.php/aewatrends8; https://www.unep-aewa.org/; and https://www.ramsar.org/

Sources: Carenton, N., Defos du Rau, P., Wachoum, A.S., Ducros, D., Suet, M., Deschamps, C., Betoloum, M.R., *et al.* 2024. Migration of humans fleeing conflict in the Lake Chad region may increase pressures on natural resources in Lake Fitri (Chad): A case study on waterbirds. Journal of Applied Ecology, 61(9): 2231–2243. https://doi.org/10.1111/1365-2664.14700; Jarry, G. & Roux, F. 1987. Importance, composition et distribution des populations d'anatides presentes en hiver dans l'Ouest Africain tropical. (Importance, composition and distribution of wintering anatidae populations in tropical West Africa). La Revue d'Écologie (La Terre et La Vie), 205–219; Trolliet, B., Girard, O., Benmergui, M., Schricke, V., Boutin, J., Fouquet, M. & Triplet, P. 2008. Oiseaux d'eau en Afrique subsaharienne: Bilan des denombrements de janvier 2007. (Waterbirds in sub-Saharan Africa: Summary of the January 2007 counts). Faune Sauvage, 279: 4–11; Ducros, D., Devillers, R., Messager, A., Suet, M., Wachoum, A.S., Deschamps, C., Breme, B.M., *et al.* 2023. Planning from scratch: A new modelling approach for designing protected areas in remote, data-poor regions. Journal of Applied Ecology, 60 (9): 2018–2030. https://doi.org/10.1111/1365-2664.14470.

Figure 7. Distance sampling design of the aerial waterbird surveys conducted at Lake Fitri by the RESSOURCE Project since 2018



Source: Shapefiles provided by the French Office for Biodiversity, Tour du Valat, African Parks Network and Wings for Conservation. 2024. Refer to the disclaimer on page ii for the names and boundaries used in this map.

Example 2. Assessing densities of hunted terrestrial mammals in the northen Republic of the Congo

Context

One of the largest remaining tracts of intact rainforest with functional densities of wildlife in Africa is found in the northen Republic of the Congo, which provides local rural communities with protein and many other resources essential for their lives. The SWM Programme site is located in the catchment area for wild meat that is sent to the town of Ouésso. It comprises several logging concessions (some Forest Stewardship Council- [FSC] certified, and some non-FSC-certified). In these concessions, community hunting zones (CHZ) have been delimited. The Kabo CHZ is in a certified concession (certified between 2008 and 2010), while the Makao CHZ is in a non-certified concession; both have similar human population sizes. The main difference in terms of wildlife management between these two concessions is that hunting laws and management rules are being enforced only in the certified concession. In this precise example, the team did not compare the Kabo CHZ with a pristine environment but rather tried to assess the impact of wildlife management in a certified versus a non-certified concession.

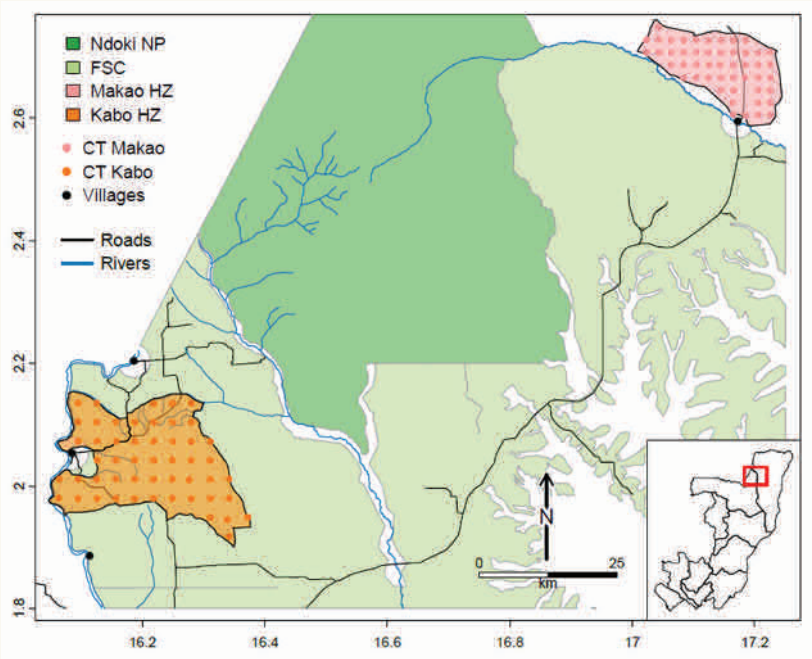
What did we do?

The SWM Programme focuses on evaluating the effectiveness of existing and proposed wildlife management strategies related to hunting to create a sustainable hunting management system. Monitoring the density and distribution of the hunted wildlife species is key, starting with a baseline from which to measure subsequent changes. This can reveal whether local populations of hunted species are stable or increasing. We used camera trap distance sampling to estimate baseline densities of frequently hunted species in Kabo and Makao CHZs in which a systematic random point transect design was generated (Figure 8). Cameras were active 24 hours/day between February and April 2021 in Kabo, and between November and December 2021 in Makao. Density estimates were obtained for eight of the most hunted species.

What did we learn?

This study provided the first absolute estimates of density for multiple hunted species in the region, including previously unknown, highly valuable information on the status of key species. Three of the four duiker species occurred at statistically significant higher densities in the managed CHZ (Kabo) than the unmanaged CHZ (Makao): these were blue, Peters' and yellow-backed duikers. Bay duiker density was roughly the same in both. Water chevrotain was not recorded at all in Makao. African brush-tailed porcupine was more abundant in the non-managed CHZ than in the managed one; a possible explanation could be competitive release, as duiker populations were greatly reduced in the non-managed area.

Figure 8. Location of Kabo and Makao CHZ and of our camera trap sampling designs in the northern Republic of the Congo



Note: The Nouabalé-Ndoki National Park and the FSC-certified logging concessions are also shown.

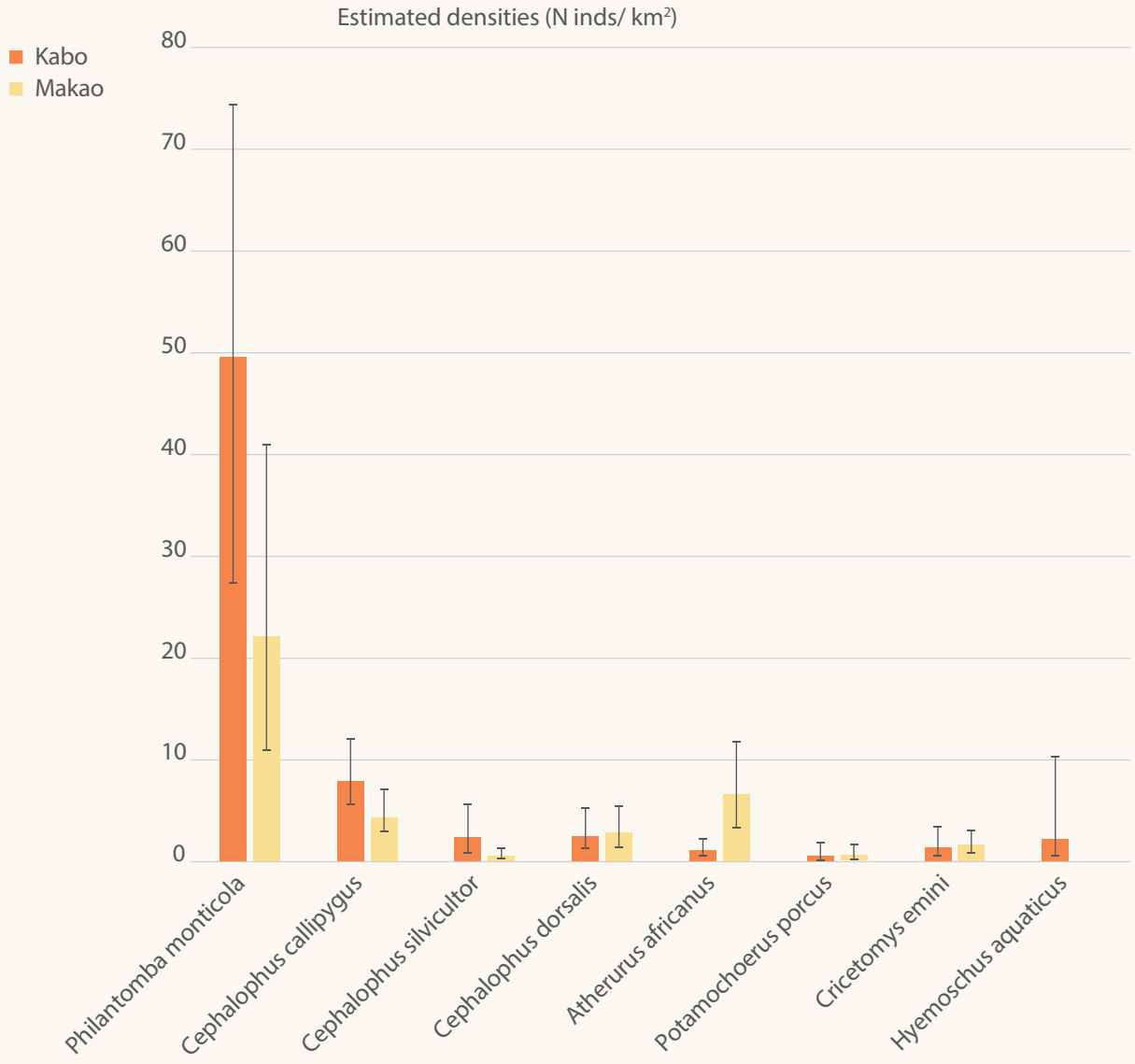
Source: Wildlife Conservation Society shapefiles. 2025. Based on UN Geospatial. 2022. Map of Africa. [Cited 11 February 2026]. https://www.un.org/geospatial/

Refer to the disclaimer on page ii for the names and boundaries used in this map.

How was this information useful for management?

Because the three most intensively hunted duiker species (together comprising over 50 percent of hunted individuals) had significantly lower estimated densities in the unregulated hunting zone of Makao, we conclude that regulated hunting and appropriate law enforcement efforts sustains a higher availability of hunted species for local communities. Long-term, regular monitoring of these zones will allow adaptive management of wildlife populations and inform sustainable hunting regulations.

Figure 9. Estimated densities (number of individuals/km²) of target species in the two study areas



Source: Authors' own elaboration

Lessons learned from the SWM Programme

- **Pilot and standardize your methods before scaling up:** Pilot studies are essential to determine optimal camera density and settings, ensuring data is precise enough for management. Standardizing protocols, such as trap placement and detection zones, are also critical to allow for comparability across sites and over time.
- **Reduce data-processing burdens with automation:** Processing camera trap data, especially species identification and distance measurements, can be time consuming. Fortunately, machine learning tools are becoming available to automate these tasks, saving time and resources.
- **Leverage remote sensing for broader and more efficient coverage in bird surveys:** Remote sensing, when combined with simple statistical modelling, offers a cost-effective approach to improving sampling for waterbird and wetland monitoring in under-surveyed regions. New efforts are also exploring artificial intelligence to identify waterbirds directly from drone, aerial or satellite imagery, which could further enhance efficiency at scale.
- **Be realistic about complexity and community use:** Camera trap distance sampling is a complex method that requires specialized expertise and can be expensive. While training and simplified tools may increase accessibility, this method is generally not suitable for use by Indigenous Peoples and local communities on their own without external support. Training local teams in deployment, maintenance and basic analysis ensures long-term success and local ownership of monitoring systems. Even simple, regular monitoring conducted by communities can be effective and helps maintain traditional knowledge and connection to place.

Further reading

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4.3. Assessing sustainability using harvest data

Why use harvest data?

Harvest data is a valuable tool for evaluating the sustainability of hunting practices. Population estimates are often difficult to obtain due to the high cost and technical requirements of advanced monitoring methods. In contrast, harvest data can provide critical insights into the degree of wildlife population alteration, offering practical indicators of hunting sustainability. These indicators simplify the monitoring process, making it more accessible and easier for local communities to adopt and implement as part of their wildlife management efforts.

How do we use harvest data?

Throughout history, humans have prioritized hunting species that offer the highest capture value relative to effort. According to optimal foraging theory hunters typically prefer larger-bodied species when they are available and within their technological reach, and only start hunting smaller-bodied species, when larger-bodied species become scarce - a pattern known as "hunting down the size classes. This practice significantly alters key characteristics of the harvested populations and affects the economics of hunting. Three notable changes typically occur:

- the catch per unit effort (CPUE), that is how many animals (or kilograms of animals) a hunter catches on average for a given effort, declines over time;
- species composition shifts toward smaller-bodied species; and
- the mean body mass of the catches (all species combined) decreases.

In other words, a continuous decrease in the average body size of captured individuals, coupled with a shift in species composition toward smaller-bodied species, serves as a potential warning sign of overexploitation. Specifically, a consistent decline in one or more of these indicators may signal an unsustainable hunting system where population estimates concomitantly show that stock density is less than 0.5K.

CPUE requires careful consideration to ensure accurate use. If hunting methods and areas remain constant, a decline in CPUE suggests that hunters are spending more effort (time or travelling more distance) to encounter animals, likely due to game population declines. Accurate CPUE calculation requires knowing both the effort (time spent or distance travelled hunting) and the quantity of wild meat harvested per trip. However, estimating hunting effort can be difficult when hunting occurs opportunistically, such as when travelling to fields or when hunters establish camps in the forest for various days. Therefore, CPUE is best applied when hunting is a deliberate activity, a one-day activity and the hunter's primary focus.

As with population estimates, these three indicators of hunting sustainability are most useful when monitored over a number of years, allowing trends to emerge. In the specific case of initial monitoring, or during the first few iterations, their informative value is rather limited. Therefore, a space-for-time approach may be recommended, i.e. comparing these indicators simultaneously in different hunting grounds. Ordering such indicators makes it possible to classify hunting areas according to a degradation gradient, which serves as a basis for initial management recommendations (Fonteyn *et al.*, 2024).

Example of using harvest data in Gabon

Context

In the Sustainable Wildlife Management (SWM) Programme Gabon site, where about 300 hunters from 10 communities engaged voluntarily in monitoring their offtake, more than 14 000 hunting trips were recorded between 2019 and 2023, totalling 18 500 individual animals hunted.

What did we do?

The data was used by the SWM Programme teams to produce dashboards, which were used by the communities to inform their hunting management plan. These data, together with data from camera traps, were also used for research purposes to identify the simplest and most robust indicators to enable communities to carry out this monitoring independently.

What did we learn?

The results of this work showed that two indicators were particularly correlated with the degree of faunal alteration in the intervention area in Gabon: the average body mass of the animals sampled, and the ratio of rodents to ungulates (Fonteyn *et al.*, 2024).

How was this information useful for management?

In addition to this intensive offtake monitoring system, the programme installed boards in strategic points in each village to allow hunters to document directly their offtake voluntarily. These easily accessible boards collected data on the animals collected by hunters, the number of completed hunting trips and the hunter's identification number. Using this data collection system, communities were able to derive simple indicators of the status of game species and use it to inform their management decisions.

Source: Fonteyn, D., Fayolle, A., Fa, J.E., Vanthomme, H., Vigneron, P., Vermeulen, C., Malignat, R., *et al.* 2024. Hunting indicators for community-led wildlife management in tropical Africa. Npj Biodiversity, 3:15. https://doi.org/10.1038/s44185-024-00048-4.



Three-hundred hunters from 10 communities engaged voluntarily in monitoring their offtake in Mulundu Department, Gabon.

© FAO/Marco Gandolfo

Lessons learned from the SWM Programme

- **Use harvest indicators as practical proxies for wildlife monitoring:** Although less precise than direct wildlife density estimates, harvest-based indicators are promising, robust and low-tech tools for assessing species status and the sustainability of hunting systems. When interpreted alongside population estimates, they offer a practical solution for adaptive management.
- **Build shared understanding through collaborative indicator use:** In community-managed hunting systems, harvest indicators help establish a shared understanding between hunters and technical teams. This foundation is critical for setting realistic and mutually agreed-upon management objectives.
- **Ensure regular feedback to foster engagement and learning:** Frequent reporting of monitoring results, such as quarterly updates, promotes community dialogue, stimulates collective reflection, and encourages peer learning and emulation around sustainable hunting practices.
- **Recognize hunter-led monitoring as a sign of true ownership:** The voluntary, ongoing participation of hunters in monitoring efforts reflects their ownership of the management process and can serve as an indicator of governance maturity and community commitment.

Further reading

Fonteyn, D., Fayolle, A., Fa, J.E., Vanthomme, H., Vigneron, P., Vermeulen, C., Malignat, R., *et al.* 2024. Hunting indicators for community-led wildlife management in tropical Africa. *npj Biodiversity,* 3:15. https://doi.org/10.1038/s44185-024-00048-4

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4.4. Understanding habitat quality and other factors influencing wildlife productivity

Why analyse habitat quality in the context of wildlife management?

Understanding the availability, quality and dynamics within a habitat is critical in wildlife management, especially when the focus is to enhance wildlife productivity. Habitat quality refers to its ability to meet the vital needs of wildlife, i.e. feeding, reproduction and protection, while also ensuring sufficient and accessible space to maintain viable populations. Habitat quality affects the overall productivity of wildlife, directly influencing species diversity, population density and distribution.

Agricultural expansion, particularly in tropical and subtropical regions, is a leading cause of habitat fragmentation. Additional threats, including mining, logging and infrastructure development, further compromise habitat quality. Climate change – both human-induced and natural – exacerbates these challenges by intensifying land-use pressures and increasing the frequency and severity of wildfires, floods and droughts. Assessing habitat quality and its threats is vital for identifying environmental changes and their underlying drivers. Habitat degradation results in blocked migratory corridors, lesser availability of food and shelter and diminished species diversity, and it is recognized as a primary driver of zoonotic risks and human–wildlife conflicts, highlighting the interconnectedness of habitats and wildlife. The absence of a broader understanding of the factors that influence habitat quality within the management area may lead to hunting management approaches that could be undermined by irreversible changes in habitat availability and quality.

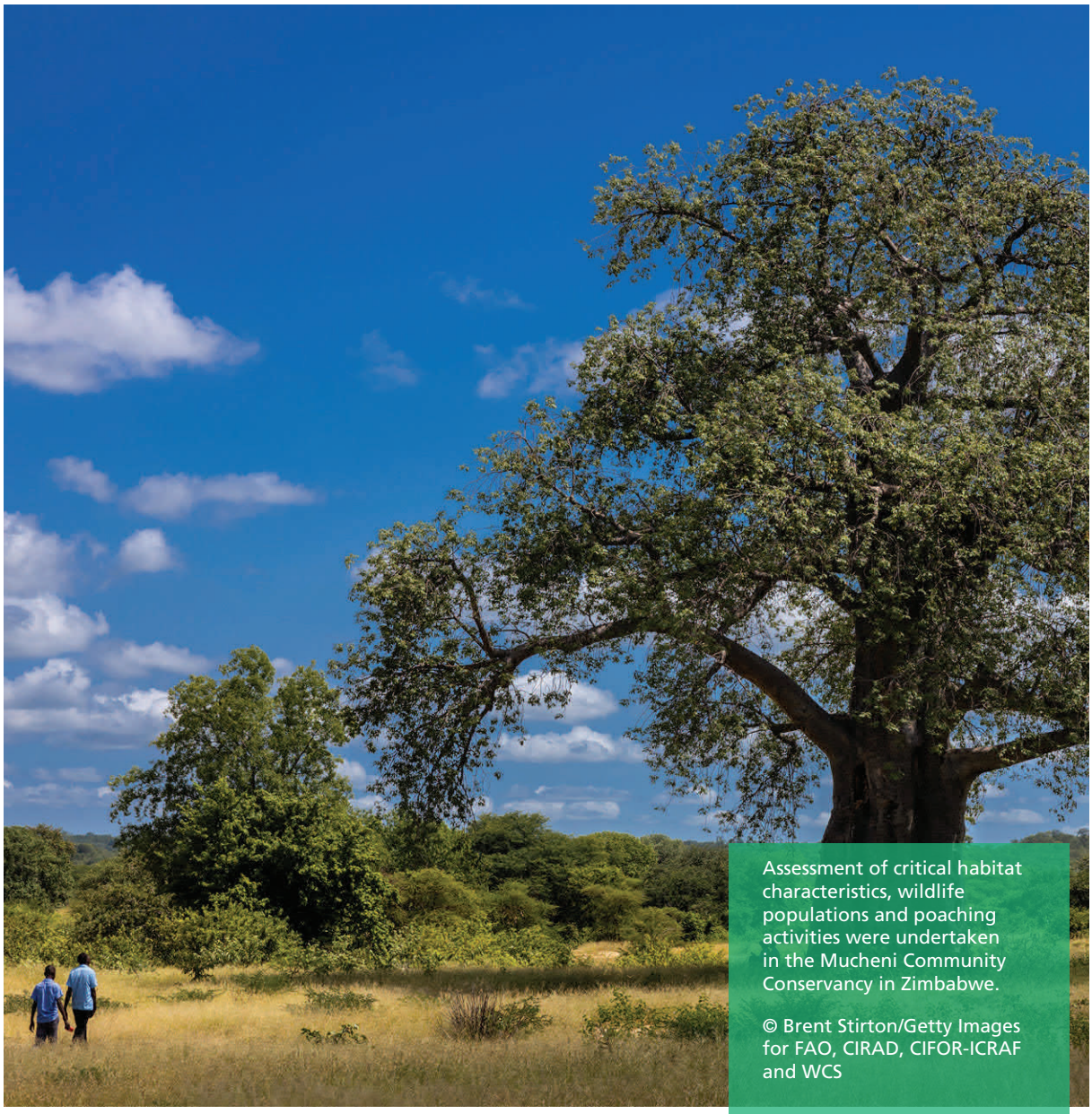
How to analyse habitat quality?

Habitat quality can be assessed in different ways depending on the data needs and contexts. The option often used in contexts where rewilding is a primary focus for management, is to resort to a comprehensive ecological assessment, which involves a systematic process to gather, analyse and interpret ecological data that informs decisions aimed at sustaining and enhancing wildlife populations and their habitats. In ecological assessments, stakeholder input and data gathering is integral to the process. Baseline data collection involves a comprehensive inventory of wildlife and habitat characteristics, including land cover types, vegetation composition and water sources. Abiotic conditions, such as soil quality and water availability, are also measured to understand the physical and chemical environment. It involves mapping land cover and vegetation using tools like remote sensing and a geographic information system (GIS), evaluating the availability of essential resources such as food, water and shelter, and analysing the connectivity of the landscape to identify migratory routes or wildlife corridors. These factors collectively determine the habitat's ability to support wildlife populations sustainably. The assessment must also identify threats to wildlife and habitats. Human activities, such as agriculture, logging, mining and infrastructure development, are evaluated for their impacts on habitat fragmentation and degradation. The assessment should also identify the presence of invasive species that can affect ecosystem balance. Climate change effects, including shifts in habitat conditions and increased frequency of extreme events, are analysed. Areas of human–wildlife conflict are mapped, and their socioeconomic implications are studied to inform conflict mitigation strategies. Interactions within the ecosystem are analysed to understand the balance between species and their environment. Predator–prey dynamics, the health status of populations and the risks of zoonotic diseases are assessed to provide a holistic understanding of ecological processes.

If a comprehensive ecological assessment is not deemed necessary, at a minimum the analysis should focus on identifying and understanding the main drivers that influence habitat quality and wildlife productivity in the management area. Depending on the context, these main threats range from, for example, deforestation, fires, contamination and the impact of infrastructure such as roads. The assessment of habitat quality characteristics and main threats can also be done based on expert or local knowledge, using tools such as participatory mapping and ranking exercises.

How do we use ecological assessment results?

Data on habitat quality can be used to develop practical recommendations for wildlife management, including strategies for habitat restoration, development of water access points in key areas, management of fires, reduction of anthropogenic pressures through sustainable land-use practices and enhancing habitat connectivity by protecting corridors.



Assessment of critical habitat characteristics, wildlife populations and poaching activities were undertaken in the Mucheni Community Conservancy in Zimbabwe.

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Example of an ecological assessment in the Mucheni Conservancy (Zimbabwe)

Context

The Kavango Zambezi Transfrontier Conservation area is home to diverse ecosystems and landscapes. Each year, the area experiences large-scale migrations of megafauna. Rural communities in the Mucheni Community Conservancy in Zimbabwe depend on hunting and fishing for both food and income. However, the communities' livelihoods are threatened by erratic rainfall, poor soils and human–wildlife conflicts. In this context, an assessment of critical habitat characteristics was conducted to complement information on wildlife populations and poaching activities. This assessment was used to inform management decisions, particularly regarding the management of corridors.

What did we do?

The assessment of habitat quality focused primarily on identifying wildlife corridors through a participatory mapping approach that involved a game-based methodology. Using wood-made features representing, for example, different species, rivers and vegetation types, community members were invited to map key wildlife corridors used by species such as elephants, common duikers, zebras, impalas and kudus. The mapping exercise also led participants to map current land uses (crop areas, settlements, grazing areas, water holes) and identify possible areas of human–wildlife conflicts in corridor areas. Wildlife censuses, conducted through terrestrial line transects and camera trap surveys, complemented corridor identification efforts by providing a comprehensive picture of wildlife populations and their distribution within the conservancy.

What did we learn?

Our study enabled the identification and geographical delineation of grazing areas, water points utilized by wildlife and human settlement zones within the corridors. Seasonal water scarcity and the occupation of wildlife corridors by human settlements were identified as major barriers to wildlife movement. These corridors are paramount for wildlife restoration in Mucheni since they connect the Mucheni Conservancy to neighbouring protected areas like Chizarira National Park, Chete Safari Area and Sijarira Forest, facilitating species movement and promoting genetic diversity.

How was this information useful for management?

This understanding underscored the importance of managing wildlife corridors to ensure access to resources by wildlife and people, and to maintain ecosystem connectivity by establishing, for example, bore holes in key corridor areas. It also provided information on the likelihood of the Mucheni Conservancy being rewilded naturally through the functional corridors or whether there was a need to translocate some species. The information was also critical for mapping human–wildlife conflicts in wildlife corridors and developing mitigation strategies, including through land use planning for crop production.



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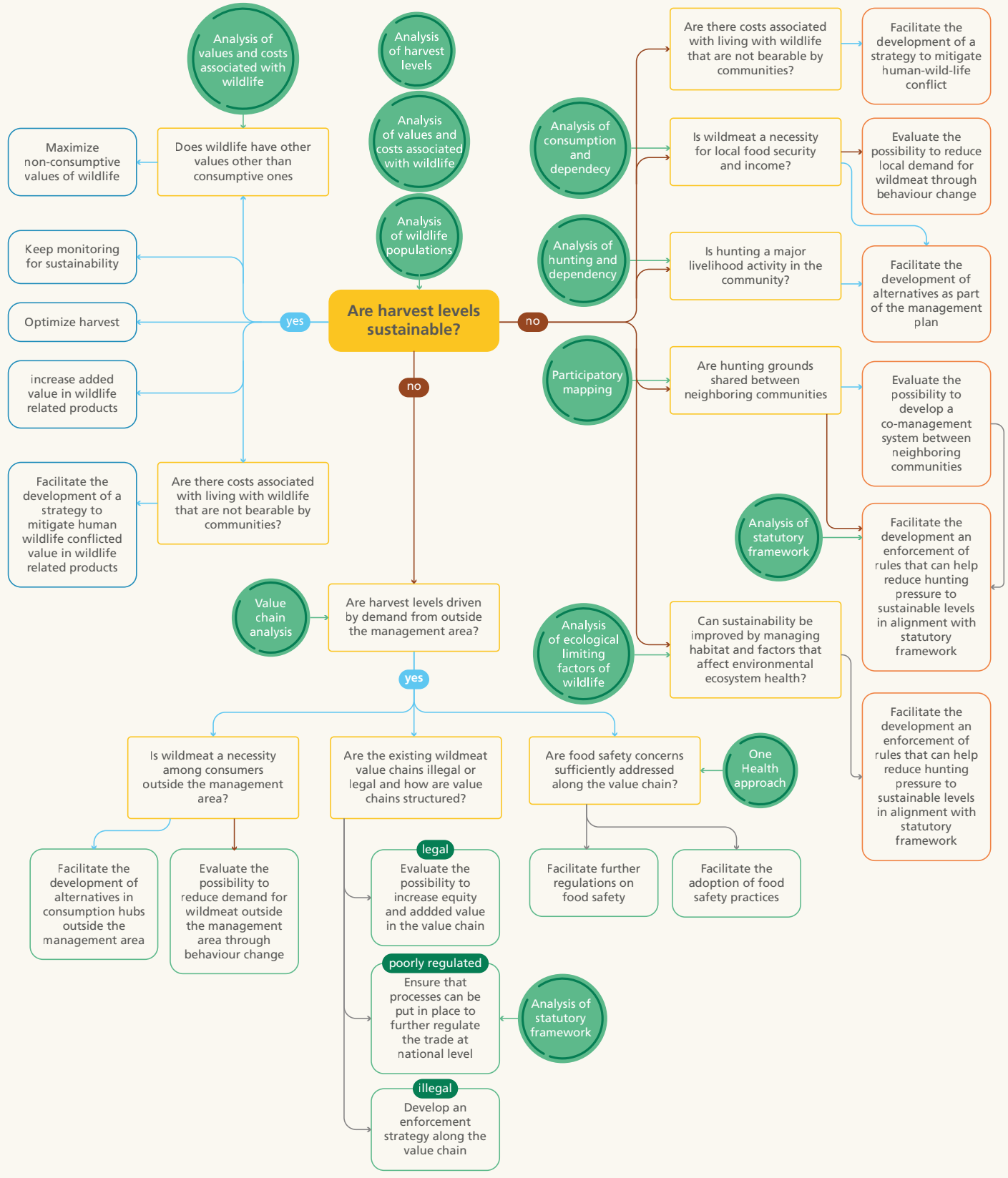


5. FROM UNDERSTANDING HUNTING SYSTEMS TO THE DEFINITION OF COMMUNITY-BASED WILDLIFE MANAGEMENT MODELS

The comprehensive framework proposed in this document to analyse hunting systems in tropical and subtropical contexts serves as an essential starting point for guiding decision-making toward the most appropriate and locally relevant model for sustainable wildlife management. While recognizing that there are multiple, non-linear entry points for understanding hunting systems, meaning that the steps of the diagnostic do not necessarily follow a linear sequence, as several processes can be initiated simultaneously and some may require iterative revisiting, the framework introduces two central guiding questions. These questions help managers and decision-makers shape effective management strategies while considering the multidimensional nature of hunting systems.

The first guiding question addresses whether hunting is sustainable, as this serves as the foundation for addressing interconnected factors that influence sustainability (see Figure 10). Wildlife population assessments offer critical data on the status of species and their capacity to sustain hunting, while monitoring harvest levels provides indirect insights into sustainability. If hunting is determined to be sustainable, the focus shifts toward maintaining and optimizing this equilibrium. Actions might include continuous monitoring of harvest levels, improving enforcement strategies and increasing the value of wildlife-related products to support community livelihoods. Management approaches should also enhance non-consumptive values of wildlife, such as promoting ecotourism or implementing payment for ecosystem services programmes.

Figure 10. Decision tree for defining activities under sustainable and unsustainable hunting scenarios



If current hunting levels of target species are ecologically unsustainable, immediate local interventions become necessary to reduce hunting pressure. These interventions could include enforcing stricter harvest limits, delimiting no-hunting zones, establishing special rules for resource access around gazetted protected areas and diversifying community livelihoods. Participatory mapping can play a crucial role by identifying shared hunting grounds between neighbouring communities, which may require co-management systems to foster collaboration and equitable resource sharing. Ecological assessments can also identify limiting factors, such as habitat degradation or disease, that undermine wildlife productivity.

Where wild meat is critical for food security or income, management decisions must account for local needs. Diversifying livelihoods and providing alternative protein sources can help reduce reliance on hunting while maintaining community well-being. In situations where wildlife has both consumptive and non-consumptive values, management decisions should aim to maximize these benefits. When consumptive use is prioritized, efforts should focus on equitable benefit-sharing and ensuring that harvest levels remain sustainable. Additionally, the costs of living with wildlife, such as crop damage or predation, must be addressed through measures like compensating communities, implementing deterrents, or creating buffer zones to reduce conflict while fostering stewardship.

The sustainability of hunting is intrinsically linked to the broader context of wildlife value chains. A thorough value chain analysis helps identify challenges related to legality, regulation and demand, guiding decisions on appropriate management interventions. If credible evidence exists that current hunting of wildlife for food is ecologically sustainable, management efforts should focus on ensuring that all actors along the wildmeat value exchange are compliant with regulations on hunting, trading, food safety and minimizing the risks of zoonotic spillover of diseases with pandemic risk. Additional investment should also be made to ensure that the costs of complying with current regulations do not unjustly fall on Indigenous Peoples. Lastly, it will be important to understand and address likely future changes in the rural and urban demand for wildmeat that may require regulatory reform, promotion of sustainable production of culturally acceptable alternative food sources, investment in behaviour change actions and research to better understand how wildmeat prices and consumer willingness to pay influence the entry and exit of different actors into and out of the wildmeat trade.

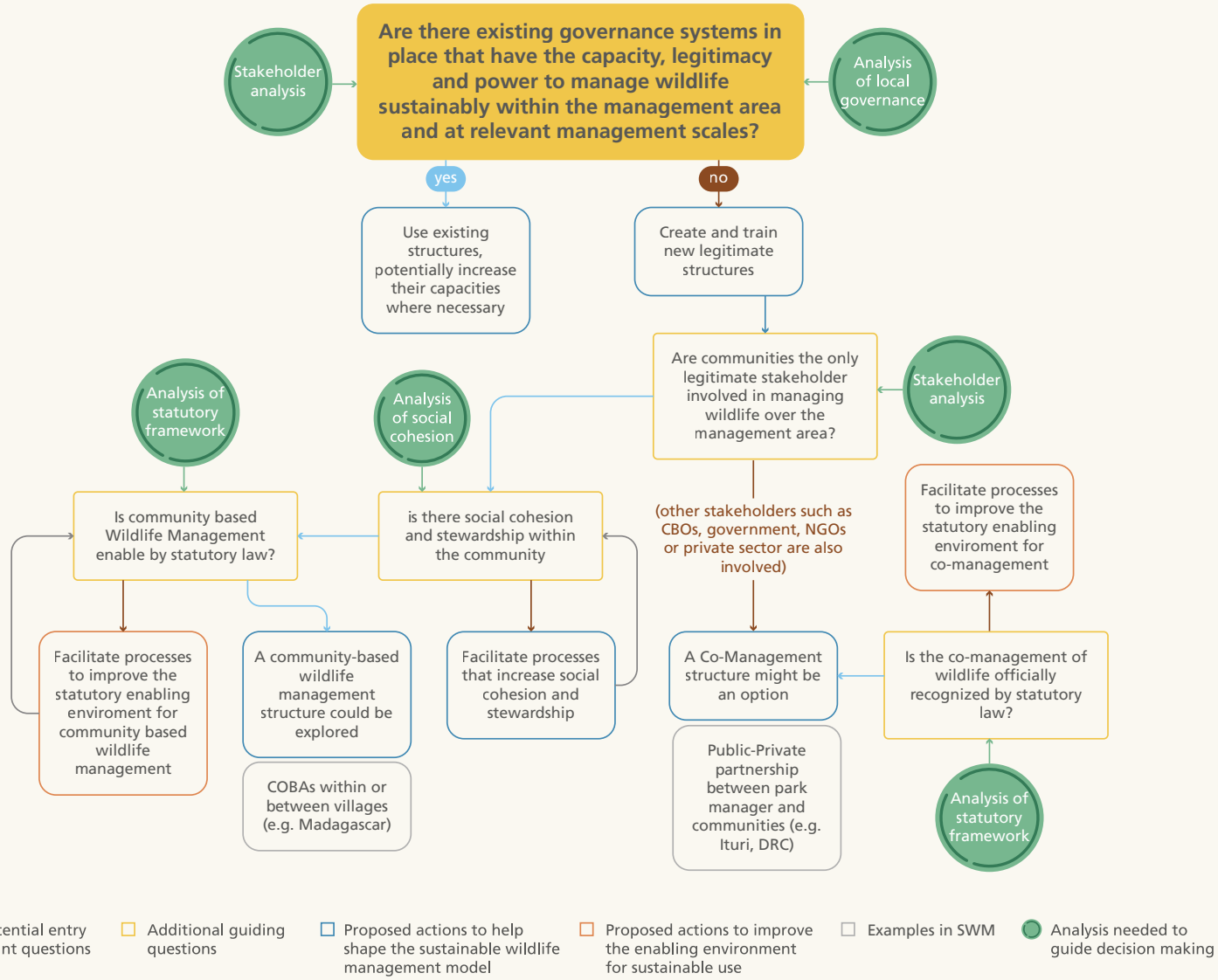
In contexts where value chains are poorly regulated, formalizing and strengthening trade regulation through new legal provisions and stricter enforcement mechanisms is essential. Strategies to reduce demand for wild meat in areas with available alternatives, such as promoting substitute foods, behaviour change campaigns or regulating market access, should be complemented by efforts to diversify protein supplies in regions where alternatives are scarce. For cases where wild meat trade is illegal, it is necessary to assess whether current statutory frameworks are outdated or misaligned with national realities and international treaties, while carefully considering their impacts on Indigenous Peoples and local communities. Legal reform may be required alongside robust enforcement to ensure compliance.

Finally, management must anticipate future changes in wild meat demand, both rural and urban, by promoting the sustainable production of culturally acceptable alternative food sources, investing in behaviour change campaigns and conducting research to understand the economic dynamics influencing the entry into and exit from the wild meat trade. These combined measures ensure the ecological and socioeconomic sustainability of hunting while addressing public health risks and regulatory challenges.

The second guiding question examines whether governance systems exist that have the capacity, authority and power to manage wildlife sustainably and within the relevant management areas and scales (see Figure 11). If such systems exist, they can be leveraged as a foundation for wildlife management. Strengthening their capacities through targeted training, resources and support ensures their effectiveness. If governance systems are absent, new structures must be created that are both legitimate and capable of fulfilling their responsibilities. Establishing such systems requires participatory processes and capacity-building programmes to ensure they are recognized and supported by stakeholders.

The decisions guided by this framework are grounded in a structured analysis of sustainability, governance, and stakeholder dynamics. Managers can leverage existing governance systems, create new ones, or explore co-management models based on the local context. Legal barriers must be addressed to create a supportive statutory environment, ensuring that the chosen model aligns with ecological sustainability, community well-being and socioeconomic goals. By integrating these elements, the framework balances the multidimensional nature of hunting systems with the need for pragmatic and locally relevant solutions for sustainable wildlife management.

Figure 11. Decision tree for managing community-based sustainable hunting according to existing conditions



CONCLUSION

The sustainable management of wildlife in tropical regions demands a transformative and inclusive approach that places Indigenous Peoples and other local communities at the heart of conservation efforts. This guide has sought to equip duty bearers, government agencies, NGOs and other partners with the tools, concepts and practical examples necessary to understand community hunting systems in all their social, cultural, ecological and legal dimensions. By doing so, it aims to support the design of equitable and effective community-based sustainable wildlife management models.

Across the diverse geographies and communities documented in the SWM Programme, several consistent lessons have emerged. First, a rights-based approach is foundational, not only as a legal and ethical obligation but as a practical requirement for success. Respecting and reinforcing community rights to land and wildlife use fosters ownership, agency and trust. Second, sound governance, both within communities and across broader landscapes, must be in place. Effective stewardship depends on social cohesion, local knowledge, accountable institutions and strong leadership. Third, understanding the full complexity of hunting systems, including value chains and market drivers, is essential for crafting sustainable solutions. Integrating scientific and local knowledge allows for more nuanced, adaptable and legitimate management strategies.

Moreover, ecological sustainability must remain a cornerstone of CBSWM. Assessing population trends, habitat conditions and harvest levels enables communities and their partners to set realistic management objectives and monitor progress. However, sustainability is not only biological, it is also social and economic. Livelihoods, food security and cultural values must be part of the equation.

This document is not a manual for one-size-fits-all solutions. Rather, it offers a framework for deep engagement, contextual analysis and adaptive planning. It encourages practitioners to listen before acting, to build partnerships grounded in mutual respect, and to co-design models that reflect the lived realities and aspirations of communities.

These guidelines will be complemented by a second volume focused on the implementation of CBSWM. Together, these resources aim to support durable change, where conservation is not a constraint, but an opportunity for communities to thrive alongside wildlife. Ultimately, sustainable wildlife management is not just about species survival; it is about sustaining the relationships, values and systems that make coexistence possible.

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