

Wildlife Management

Basic knowledge



This module is intended for practitioners, policymakers, forest managers, students and other stakeholders involved in wildlife management. It outlines the definition, the value and importance of wildlife resources and its sustainable management. This module also addresses some current issues that are coming up at the point where wildlife management intersects with food security, livelihoods and well-being, and offers a forest-specific perspective where appropriate.

Wildlife refers to all living, undomesticated organisms inhabiting natural environments (Chandra, 2011). In the context of wildlife management, the term '*wildlife*' in this module focuses on terrestrial vertebrates in all biomes and geographic areas.

Wildlife is extremely important for both people and the environment as it is an essential natural resource and it contributes to the maintenance of forest ecological services and ecosystem health.

It plays a key role in regulating natural processes at all levels of the food chain, including seed dispersal, nutrient cycling even landscape structure, and delivers provisioning services (such as those that produce food and income) to a substantial proportion of the world's poorest people, including forest-dependent communities as well as urban populations. Wildlife contributes to national economies, too, through such things as tourism and the trade in wild animal products.

There are many uses for wildlife, and they are generally organized into two categories: 1) extractive (or consumptive) use refers to the removal of wildlife from its habitat and often involves reductions in wildlife populations by killing (e.g. hunting); and 2) non-extractive (or non-consumptive) use implies unintrusive action on wildlife populations (e.g. wildlife photography and bird-watching), but also non-traditional uses such as harvesting a specific product (e.g. eider down, vicuña fiber) (Lichtenstein, 2009). Wildlife can be used for subsistence, commerce or recreation.

Wildlife management

Wildlife management is defined as the application of science-based and local knowledge in the stewardship of wild animal populations (including game) and their habitats in a manner that is beneficial to the environment and to society (IUFRO, 2017). Wildlife populations are managed for several reasons, such as: to control an over-population; to avoid over-harvesting; to maintain populations at levels compatible with the sustained yield of products such as food, trophies and furs; and to support ecosystem processes and resilience.

Currently, a series of natural and anthropogenic pressures, such as continued degradation and loss of forests, grassland and wetland

ecosystems, conversion of forest habitats to agricultural fields, unsustainable commercialization of wildlife, climate change, spread of zoonotic pathogens, among others, threaten wildlife, which has serious consequences for vital ecological processes and on the livelihoods of those people who depend on it.

Given these multiple pressures, sustainable wildlife management (SWM), defined as “the sound management of wildlife species to sustain their populations and habitats over time, taking into account the socioeconomic needs of human populations”, is becoming a more and more common approach (CPW, 2014). This approach goes beyond protecting individual species or meeting hunting demands, but rather it focuses on wildlife as a renewable natural resource in a holistic way, for the benefit of present and future generations. This requires that all land users within wildlife habitats be aware of and consider the effects of their activities on their wildlife resources and habitats. A more mindful use of forests is of benefit to them.

The SWM approach greatly supports sustainable forest management (SFM) and biodiversity conservation by emphasizing the benefits to humans of forest biodiversity, and encourages people to safeguard and value wildlife by managing it responsibly.

SWM requires appropriate policies, social acceptability and good governance. It can be best achieved through by generating benefits locally, which may include generating income (commercial harvesting and wildlife-based tourism), subsistence (wild meat consumption), recreation and cultural affirmation, such as for Indigenous Peoples (Morgera and Wingard, 2009).

Linkages between wildlife and forest management

Wildlife and forest management are not only compatible, but are intrinsically interconnected. Forests are the most biologically diverse ecosystems on land, and harbour most of Earth’s terrestrial biodiversity (MEA, 2005).

While implementing SFM, it is crucial to recognize that forest management has direct implications for the habitat and living conditions of wildlife. The intensity and scope of forest management activities affects vegetation distribution as well as abundance and coverage, which sometimes leads to increased fragmentation of the forest landscape and a decrease in habitat quality. This can further alter the community structure, abundance of wildlife species and their spatial distribution and behaviour. For example, by opening up the canopy and shifting much of the primary production to the understory, logging tends to simplify the vertical stratification of forest species, sometimes causing birds of the canopy layer to forage at lower levels. This shift in productivity may benefit large terrestrial browsers, like elephants and okapis in African forests, or tapirs in neotropical forests (Peres and Barlow, 2004). In temperate forests, clear cutting systems can favour roe deer which like clearings and forest edges for food and thickets for cover (Matthews, 1991).

As well, the amount of wildlife, the presence of particular species and their feeding and behavioural patterns, can greatly affect forest health. For example, when cervids (deers) experience external stress, they sometimes mark their territories by rubbing trees or stripping bark, which severely damages the forest, reduces its productivity, slows forest regeneration, all with important economic implications. Bears can strip bark with their claws to reach the newly formed wood underneath (Nolte and Dykzeul, 2000). Different species across temperate and tropical ecosystems can have different effects. Forest damage caused by wildlife leads to reduced productivity and forest regeneration and can have serious economic consequences.

On the other hand, wildlife provides a wide range of ecological services with multiple benefits for forest health and productivity. Certain wildlife species, such as gibbons, elephants, rhinoceroses, hornbills and imperial pigeons, act as dispersers of large seeds. For example, [African elephants](#) disperse more seeds of more tree species, and over greater distances, than any other animal, which makes them important for the African rainforest. Certain wildlife species can act as biological control for pests. Bats can consume as much as one-half their body weight in insects, thereby helping control the population of insects that are harmful for forest, in addition to pollinating flowers and dispersing seeds.

Wildlife must be recognized as an integral part of SFM, taking into account continued deforestation, forest fragmentation and climate change. Wildlife distribution, population levels and diversity have an impact on forest productivity, health and regeneration. The socio-economic values and functions of wildlife should be considered as part of a regional set of criteria and indicators for SFM, since wildlife issues are essential in guiding, monitoring and assessing the SFM process (FAO, 2017).

Wildlife and food security

Wildlife plays a crucial role in food security, and, therefore, in the nutritional well-being of an individual, especially in developing countries, where famine and malnutrition are severe problems. Mainly, wildlife contributes to the food security of both rural and urban households, directly through the consumption of wild meat. Wild meat is considered an important part of the diet and a crucial source of animal protein, especially where people live in close proximity to forest and fallow areas.

Wildlife can also have both positive and negative influences on food production systems. Some wild species could play an important role in

seed dispersal, pollination and as fertilizers. For instance, some species of mammals such as monkeys and baboons are known to spread the seeds for fruit trees. On the other hand, some wild animal species, due to their role as intermediate hosts for parasites and disease pathogens, can potentially transmit diseases to humans and livestock.

Besides its importance as food, wildlife plays other crucial roles such as providing employment and generating income generating opportunities. It also has a role in the physical, spiritual and cultural well-being of people. And, it is a source of food, which is important for food security. For instance, trade in wild meat and wildlife products as well as wildlife-based industries such as tourism and recreation contribute significantly to both national and household food security by generating financial resources, which can be used directly to purchase food or to develop and improve food production systems. The sub-products of wildlife such as skins, hides, bones, shells and horns contribute to local economies, as they are often locally used for manufacturing clothing or they are shipped and exported for processing into more sophisticated leather products.

International policy framework

SWM is the focus of considerable international effort. Due to the important roles it plays for biodiversity conservation, food security and livelihoods, and human health and well-being, SWM is included in the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDG). SWM is critical to achieving several SDGs, specifically those related to solving the root causes of poverty and hunger, namely, SDG1 - No Poverty and SDG 2 - Zero Hunger, and due to its connection with forest management and biodiversity, SDG 15 - Life on Land.

Building partnerships with governments, private sector and civil society to create shared vision, regulations and incentives is key to developing and implementing long-standing interventions to manage wildlife. Therefore, implementing SWM is crucial because it contributes towards achieving SDG 17 - Partnerships for the Goals.

In recognition of the important role wildlife management plays in achieving sustainable development, the Conference of Parties (CoP) of the [Convention on Biological Diversity](#), in its [Decision XI/25](#) in 2012, requested that a [Collaborative Partnership on Sustainable Wildlife Management](#) (CPW) be established to better address the issues related to wildlife. The CPW was formally established on the margins of the 16th meeting of the CITES COP in Bangkok, in 2013.

At the moment, the Convention on Biological Diversity recognizes the importance of SWM, particularly the sustainable wild meat sector, through [Decision 14/7](#), which was adopted at the 14th meeting of COP in Egypt in 2018. Further information about the wildlife work of CBD can be found [here](#).

[The Convention on International Trade in Endangered Species of Wild Fauna and Flora](#) (CITES) protects wildlife resources by ensuring that international trade in wild plants and animals is legal, sustainable and traceable. CITES recognizes the critical role of local and indigenous communities that live on the frontlines of wildlife conservation and sustainable management, and their need for adequate incomes and livelihoods.

As the UN Decade on Biodiversity 2011-2020 comes to an end, there is a need emerging to integrate wildlife issues into the post-2020 biodiversity global framework of CBD in order to address wildlife issues such as unsustainable hunting of bushmeat, legal use and trade in wild fauna and flora and an increased awareness of the many dimensions of SWM among member countries.

Wildlife management contributes to SDGs:

1 NO
POVERTY



2 ZERO
HUNGER



5 GENDER
EQUALITY



8 DECENT WORK AND
ECONOMIC GROWTH



10 REDUCED
INEQUALITIES



12 RESPONSIBLE
CONSUMPTION
AND PRODUCTION



13 CLIMATE
ACTION



15 LIFE
ON LAND





Related modules

- [Collaborative conflict management](#)
- [Forest management planning](#)
- [Forest tenure](#)
- [Management of non-wood forest products](#)
- [Protected areas](#)

In more depth

This section focuses on the main areas of FAO's work on sustainable use and management of wildlife resources. Firstly, it provides in-depth practical information about the main wildlife harvesting models worldwide. Secondly, it explores wildlife in the context of food and livelihood security, nutrition, and in safeguarding human and animal health. Thirdly, it describes the community-based and gender equality approaches and the current key aspects for achieving SWM.

The uses of wild animal harvesting can be broadly classified as: subsistence, commercial, recreation and ecological. Wildlife can be hunted or captured for food, body parts, medicines, other traditional uses, trophies, or as pets for trade or personal use. The socio-political context and the legal framework governing wildlife ownership play important roles in shaping harvesting models. Wildlife can be a public good, communally owned, government-owned or privately owned. This section provides a snapshot of selected models from different regions of the world.

North America and Europe

In North America and Europe, recreational hunting serves a population-regulation function and produces food for consumption. Hunting is a low-cost method of maintaining wildlife populations (especially large ungulates and suids) at levels within ecological and social carrying capacities, and for conserving habitats favourable to wildlife (Heffelfinger *et al.*, 2013).

The North American hunting model sees wildlife as a public good; thus, no individual owns wildlife, even on private land (Organ *et al.*, 2012). State governments regulate hunting seasons and quotas for game species. Any citizen may hunt for sport, subsistence, self-defence or to protect property, provided she or he holds the correct licence. In addition to licensing, prospective hunters must purchase tags within the “wildlife management unit” in which they wish to hunt; one tag permits the hunting of one “head” of the game species in question. Wildlife management costs are covered through excise taxes paid on equipment and ammunition and by purchasing hunting licences, tags and stamps. States use these funds to ensure there are viable populations of game and non-game species (Organ *et al.*, 2012).



In Canada and the United States, members of first nations or

indigenous communities have significant use rights and are permitted to hunt without a permit if hunting for food, social or ceremonial purposes and within traditional or signed treaty boundaries (e.g. rights and responsibilities in Manitoba). Markets for live or dead wildlife products are prohibited, although exceptions exist at the state or provincial level (e.g. the sale of lawfully taken fur-bearing animals) (Organ et al., 2012).

Wildlife is also considered a public good in European countries, and hunting is regulated by law. The right to hunt is granted if applicants pass an exam and pay for an annual licence (e.g. [hunting in Finland](#)). Depending on the country, some species (e.g. [red deer harvesting in Europe](#)) are subject to annual or multi-annual quotas, which the relevant authorities regulate by allocating tags (Brainerd, 2007).

In contrast to North America, the commercial hunting and sale of wildlife products is allowed in most European countries. In addition, the actual right to hunt in a specific area is granted to the landowner (either a private person or a communal area). This right may be exercised by the owner or it could be transferred (rented) to a third party. Leasing hunting rights provides a potentially important source of income for landowners, including communal areas and, in certain circumstances, the income generated by hunting is higher than that generated by timber harvesting. Under this model, the profits from wildlife benefit rural people (either landowners or communal areas through rentals) directly, and conservation costs are covered indirectly by the entire society.

Sub-saharan Africa

There are a variety of approaches that define the use of wildlife in Sub-Saharan Africa. The predominant model found in Southern African countries is based on the devolution of wildlife management rights and benefits to private owners and communities. The guiding assumption behind this model is that wildlife management becomes more effective when local users can manage and benefit from it.

In recent decades, Namibia (e.g. [benefits of wildlife-base private land uses](#)), South Africa, Zambia and Zimbabwe (e.g. [private wildlife conservation](#)) have decentralized state decision making to local stakeholders, thus enabling them to benefit from the numerous opportunities presented by the wildlife tourism industry. Most countries require a permit or a licence for wildlife use, particularly for hunting. In some countries explicit criteria exists for giving out this kind of authorization: in Uganda, hunting in protected areas is subject to the requirement that harvest does not exceed the sustainable yield (Morgera, 2010).

The decentralization approach has been less straightforward on communal lands because communal property organizations (in which defined groups collectively share common resources within a defined jurisdiction) need to be established.

In Central African countries, hunting is governed by sections of forest laws that were created under colonial rule. This legislation was originally designed for sport hunting in Europe (e.g. closed hunting season between March and September). Although the legal texts in all these countries acknowledge the user rights of local people, allow traditional hunting and fishing for 'subsistence' purposes, they are ill-suited for regulating subsistence harvests (Nasi *et al.*, 2008).

Since customary rights are only granted for subsistence purposes, the law either forbids trade, as in the Republic of the Congo (COG), or restricts it within the local community, as in Gabon (e.g. [hunting for livelihood in Northeast Gabon](#)). In addition, land tenure systems concerning access to hunting resources are not sufficiently precise and often do not recognize customary land rights for Indigenous Peoples and local communities or allocate land rights at the level of a community, without definition of the members of that community.

Central and South America

Wildlife national harvesting models in Central and South America are quite heterogeneous. Overall, there have been two different approaches to wildlife use:

1. Some countries have adopted protection policies, prohibiting almost all use of wildlife, enacting total bans on hunting in their territory, either explicitly or by refusing to grant hunting licences. This policy is based on the premise that a total ban will protect wildlife populations and allow them to increase, and also that research will show how best to use these populations (Ojasti, 1996).
2. Other countries are combining the protection of endangered species with controlled use (e.g. [Argentina](#), [Mexico](#), [Peru](#)).

In many Latin American countries, hunting laws, policies, wildlife management and administration models tend to mirror the successful models from industrialized countries. Sport hunting is the dominant model, a wildlife utilization strategy involving compulsory hunting licences, regionalized hunting seasons, bag limits per species and other measures designed to rationalize utilization and promote user awareness. Support for hunting clubs and associations, the establishment of reserves and various forms of cooperation between the administrative bodies and the resource users often go along with this model. In some countries the earnings from licence fees are earmarked exclusively for wildlife management and research.

Subsistence hunting encompasses various forms of wildlife utilization for the purpose of procuring meat to feed the family, and is practiced by Indigenous People and so-called "[campesinos](#)" hunters, who are the main wildlife users in Latin America. Campesinos,

generally have better access to alternate forms of protein, a different cultural and economic context and are usually quite unaware of the legal and administrative wildlife regulations. They typically hunt a great variety of game year-round, though they prefer big animals, and those that can be caught by hand or with simple tools. Subsistence hunting can also become commercial hunting when a large portion of the product is sold to third parties.

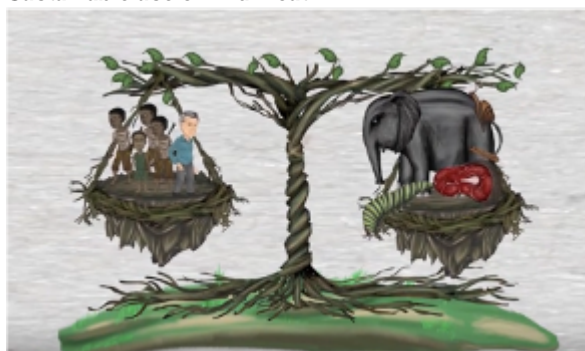
Asia and Oceania

Across Asia, national governments typically retain ultimate control over land and natural resources including wildlife, although Papua New Guinea, Solomon Islands and Timor-Leste recognize the pre-eminence of customary rights. For example, in China, wildlife is the property of the state; in Bangladesh, the legislation does not include clear and specific statements on wildlife tenure but clarifies that any wild animal, trophy or meat shall be presumed the property of the government until the contrary is proven; and in the Philippines, wildlife is state-owned, but congress may, by law, allow small-scale utilization of natural resources by Filipino citizens (Morgera, 2010).

Most countries in the region regulate hunting through a system of permits, with different legal tools in place to regulate hunting. In Japan, an exam must be passed before receiving a hunting licence. In the Philippines, all wildlife utilization activities require that authorization be issued after a proper evaluation demonstrates that the activity is not detrimental to the survival of the species. The one exception is India, which has banned commercial and recreational hunting altogether. When it comes to traditional use by local communities, general legal clauses may facilitate or promote greater involvement among local communities in wildlife use (Morgera, 2010).

For further information on wildlife laws and case studies, see [Principles for Developing Sustainable Wildlife Management Laws](#) (CIC and FAO, 2009), [Wildlife law and the empowerment of the poor](#) (Morgera, 2010), and [Sustainable management of wildlife and food security through sound legal frameworks, institutions and practices](#) (FAO 2019).

Sustainable use of wild meat



Bush meat is defined by the Convention on Biological

Diversity (CBD) as the meat of wild animals harvested in tropical and sub-tropical countries for food and for non-food purposes, including medicinal use. Given that wildlife hunting for food and livelihoods is present across other regions too, the term wild meat is now being used. The same terminology will be applied here, with the intention of being more geographically inclusive (Coad et al., 2018).

For many, wild meat may be the main type of animal protein available, an important component of food diversity, and/or a food type closely tied to a particular cultural identity. For example, estimated wild meat consumption in the Congo Basin alone is over 4 million tonnes per year, in a region where 60 percent of the population lives in rural areas and subsists on natural resources (Nasi and van Vliet, 2011). In the United States and Canada, an estimated 15.5 million hunters participate in wild meat harvests, and an unknown number of First Nations hunters harvest wildlife to meet their food needs as part of longstanding cultural practices and traditions (Heffelfinger et al., 2013).

Wild meat is a natural and highly nutritious food, although, as with domestic stock, its use may carry health risks related to zoonotic diseases transmitted to humans through the handling or consumption of animals when such consumption is not controlled. For further details, see CIFOR's video of the [role of bushmeat in the spread of ebola](#).

While wild meat hunting has been practiced by humans for millennia, increasing demand as human populations grow, as new technological advances in hunting techniques re developed, and as wild meat becomes more commercial are affecting the sustainability of harvests. Unsustainable hunting is leading to the decline or extirpation of vulnerable species, which may in turn affect ecosystems as a whole, e.g. decline in dispersers, depletion of top predators.

There are several elements involved in improving the sustainability of the wild meat sector (Coad et al., 2018).

Enabling environments must be created by:

- adapting hunting legislation, ideally using an evidence-based approach that would consider data and projects on local food and livelihoods, as well as the status of wildlife. Further information on hunting and wildlife related laws can be found in [FAOLEX](#) and [WILDLEX](#);
- designing regional and national monitoring frameworks for wild meat to inform policy and legal interventions (e.g. Development of a Central African Bushmeat Monitoring System, [SYVBAC](#));
- setting up and applying standardized, robust data collection, and conducting regular analysis, to be considered in national resource assessments and policy planning documents;
- developing guidelines that distinguish species that are resilient to hunting and those that are not, in order to direct offtakes to those species that can be hunted sustainably, and distinguish these categories in the legislation;
- enhancing appropriate forms of land tenure, including ownership, to give more incentive to communities to sustainably manage their resources and exclude external hunters; and strengthening capacity to enforce wildlife hunting and trade legislation.

Improving the sustainability of the supply of wild meat by:

- implementing community-based wildlife management;
- diversifying income sources to reduce the local demand for wild meat (e.g. [Lebialem Hunters' Beekeeping Initiative](#) in Cameroon);
- managing hunting practices in extractive industry concessions;
- defining sustainable harvesting levels for wild meat species by measuring ecologically sustainable levels of offtake, or by simple indicators of population production, or by using indicators of hunting offtakes, tracking underlying changes in prey population densities;
- using an alternative to quotas - spatial management of hunting, including no-take zones, and rotating hunting zones; and
- undertaking further research to understand whether these methods can be successful over the long-term (e.g. testing emerging population census methods such as [abundance estimation using camera trap data in the United Republic of Tanzania](#)).

Reducing the demand for wild meat by:

- increasing the supply and decreasing the price of wild meat substitutes (fish, domestic species, poultry, insects) by scaling up production of domesticated sources of meat and by implementing wildlife farming (e.g. [analysis of game meat production in Namibia](#));
- increasing the price and/or reducing the availability of wild meat by restricting supply in urban areas through law enforcement that prohibits the sale of wild species, by licensing the trade and taxing the sale of wild meat in markets (e.g. [taxation in Gabon and Cameroon](#)), and by banning trade, effective depending on countries' monitoring and enforcement capacities; and
- influencing non-price determinants of demand, by designing demand reduction campaigns, including on social media (e.g. [this is not game](#) in Zambia and the [Pride Campaign](#) in Thailand).

For further information, please check the CIFOR report "[Towards a sustainable, participatory and inclusive meat sector](#)".

Human-wildlife conflicts

Human wildlife conflict (HWC) is commonly described as a conflict that emerges whenever actions by humans or wildlife have an adverse effect on each other. Human population growth has been increasing the demand for natural resources in many parts of the world. This has led to wildlife habitat degradation and fragmentation with humans and livestock encroaching on natural habitats. Wildlife is increasingly competing with humans for limited natural resources resulting in an increase in HWCs. Climate change is exacerbating these conflicts through, for example, increased competition for water and habitats.

HWC is a serious global threat to sustainable development, food security and conservation. It is negatively affecting both people and wildlife and hindering the achievement of many of the SDGs and the Aichi Biodiversity Targets.

HWC can be broadly classified as:

- **Crop destruction** is the most prevalent form of HWC across the world. Its occurrence and frequency depend upon a multitude of factors such as the availability, variability and type of food sources, the level of human activity on a farm, the type and maturation time of crops as compared to natural food sources, etc. A wide variety of vertebrates, including large mammals, primates, antelopes, bears, rodents and others, come into conflict with farming activities worldwide.
- **Negative impacts on forest resources**, mainly in the form of the loss of viable trees and the destruction of plantations caused, generally, by cervids (deers) and leporids (rabbits and hares).
- **Attacks on domestic animals**, are a major issue in the savannah and grasslands where pastoralism remains the main source of livelihood for many people, but they are also a significant problem for both small and large livestock ranches, resulting in significant economic losses.
- **Human deaths and injuries**, though less common than crop damage, are the most severe manifestations of HWC. Large mammalian carnivores (e.g. crocodile) and large herbivores (e.g. elephants and hippopotamuses) are responsible for occasional fatal attacks on humans.
- **Transmission of infectious diseases** between wildlife, livestock and humans can have a huge impact on agriculture, human health and biodiversity. Of the growing list of human pathogens, 61 percent are zoonotic. Of emerging infectious diseases, 75 percent are zoonotic, originating principally from wildlife.

Managing the conflict

HWC currently ranks among the major threats to the survival of many species, including those that are endangered, and the security and well-being of community livelihoods in many countries (Madden, 2008; West *et al.*, 2006). In dealing with HWC, it is crucial to understand

the local specifics, and to address both the relationship between wildlife and humans and the underlying conflicts over wildlife among people with different values, objectives and experiences.

Managing HWC globally takes on many forms. Management actions can be grouped into six conflict management elements: policy, prevention, mitigation, understanding the conflict, response and monitoring. An integrated management approach to HWC means that all six elements must be accounted for in any affected area, and none should be implemented in isolation (WWF 2016).

Understanding HWC implies knowing the hot spots and seasonality of a conflict, social-economic characteristics of the affected communities, community tolerance and perceived risk posed by wildlife, and severity of conflict in relation to the other community challenges.

The issue of HWC is starting to be included in national policies and strategies for wildlife, development and poverty alleviation. This ensures HWC interventions are framed within a national mandate, which will promote coordinated actions among stakeholders, legal structures, adequate funding and budgetary support, overall providing authorities, managers and local populations with a framework to deal with HWC.

The examples of HWC national policies include: [2017-2028 National Policy on HWC Management](#) in Namibia, [National Wildlife Strategies 2030](#) (including HWC considerations) in Kenya, [Bhutan HWC national management strategy](#) and [European Union \(EU\) Key actions for Large Carnivore populations](#), where special attention was given to HWC.

Prevention is the core tenet of effective conflict management. A wide range of responses have emerged, broadly categorized as lethal and nonlethal approaches, to prevent conflict from occurring or to reduce the frequency or severity of conflict. The most popular techniques involved natural and artificial deterrents, such as chilli repellents, livestock guard dogs, bee fencing, and electrical fencing, among others. In addition, implementing land use planning, establishing watchtowers, and early warning systems are also common solutions.

Effective mitigation helps to reduce the impacts of HWC after it occurs. Currently, mitigation mechanisms, including compensation, interim relief schemes, insurance, revenue sharing incentives, conservation payments, alternative livelihood programmes, payments to encourage co-existence, and management of problem animals are variously employed globally to buffer or mitigate the impact of HWCs. See [here](#) how insurance can reduce the costs of living with wildlife.

Following is a summary of selected common approaches used to prevent and mitigate HWC and promote human–wildlife coexistence organized by broad categories of intervention is provided in the illustration below.

Wildlife	Habitat & separation	People, livestock and property	
<p>Lethal Physical (e.g. traps, shooting) Chemical (e.g. pesticides, biocontrol) Selective (e.g. problem, animal control) or unselective (e.g. general population control) Regulated or unregulated</p> <p>Non-lethal Capture & translocation or removal (in situ or ex situ) Monitoring Restraints Deterrents and aversion (chemical, biological, lights, noise, harassing, vehicles, scarecrows, fladry) Diversionary feeding Fertility control Prey management Disease management</p>	<p>Habitat Manipulation Habitat modification Buffer crops Alternative food sources</p> <p>Separation Zooning Barriers: constructed (fences, walls, enclosures, nests) Barriers: natural (other animals, landscape features) Other forms of exclusion</p>	<p>Human: economic Compensation, insurance, performance payments Alternative income Increase benefits of wildlife (hunting, tourism) Other financial incentives (e. g. loans)</p> <p>Human: governance Laws and policies (e.g. endangered species protection, hunting laws) Institutions Collaboration, participation Stakeholder engagement Planning and evaluation</p>	<p>Livestock and cultivation Protection Guarding (e.g people, animals, physical devices like collars) Improved management and husbandry (location, carcass, disposal, etc.) Modify crops, cropping cycles Immunization</p> <p>Human: other Relocation of people Education, information, communication, training Verification and response Modify behavior (driving, recreation) Social and psychological intervention Technology (modify gear) Personal protection Research and specialist networks</p>

Source: Philip J. Nyhus, 2016

A comprehensive database of documents, manuals and species-specific management strategies can be found in the [Library](#) of the

International Union for Conservation of Nature (IUCN) Species Survival Commission (SSC) Task Force on Human-Wildlife Conflict Resource Library.

In addition, a wide collection of case studies on cohabitation between people and large carnivores can be found in [the EU Large Carnivore Platform](#).

An efficient information system to report HWC incidents, an established centralized HWC database and HWC hot spot maps are important for considering effective management. A systematic and objective gathering of HWC-related information would allow the responsible authorities to place the problems caused by HWC in a specific context and ensure that resources are being correctly directed. Frameworks for reporting and a common set of indicators should be in place to measure the performance of strategies at the institutional and community level.

Responses are the measures taken to alleviate a specific or ongoing HWC incident. There is universal consensus for the need for response teams, which must be rapid and ideally located near HWC hotspots. Response teams serve a range of functions in attempting to reduce the number of deaths of both human and wildlife, and in reducing the threats (perceived or real) that wildlife pose. The specific nature of the response teams – their source of funding, where they should be located, and what types of response teams are required – is dependent on the local context (WWF, 2016).

Empowering rural communities with a shared understanding of animal behaviour and information about past conflicts, patterns in seasonality, breeding seasons and habitat preferences, as well as practical skills and tools, may help them to deal with dangerous wild animal species and acquire new approaches for defending their crops, water and livestock. Over time, more effective engagement of the local populations may result in a change of behaviour, and contribute to reduced risks, improvements in local livelihoods and a reduction in their vulnerability (CPW, 2016). See an example of solutions to enhance coexistence between people and wildlife in [Gabon's La Lopé National Park](#). Shared governance, where ownership of the management strategies is transferred to local communities affected by the conflict, is fundamental for a sustainable outcome.

Disease transmission

Current population growth, agricultural intensification, wildlife farming and the introduction of new species are increasing the interactions among wildlife, livestock and humans. Besides competition for resources and direct predation, wildlife and livestock interactions can lead to disease transmission.

Diseases brought in via domestic livestock are a severe threat to endangered wildlife species and indigenous livestock breeds, and can affect the ecological integrity of protected areas (e.g. canine distemper brought African wild dogs near to extinction). Transmission of diseases from wildlife to livestock can also have important implications for raising livestock, local and regional food security and the livelihoods of people. Diseases transmitted from animals to humans due to the increasing interaction among humans, livestock and wildlife, known as zoonoses, is another important aspect for wildlife disease management. Zoonoses, which particularly affect humans who come into close contact with infected animals, represents more than 60 percent of all pathogens infecting humans worldwide and over 70 percent of these originate with wildlife populations (Taylor *et al.*, 2001). Crises due to the outbreak of zoonoses can have a further effect on a household's income and food accessibility, directly affecting the food security of local communities (e.g. the Ebola crisis in West Africa).

Addressing the issue



Successful SWM has the potential to minimize the negative effects of disease on livestock and transmission to humans while contributing to the protection of wildlife and associated biodiversity. In this sense, applying the One Health approach is essential to assessing this issue in an effective and sustainable manner. One Health is a unifying force to safeguard human and animal health, to reduce disease threats and to ensure a safe food supply through effectively and responsibly managing natural resources. The One Health approach leverages the idea that problems impacting human health, terrestrial and aquatic animals, plants and the environment can be effectively resolved through improved coordination, communication and collaborative actions across disciplines, and that these solutions must be sustainable (Figure 1).

Further information about FAO's strategic plan on the One Health can be found [here](#). In addition, see [here](#) a strategic direction for FAO-OIE-WHO to build together a long term basis for international collaboration aimed at coordinating global activities to address health risks at the human-animal-ecosystems interfaces.

Generally, there are four management strategies that can be applied to manage pathogens and diseases of wildlife (Wobeser, 2002), namely:

1. Prevention, by implementing measures to exclude or prevent the introduction of a disease into unaffected individuals or unaffected populations.
2. Control of an existing disease, by undertaking activities designed to reduce the frequency or occurrence of a disease to an acceptable level or to contain the outbreak spatially.
3. Eradication of the pathogen, or the total elimination of an existing disease (e.g. by burning the habitat or completely eradicating a wildlife population).
4. Take no action, since some argue that any human intervention to alter the course of an infectious disease in wild animals is an unnatural and undesirable intrusion.

Additionally, wildlife disease surveillance is crucial for understanding the local risk to animal health and potential zoonotic disease transmission and it is, therefore, considered an integral part of national wildlife health programmes. It may provide information about domestic and

wild animal morbidity and mortality, identify changes in patterns of disease occurrence over time, and assist in early detection of disease outbreaks, including those linked to emerging diseases. Further information can be found in the [World Organization for Animal Health Training Manual on wildlife disease and surveillance](#).

Additionally, see [here](#) the FAO-OIE-WHO tripartite zoonoses guide: “Taking A Multisectoral, One Health Approach: A Tripartite Guide to Addressing Zoonotic Diseases in Countries” that provides member countries with practical guidance on One Health approaches to build national mechanisms for multisectoral collaboration to address zoonotic disease threats at the animal-human-environment interface.

Community-based approach

A community-based natural resource management (CBNRM) approach recognizes the participation of community members in decision making as a key aspect to assure the long-term sustainability of a resource. According to Gruber (2010), effective CBNRM is based on [twelve organizational principles](#). Considering these principles, CBNRM for wildlife management can encourage regulated use of wildlife, provide livelihood opportunities, and minimize costs, while increasing the probability of achieving long-term sustainable initiatives.

There is a variety of approaches to consider while specifically referring to CBNRM for the management of wildlife. While some have proved successful in previous experiences, the results will vary depending on the region, country, socio-political and biophysical context in which they are implemented (Coad *et al.*, 2018). These are some of the most widely applied:

Community-managed protected areas with governments, non-governmental organizations or industry partners is a way to reduce resource-use conflicts. Protected areas can be created to manage specific wildlife management issues such as [“Sustainable Development Reserves”](#) in Brazil, [“Community Hunting Zones”](#) in the Central African Republic and [“Community Wildlife Management Areas”](#) in the United Republic of Tanzania.

- **Wildlife ranching** is a form of husbandry, in which wild animals are maintained in certain private land areas delineated by fences to improve production efficiency with direct benefits for landowners (e.g. [wildlife ranching in South Africa](#)).
- **Community conservancy** is a communally owned and managed area where people have the legal right and responsibility to utilize and benefit from their wildlife and other natural resources (e.g. [Namibia's conservancy association](#)).
- **Payment for ecosystem services** is a mechanism in which an ecosystem service is bought by a buyer only if the service provider (e.g the local communities) can assure its continuation. For example, in the case of wild meat, local communities can be paid to maintain “food stocks” at sustainable levels (e.g. direct payment approach for ecotourism in the [Lao People's Democratic Republic](#) and [Zimbabwe](#)).
- **Certification scheme** is a system to certify that certain products were produced without harming wildlife habitats or populations. This scheme seeks to influence consumer choices for wildlife friendly products (e.g. [an example from the Peruvian Amazon](#)).

Gender considerations

Although gender plays a key role in local livelihoods, the connection between gender, wildlife use and livelihoods has remained under explored and is often overlooked or inadequately addressed in wildlife conservation and management efforts. Yet key factors influencing SWM, particularly HWC, unsustainable and illegal wildlife trade, tenure rights, poverty, and food and livelihood security, all have significant gender dimensions, even in situations when women are not considered the direct users of wildlife and where their roles are often less visible (Espinoza, 2010).

If not effectively addressed, these differences in the access and control of wildlife resources can limit the effectiveness of management measures and exacerbate pre-existing gender inequalities. For instance, threats to food security caused by unsustainable bushmeat hunting have proved to have more detrimental effects on women and children, who receive less and lower quality food, than on men (CPW, 2017). In the context of HWC, the fact that women usually go into the forest to collect firewood, travel long distances to fetch water due to lack of plumbing or when pipes are broken by animals, puts them at risk of wildlife attacks (Browne-Nuñez *et al.*, 2013).

While women can bear a disproportionate burden of the hidden HWC effects, such as fear, economic hardship and/or increased workload, such gender-specific effects are not often recognized in the community or by public officials. At the same time, men may suffer higher

mortality rates than women – also stressing families - given that men are usually the ones involved in wild game hunting, which is often more dangerous work (though that is because of the risk of accidents or snakebite than of actual attacks).

Gender disparities in decision-making in the context of SWM reinforce inequalities between men and women and lead to less effective management of wildlife. The low level of representation of women in management committees, due to several reasons such as deference given to male elders, women's limited time due to household responsibilities such as caretaking and providing food, etc., means that women's perspectives and knowledge, which are necessary for effective SWM, are lacking.

Gender mainstreaming, which refers to the promotion of gender equity within institutional policy and practice, should be considered essential for SWM. While it is possible to add-on gender considerations to ongoing projects, it is much better to analyse gender at the beginning of the phase of any management initiative. In order to ensure successful interventions, gender should be incorporated not only as part of the programming activities, but also fully integrated into the budgeted programme. For practical steps to integrate gender into conservation programming, please check the [Conservation International's Gender Mainstreaming Guideline](#), [FAO's Guidelines for the Assessment of Gender Mainstreaming](#) (FAO, 2017).

For further information on key issues and solutions, please check the [CPW fact sheet on gender and SWM](#) (FAO, 2016).

Keys for achieving sustainable wildlife management



To achieve the overarching aim of SWM of securing the interest of present and future generations while maintaining wildlife species populations and their habitats, the following aspects need to be considered:

- Implement incentive-driven approaches that are based on adaptive management principles, with Indigenous Peoples and local communities to use wildlife sustainably in ways that contribute to wildlife and biodiversity conservation more generally, as well as to livelihoods.
- Plan and implement SWM strategies at the landscape level, considering both species characteristics and the ecosystems in which they live. SWM and species conservation strategies should be complementary for priority species, but in certain cases that deal with species that are highly threatened, individual species-centric approaches are warranted.
- Review and strengthen legal frameworks, improve policy and management, and create clear regulatory guidance at the national and subnational levels to incentivize and enable SWM to also address unsustainable wild meat harvesting and use, HWC, animal and human health and other issues.
- Effectively implement national policies to meet global commitments in support of SWM, such as those made under CBD, CITES and the Convention on the Conservation of Migratory Species of Wild Animals (CMS).
- Identify opportunities and barriers for providing sustainably produced food and livelihood alternatives considering the specific context, in order to develop appropriate models of SWM.
- Ensure that SWM strategies are based on the integration of traditional, indigenous and scientific knowledge of livelihoods, species and ecosystems, information that should be readily available and disseminated to decision makers as well as to the people who benefit from or are affected by wildlife. Address gender-specific considerations throughout the SWM intervention to assure both men and women are actively involved in a way that includes the unique perspective and knowledge of women and ensure that their particular needs are addressed.

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