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Managing Trade-Offs Between
Communities' Welfare and
Nature Conservation: The Case
of Wildlife Management
Systems in and Outside
Protected Areas in Africa

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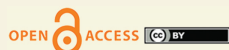
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Abstract

Successfully analyzing and managing trade-offs between community welfare and wildlife conservation are complex tasks that require a multi-disciplinary approach and consideration of various factors. Bioeconomic modeling provides a structured quantitative framework for understanding and evaluating the complex interactions between biological systems and economic activities, aiding in the crafting of more effective and sustainable conservation and rural development strategies. Combined with results from other methods such as economic valuation, institutional analysis, impact evaluation, and framed-field experiments, they can provide guidance on reaching the social planner's optimum. The literature suggests significant roles for comanagement, benefit-sharing, and sustainable financing of conservation as the key ingredients for managing the trade-offs between communities' welfare and nature conservation in Africa.

However, comprehensive research tackling multiple problems simultaneously is required to fully understand and manage the trade-offs. Further, mainstreaming gender and climate change in studies of the trade-offs is increasingly becoming an obligation.

1. INTRODUCTION

Trade-offs in the context of social ecological systems, where human beings interact with nature, are increasingly becoming a significant area of sustainability science because of the negative impacts that human activities have on nature (Adhikari et al. 2021, Chen 2020, Prasad et al. 2022). For the conservation agency, trade-offs emanate from community activities such as livestock encroachment on parklands, grazing competition from livestock, overextraction of water upstream, wildlife injury, illegal offtake, and diseases from livestock. For the community, trade-offs emanate from conservation activities such as removal from traditional land, restricted access to natural resources, alienation from cultural places, wildlife encroachment on rangelands, crop damage, grazing competition from wildlife, predation by wildlife, and diseases from wildlife.

Trade-offs need to be managed because most natural resources have thresholds that, if surpassed, can cause regime shifts in ecosystems (Dasgupta 2021, Ntuli et al. 2023). Stakeholders with diverging interests engage with nature in various ways to maximize their goals, some of which are proconservation, while others are anticonservation (Rakotonarivo et al. 2021). Evidence reveals that the biggest trade-off is observed in developing countries where poor communities seek to benefit (legally and/or illegally) from conservation (Prasad et al. 2022). At the same time, managers of protected areas are exclusively interested in increasing the public goods value of nature (Ntuli & Muchapondwa 2017a).

Other compelling reasons for managing the trade-offs include the generally suboptimal outcomes for both communities and conservation. On the community side, (a) conflicts between humans and wildlife become more common as human populations expand and settlements encroach on wildlife habitats or as wildlife populations outpace habitats inside parks; (b) agricultural processes become depressed; (c) there are fewer livelihood options for communities dependent on logging, fishing, and hunting when strict conservation measures limit or regulate these activities; and (d) there are economic hardships and impoverishment. On the conservation side, (a) wildlife habitats are harmed by community traditional practices that involve hunting or gathering from natural resources, (b) illegal logging or poaching continues unabated, (c) wildlife populations are harmed by the habitat destruction and fragmentation emanating from expanding agricultural areas, and (d) there are unsuccessful conservation and unmet conservation targets.

To manage natural resources sustainably and meet the needs of park managers and local communities, proper planning and tailor-made solutions based on a grasp of the underlying conflicts are needed. The interplay between communities and wildlife protection is one area where the management of trade-offs becomes essential to balance community welfare and conservation objectives. However, there is still a growing debate about the understanding, characterization, and visualization of the trade-off relationships. This review thus focuses on the nature, interlinkages, and dynamics in trade-offs to shed light on the relationships between community welfare and conservation initiatives and to inform policy. Designing effective conservation strategies requires an understanding of the socioecological context and people's preferences toward conservation programs (Estifanos et al. 2020, Ntuli et al. 2020).

The various trade-offs between community welfare and wildlife conservation are linked, requiring a comprehensive approach to finding suitable solutions. Previous studies have focused on different dimensions of these trade-offs in Africa as if they are isolated problems and suggested

partial solutions, but none of these studies took a holistic view of the trade-offs and their solutions. Taking a holistic view of these trade-offs and how they are interlinked will not only help to understand the problems of integrating rural development and conservation but might also assist policymakers and development practitioners in crafting a comprehensive set of solutions to reduce conflict. Therefore, this review takes an integrated approach to shed light on the trade-off between welfare and conservation objectives and their solutions. The objective of this article is therefore to review the literature to identify the trade-offs between community welfare and wildlife conservation in a holistic manner and propose comprehensive solutions that take these different conflicts into consideration. This approach is suggested as the direction for future research studies.

The trade-offs between community welfare and conservation have been analyzed using bio-economic models and empirically using economic models based on survey data and framed field experiments. Empirical studies have applied methodologies such as choice experiments, framed field experiments, and impact evaluation studies. The benefits and costs of conservation have not been comprehensively weighed in terms of their environmental, socioeconomic, and cultural aspects, so it is unclear whether expanding nationwide protected areas and enhancing tourism development to align with the United Nations' Sustainable Development Goals and the Kunming-Montreal targets would generate greater benefits or costs (Chen 2020). Owing to data limitations, few empirical studies analyzing these trade-offs have been conducted in the African region. As a result, much of the policy insights come from theoretical models, qualitative analyses, and a few experimental studies. Furthermore, the results from previous empirical studies done on the African continent are mixed, and the policy recommendations are also isolated and partial. As a result, most of the policy recommendations are fervently endorsed based on weak empirical evidence, and there is a need for more empirical case studies to inform policy and craft interventions tailor made to suit local conditions on the African continent. Here, we present policy insights based on theoretical models and experiments, while at the same time supporting our discussion with empirical evidence where it is available. This review is guided by the following questions:

- How have the trade-offs been studied?
- What were the conclusions from the studies?
- What gaps do we see in previous studies?
- How should we attempt to investigate and manage the trade-offs in the future?

Specifying the questions in this way can in some ways help us to indicate the state of the literature, gaps in literature, and how research should proceed in the future.

The rest of the review is organized as follows. Section 2 discusses the trade-offs between community welfare and conservation, and Section 3 focuses on the solutions that have been suggested and used to address these trade-offs paying particular attention to what is working, what is not, and why. Section 4 focuses on the way forward and how the current solution can be improved taking into consideration the insights from the holistic overview and analysis of the trade-offs identified in this review. Finally, we conclude in Section 5.

2. TRADE-OFFS BETWEEN COMMUNITY WELFARE AND WILDLIFE CONSERVATION

The trade-off between community welfare and wildlife conservation is observed in many areas such as the wildlife policy in Africa, competing interests, human-wildlife conflict (HWC), land conflict, and benefit-sharing arrangements. As already mentioned, these trade-offs are linked together and as such they should not be viewed in isolation but as part of the global picture of the problems in wildlife conservation and development in general.

2.1. The Wildlife Policy and Legal Environment in Africa

The wildlife policy is an important instrument that seeks to balance the trade-offs between community welfare and conservation objectives in Africa (Dasgupta 2021). However, a wildlife policy can exacerbate these trade-offs if instruments are not properly crafted or aligned with development goals (Littlefield & D'Amato 2022). Policies can have both intended and unintended consequences that need to be considered during the design process. According to the policies in most African countries, wildlife is a property of the state that qualifies the resource as a public good to be funded through the fiscus unless it is found on private property that is fenced (Chomba et al. 2011). This means that harvest by communities, which do not ordinarily have land titles, is forbidden by law. In many areas, indigenous communities were forcefully removed from their ancestral lands to pave the way for the creation of protected areas. The establishment of protected areas also came with restrictions in the form of laws and policies to govern park access and protect wildlife. As a result, many local communities do not have access to the protected areas, including ancestral lands and sacred areas inside the park. Conservation laws are often contested by local communities as unfair because communities are forbidden from exploiting resources that they inherited from their ancestors. This situation is referred to as contested illegality in the literature on common pool resource (CPR) management and poaching. The fact that some communities lost not only their ancestral land but also livelihoods because of the creation of national parks means that both the land question and community livelihood issues still need to be addressed to strike a balance between welfare and conservation goals.

Land ownership has been cited as one of the main constraints to good stewardship of natural resources, especially wildlife, by local communities in Africa (Zeng et al. 2023). A significant proportion of African wildlife resources are managed as CPRs because they cross boundaries between public protected areas and communal areas (Ntuli & Muchapondwa 2018). Contested land rights make wildlife vulnerable to overexploitation by local communities in the absence of robust CPR institutions to constrain the behavior of resource users. As a CPR, wildlife ownership has also been the subject of debate by many researchers (Snijders 2012). The fact that wildlife is a fugitive CPR makes assigning property rights very difficult. The difficulty in assigning property rights to common pool wildlife translates into what Gareth Hardin coined as the tragedy of the commons in the face of limited state budgets for monitoring and law enforcement and multiple users with diverging interests. When local CPR institutions are either missing or weak and the government cannot exercise its duties, CPRs can quickly degenerate into open access systems or mimic open access resources where *de jure* or on-paper wildlife is labeled as state property, but *de facto* local communities have unlimited access to the resource (Ntuli et al. 2022).

2.2. Overlapping Jurisdictions and Power Dynamics

The issue of overlapping jurisdictions is initially manifested in a conflict of policy between government departments (Sullivan 2019). While some departments would prefer rural development policies that may threaten conservation initiatives, other agencies whose mandate is to protect the environment usually fight to stop worthwhile development projects, especially if they are happening in the vicinity of protected areas. This is usually common in the buffer zones where, according to conservation policy, maintenance of the natural environment is a priority. Overlapping jurisdiction and conflict in policy are also common with wild animals that are captured from wild populations and farmed on private property to meet the global demand for the commercial trade of wildlife and wildlife-derived products (Child 2019). This activity is also supported by the government based on the economic benefits such as employment and growth in rural economies even if there are concerns associated with the activity from an ethical point of view or an ecological and

human health perspective. Another frequently cited argument is that the notion that game farming helps to reduce pressure on wildlife populations in natural environments is debatable (Bond et al. 2004).

A typical case is provided by South Africa, where there is overlapping jurisdiction and conflict in government policy between the Department of Environmental Affairs and the Department of Agriculture, Land Reform and Rural Development over wild animals that are found on private farms. There is growing concern in the country over the increasing number of species that have shifted to the agriculture list and are now farmed under the management of the Department of Agriculture such as zebras, giraffes, white and black rhinos, and a large number of antelope, including the national animal, the springbok.

Another angle that researchers have used in analyzing the trade-offs between community welfare and conservation is based on the overlapping jurisdiction between formal and informal structures responsible for managing natural resources in Africa. While traditional institutions tend to favor wildlife uses that enhance community welfare, state institutions tend to enact policies that limit local communities' access to natural resources (Ntuli et al. 2022). Globally, this is common with valuable natural resources such as wildlife where the state exercises more power and control over such resources, while at the same time relegating traditional institutions to spectators (Bunten 2010, García-Frapolli et al. 2009, Lee 2016).

2.3. Conflicting Interests

Conflicting interests may occur when agents such as individuals, communities, private companies, and the state have divergent interests. In terms of land use, there is a divergence of interest between the community whose interest is agricultural activities and the state agency mandated to conserve wildlife. The park agency's problem is to maximize the stock of wildlife and increase the land under conservation, while the community would like to increase the number of hectares under crop cultivation and their grazing land to cater to the growing population (Fynn et al. 2016). As the rural population increases, human activities encroach on wildlife habitat, thereby reducing the land under conservation.

Another source of conflict involves how to use wildlife (consumptive versus nonconsumptive uses), who owns it, and who is entitled to benefits. Consumptive use of wildlife resources by local communities is considered illegal by the state. The use of wildlife is granted by the state through the issuance of a quota. Unlike trophy hunting, which is increasingly becoming the biggest source of revenue for private game farms, consumptive use by local communities does not generate benefits for the government (Norton-Griffiths 2000). Usually, the private sector is favored by the state because of its ability to generate resource rent. The partnership between the state and private sector in wildlife conservation is generally viewed negatively by local communities, as they are usually sidelined from participating in the benefit-sharing arrangements. There is also conflict between consumptive and nonconsumptive wildlife uses and interventions promoting both uses (Mwakiwa et al. 2016). For instance, private safari operators around Kruger National Park (KNP) in South Africa who are involved in hunting elephants oppose the use of a chili pepper smoke shield to drive elephants from the community, as this affects trophy hunting in the area. On the other hand, wild animals get scared of people when they are being hunted, and this may affect game viewing activities, as animals run away the moment they hear the sound of a vehicle coming (May et al. 2019).

The concept of integrated conservation and development projects (ICDPs) is questioned in Africa because of trade-offs between welfare and conservation (Adams & Hulme 2001, Dahlberg & Burlando 2009). An interesting case study demonstrating existing conflict involves, on one hand,

trophy hunting in the region meant to benefit local communities and conservation efforts and, on the other hand, measures such as fencing and chili production aimed at reducing HWC by keeping problem animals, such as elephants and lions, away from the community. While local communities are likely to support initiatives that will protect their livelihoods by keeping wildlife away, other stakeholders benefiting from trophy hunting fight these initiatives based on the argument that the former are less likely to yield more benefits to the community. Proper studies have not been conducted to demonstrate the effectiveness of nonconsumptive wildlife uses compared to consumptive uses.

2.4. Human-Wildlife Conflict

A key trade-off between community welfare and conservation is characterized by the relationship between community livelihoods and damage-causing animals such as elephants, buffalos, lions, leopards, and hyenas (Ceaușu et al. 2019, Meyer & Börner 2022). Wildlife acts as both an asset because it generates revenue and a pest when it destroys livelihoods for the local communities living adjacent to protected areas. Evidence shows that the benefits generated from wildlife conservation are not enough to offset the externality imposed on the communities (Chen 2020, Moyo et al. 2016). The objective of conservation agencies and private game farms is to increase both the stock of wildlife and land under conservation. However, this comes at the cost to the community residing adjacent to the protected areas, and without adequate compensation, the system falls out of equilibrium. The nuisance from wildlife (damage) increases as the stock of wildlife increases, and this has a negative effect on the welfare of local communities. HWC manifests in different ways, including crop damages, livestock predation, diseases, human injury, and death. Most studies done in this area are purely qualitative and contain very few quantitative assessments (Meyer & Börner 2022). There is also minimal econometric analysis of diseases and the risk of wildlife attacks (Aguirre et al. 2021, Kolinski & Milich 2021, Nyhus 2016, Ostermann-Miyashita et al. 2021, Thondhlana et al. 2020).

Contrary to contemporary narratives of HWC, Meyer & Börner (2022) find that reported conflicts do not have strong negative effects on household income and livelihood diversity. Conversely, community-based wildlife conservation increases income and livelihood diversity among participating households. The role of protected areas in reducing forest and land fragmentation also enhances HWC through its role in constraining environmental income generation, as households depend on land-based activities and harvesting of natural resources (Sims 2014).

2.5. Land Disputes and Land-Use Conflict

Another trade-off exists between community livelihoods such as agriculture (crop cultivation and livestock rearing) and conservation initiatives regarding land and land-use conflict, i.e., land allocation toward both activities (May et al. 2019). Land conflict is commonly referred to as land dispute in legal terms; it involves conflicting claims to land rights by two or more parties, focused on a particular piece of land, which can be addressed within the existing legal framework (Tchatchoua-Djomo & van Dijk 2022). Land conflicts commonly become violent when linked to wider processes of political exclusion, social discrimination, economic marginalization, and a perception that peaceful action is no longer a viable strategy for change (Baranyi & Weitzner 2001). A land-use conflict occurs when there are conflicting views on land-use and conservation policies, such as when an increasing population creates competitive demands for the use of the land, causing a negative impact on other land uses nearby including inside protected areas (Bergius et al. 2020). Sims (2014) investigated the efficacy of protected areas in reducing forest fragmentation in Thailand and found that wildlife sanctuaries are effective in preventing fragmentation conditional

Table 1 Pastoral communities found in sub-Saharan Africa and their level of recorded conflict with wildlife

Community	Location	Human-wildlife conflict ^a
Rendille	The Rendille people live in northern Kenya and practice camel herding	Minimal
Maasai	The Maasai communities are found in Kenya and Tanzania, primarily in the East African Rift Valley	Pervasive
Samburu	The Samburu people are closely related to the Maasai and are found in northern Kenya	Severe
Turkana	The Turkana people inhabit the Turkana region in northern Kenya and parts of Uganda and South Sudan	Minimal
Fulani	The Fulani people are dispersed across West and Central Africa, with significant populations in Nigeria, Mali, Niger, Cameroon, and others	Moderate
Himba	The Himba people reside in northern Namibia, in the arid region of Kaokoland	Minimal
Borana	The Borana people are found in southern Ethiopia and northern Kenya	Minimal
Touareg (Tuareg)	The Tuareg are a nomadic Berber people found in the Saharan region, primarily in Mali, Niger, Algeria, Libya, and Burkina Faso; they have a long history of camel herding and trade across the Sahara	None
Anuak	The Anuak people live in the Nile River region of Ethiopia and South Sudan	Minimal
Dinka	The Dinka people are one of the largest ethnic groups in South Sudan	None

^aNone, indicating harmonious coexistence; Minimal, describing conflicts with minor impacts on human activities or wildlife; Moderate, referring to conflicts with noticeable but manageable impacts on both humans and wildlife; Severe, characterizing conflicts with significant negative consequences for both human communities and wildlife populations; Pervasive, describing conflicts that are widespread and deeply embedded in the interactions between humans and wildlife.

on enforcement types. The study reinforces existing theoretical work urging conservation managers to consider how the spatial distribution of enforcement may affect patterns of resource use.

Human activities such as expansion of agriculture and grazing land are fast encroaching on wildlife habitat and blamed for increased competition for land in most parts of Africa (Kibira et al. 2023). Human population is increasing at a fast pace and occupying previously demarcated wildlife areas, resulting in conflict between the communities and protected area managers. First, these areas are not suitable for agricultural activities such as crop cultivation due to arid conditions that force subsistence farmers to increase land in order to produce more food to feed the growing populations. Second, nomadic pastoralists seek to maximize their welfare by increasing their livestock populations, which increases demand for grazing land, thereby increasing competition with wildlife grazers and the incidences of livestock predation. There are several pastoralist communities found in sub-Saharan Africa with different levels of interaction with wildlife and conflict. **Table 1** enumerates these pastoral communities and highlights the level of recorded conflict with wildlife based on the literature. Estifanos et al. (2020) argue that large carnivore conservation programs in human-impacted ecosystems struggle with conflicts over land use, among other issues.

2.6. Conflict Between Livelihoods, Wildlife Conservation, and Wildlife Benefits

The literature distinguishes two important issues linking community livelihoods and wildlife benefits in the conservation space. One literature strand addresses incompatibility between agriculture and conservation while another strand discusses inadequate compensation and benefits from conservation. The former is rightly talking about a trade-off. The latter is probably talking more about why we have not yet resolved the trade-offs. These issues are interlinked and deserve to be analyzed together.

Compatibility between agricultural activities and conservation activities has been questioned by previous scholars (Pineda-Vazquez et al. 2019, Redpath et al. 2013, Yousefpour et al. 2022). If the two activities are not compatible, there could be a trade-off between income from agricultural activities and conservation that needs to be balanced to maximize both social welfare and conservation objectives. This also implies that policies that seek to improve conservation outcomes such as increased wildlife stocks and benefits might have negative implications on community welfare through negative impacts on the livelihoods of poor communities. The same applies to development initiatives in local communities and buffer zones, which might have negative impacts on conservation outcomes.

Unequal distribution of benefits from wildlife conservation among stakeholders has been cited as an important source of conflict between local communities and protected areas in Africa (Adhikari et al. 2021, Bauch et al. 2014, Jagger et al. 2018). Both the state and private sector reap benefits from conservation while local communities are marginalized, yet they bear a significant amount of the costs of living with wildlife through crop damages and livestock predation with little or no compensation (Ntuli & Muchapondwa 2017a). Current evidence suggests that the benefit-cost structure for local communities is unfavorable (Di Minin et al. 2021). Under these conditions, the incentives to protect wildlife are greatly diminished for these communities, which also affect the perception of local communities toward conservation initiatives in the long run (Ntuli et al. 2019). The relationship between local communities and protected areas is also likely to suffer because the former feel marginalized. Equitable distribution of the benefits is likely to restore not only the relations but also good stewardship of the resource. Increasing the benefits from wildlife conservation might help to offset the damages incurred by local communities.

3. CURRENT SOLUTIONS TO CONFLICT BETWEEN WELFARE AND WILDLIFE CONSERVATION

In this section we focus on the solutions or interventions that are used in Africa to deal with the conflict between communities and wildlife conservation, paying particular attention to the incentive structure, strengths, weaknesses, opportunities, and threats to both welfare and conservation. The review focuses on the different solutions to address these trade-offs in the contexts of community-based natural resource management (CBNRM), ICDPs, and transfrontier conservation areas (TFCAs). CBNRM is a conservation paradigm that initially saw the recruitment of local communities in the wildlife conservation space. ICDPs are biodiversity conservation projects with rural development components that became central missions of many protected areas across Africa and elsewhere (Bauch et al. 2014, Sarkar & Sinha 2015). TFCAs are a paradigm that emerged in the context of regional integration and development.

Various African countries, including Kenya, South Africa, Namibia, Tanzania, Zimbabwe, Botswana, Uganda, Mozambique, Nigeria, Ghana, Senegal, Mali, Côte d'Ivoire, Burkina Faso, Benin, and Niger, have developed wildlife policies aimed at conserving their diverse wildlife resources. These policies prioritize sustainable wildlife management, community involvement, combating poaching and illegal wildlife trade, and promoting ecotourism to ensure the protection of biodiversity and the engagement of local communities in conservation efforts. We briefly spell out some of the key intentions of each country's wildlife policy.

Kenya has a comprehensive wildlife policy aimed at conserving and managing its diverse wildlife resources. Key intentions include promoting sustainable wildlife management, community-based conservation, and ecotourism. The policy emphasizes the need to combat poaching and illegal wildlife trafficking and trade while ensuring the participation of local communities in conservation efforts (Prasad et al. 2022). South Africa's wildlife policy focuses

on conservation, economic development, and sustainable use. It emphasizes the importance of conserving biodiversity, ensuring the viability of protected areas, and promoting responsible wildlife-related activities, including hunting and ecotourism. Community involvement in conservation is also a key aspect. Namibia's wildlife policy places a strong emphasis on CBNRM. The policy intends to empower local communities by involving them in the management and benefits of wildlife resources. It also encourages wildlife conservation through hunting and ecotourism. Tanzania's wildlife policy aims to conserve and manage wildlife resources while promoting sustainable tourism. The policy seeks to involve local communities in wildlife conservation through revenue-sharing mechanisms and community-based wildlife management areas. Zimbabwe's wildlife policy focuses on sustainable conservation, utilization, and community involvement. The policy aims to support conservation efforts while providing economic benefits to local communities through programs like the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE).

Botswana's wildlife policy emphasizes the sustainable utilization of wildlife resources, including tourism and hunting. It aims to protect biodiversity while promoting CBNRM and benefits sharing. Uganda's wildlife policy seeks to conserve biodiversity, protect critical habitats, and promote community-based conservation efforts. It emphasizes the importance of ecotourism and involving local communities in wildlife conservation. Mozambique's wildlife policy aims to conserve natural resources, including wildlife, while promoting sustainable utilization and community involvement. The policy seeks to combat poaching and illegal wildlife trade. Nigeria's wildlife policy intends to conserve and manage wildlife resources while supporting sustainable development and community participation. It emphasizes the importance of preserving ecosystems and protecting endangered species.

Ghana's wildlife policy is geared toward the conservation and sustainable utilization of wildlife resources. It aims to protect biodiversity, habitats, and ecosystems while promoting eco-tourism, research, and community participation in wildlife management. Senegal's wildlife policy seeks to conserve biodiversity, especially in its national parks and protected areas. It emphasizes the need to prevent habitat destruction, poaching, and illegal wildlife trade. The policy also encourages the involvement of local communities in wildlife conservation. Mali's wildlife policy emphasizes the conservation of wildlife species and their habitats. It promotes antipoaching efforts, habitat protection, and CBNRM. The policy seeks to balance conservation with the needs of local communities.

Côte d'Ivoire's wildlife policy focuses on biodiversity conservation and the protection of ecosystems. It aims to combat wildlife trafficking, conserve endangered species, and engage local communities in conservation efforts. Burkina Faso's wildlife policy aims to protect and manage wildlife resources while promoting community-based conservation and sustainable land-use practices. It emphasizes the importance of preventing habitat degradation and ensuring local involvement in conservation. Benin's wildlife policy seeks to conserve biodiversity, combat poaching, and protect critical habitats. It encourages community participation in wildlife management and emphasizes the importance of sustainable resource use. Niger's wildlife policy focuses on the conservation of natural habitats, wildlife species, and genetic diversity. It aims to prevent habitat destruction, promote research, and involve local communities in wildlife conservation.

3.1. Compensation Schemes

Theoretically, a compensation scheme is an attractive policy, but in practice this policy has some significant drawbacks. One of the major drawbacks is that a compensation scheme is costly for the government, considering the amount of revenue that parks generate. Most parks in Africa

rely on the government budget because they cannot raise enough funds on their own to fund park operations. With dwindling support from the government, this leaves compensation policies unattractive to most park agencies in Africa (Mukanjari et al. 2022). Recent evidence demonstrates that a significant amount of funds is donated by nongovernmental organizations (NGOs), which are also inadequate to cover all aspects of conservation let alone compensation schemes. Another challenge is information asymmetry between the park agency and local communities. Local communities sometimes hide important information about their poaching behavior, which is referred to as the problem of moral hazard in the literature (Hübschle 2017). In return, the state establishes tighter regulations, some of which are associated with compensation policy resulting in adverse selection (Bulte & Rondeau 2005, 2007). As a result, most farmers who suffer damages are not compensated, which reduces both their welfare and the incentives to conserve wildlife. Even if the communities are compensated, the value of the compensation is not enough to induce incentives to conserve wildlife.

Compensation schemes have other undesirable characteristics, as noted in the bioeconomic literature (Nyhus et al. 2003, Ravenelle & Nyhus 2017). For instance, a compensation scheme might induce bad behavior on the side of the farmers (moral hazard) in the sense that the incentives to protect their livelihoods, such as field crops and livestock, are greatly diminished in the presence of a compensation scheme. Bulte & Rondeau (2007) observed that farmers may reduce the amount of time devoted to protecting their fields and let their cattle graze in the buffer zone or even inside the park unmanned. In other words, the incentives to protect field crops and livestock diminish with the amount of compensation and the ease with which farmers will get the money in the event of a loss (Bulte & Rondeau 2005). Just like insurance companies, the government tries to deal with the problem of moral hazard by reducing the amount of compensation and making it very difficult to access the money (Ravenelle & Nyhus 2017). For instance, farmers need to demonstrate to the state that indeed a loss has been incurred by taking photos of the damage and that they did not act recklessly to receive the compensation (Nyhus et al. 2003).

A similar impact is recorded with the land that farmers devote to either crop cultivation or livestock grazing (Bulte & Rondeau 2005). A compensation scheme may increase the incentives of the farmers to increase the land under both activities (crop and livestock production) hoping to receive compensation in the event of a loss (Bulte & Rondeau 2007). Interpreted in this sense, a compensation scheme may have negative effects on the habitat or exacerbate loss of habitat through agricultural expansion. For this reason, most governments do not favor compensation schemes, and the expectation is that farmers must protect their own livelihoods (Ravenelle & Nyhus 2017). **Table 2** describes the different types of compensation schemes in Africa by country.

South Africa provides an excellent case study of the moral hazard problem in the community and adverse selection by the government. Local communities around KNP keep livestock such as cattle and goats as a livelihood activity, whereas very few households engage in crop cultivation because the potential of crops is compromised by the region's arid conditions (Chaminuka et al. 2012). This makes livestock production a lucrative enterprise for these communities relative to crop production. Despite the significant numbers of farmers who complain about crop raids by elephants annually, SANParks (South African National Parks, the government agency responsible for managing the country's parks) compensates for livestock losses and ignores crop damages by elephants. One reason for the government's choice of a compensation scheme that is inclined toward livestock production is based on the importance of crop cultivation in the economy of smallholder farmers relative to livestock production. Ntuli et al. (2019) reported that less than 20% of the farmers engage in crop production, whereas 80% engage in livestock production.

The biggest challenge with the SANParks compensation scheme is the moral hazard problem on the farmer's side, which is revealed in different ways. This in turn results in adverse selection of

Table 2 Compensation schemes for wildlife damages by African country

Country	Description
Kenya	Kenya has a well-established Wildlife Compensation Fund that compensates farmers for livestock losses caused by predators like lions and hyenas. This program aims to promote coexistence between wildlife and local communities.
Namibia	Namibia has a similar program called the HWC Self-Reliance Scheme, which compensates farmers for losses due to wildlife and also supports community-based conservation efforts.
Botswana	The Botswana government has set up the National Conservation Trust Fund, which provides compensation to farmers for crop and livestock losses due to wildlife.
Tanzania	Tanzania has various community-based conservation initiatives that include compensation for wildlife damage. These programs are often implemented through local wildlife management areas.
South Africa	South Africa has provincial and national programs that compensate farmers for livestock losses caused by predators like lions, cheetahs, and leopards. These programs vary by province.
Uganda	Uganda has a compensation program for HWC, which provides compensation to individuals and communities affected by wildlife damage.
Zimbabwe	CAMPFIRE in Zimbabwe allows rural communities to benefit from wildlife conservation and sustainable resource management and now includes compensation for wildlife damage.
Ghana	Ghana has established the Wildlife Compensation Scheme, which compensates farmers for crop damage caused by wildlife. The scheme is administered by the Wildlife Division of the Forestry Commission.
Nigeria	Nigeria has various state-level initiatives that compensate farmers for losses due to wildlife damage, especially from animals like elephants and baboons that can damage crops and infrastructure.
Senegal	In Senegal, the government has implemented compensation programs in regions where HWC are prevalent. These programs often involve the payment of compensation to farmers for crop damage.
Benin	Benin has also implemented compensation programs to address wildlife damage, particularly in areas commonly affected by crop raiding by animals like elephants and hippos.
Burkina Faso	Burkina Faso has been working on community-based conservation programs that may include compensation for wildlife damage, although the extent and effectiveness of these programs can vary.
Mali	In some regions of Mali, compensation programs have been initiated to address crop damage caused by wildlife, including elephants.

Abbreviations: CAMPFIRE, Communal Areas Management Programme for Indigenous Resources; HWC, human-wildlife conflict.

farmers with genuine claims by SANParks. The first challenge is that farmers graze their livestock either in the buffer zone or inside KNP unmanned, which makes livestock predation inevitable. The policy clearly states that livestock grazing inside protected areas is strictly forbidden, which automatically nullifies a claim if the remains of a carcass are found inside the park. The only circumstance in which the policy is followed is when a domestic animal is killed in the confines of the community. Second, the animal handling facilities that farmers have are poorly designed and cannot deter opportunistic and hungry predators such as hyenas and leopards from accessing livestock at night. According to SANParks' compensation policy, both incidents are classified as carelessness or negligence on the farmer's side. Other challenges include the lack of sufficient evidence to support claims when an animal goes missing and is later found dead in pieces, mostly bones, in the buffer zone or inside the protected areas. This can be solved through DNA testing of the remains—an internationally standardized species identification test for use on suspected seized rhinoceros horn in the illegal wildlife trade—but this exercise could be very costly for both the government and the farmer (Ewart et al. 2018). A cheaper alternative that farmers can use is tagging, which allows and provides substantive evidence on the claim. Because of these challenges, the rate of compensation to farmers for livestock predation around KNP is very low.

3.2. Comanagement Models

The trade-offs between community welfare and wildlife conservation can also be addressed through policies such as comanagement models involving either the state or NGOs and local communities. Comanagement can be defined as collaborative and participatory processes of regulatory decision making among stakeholders (Jentoft 2003, Rahman 2022), which embody measures for power sharing, capacity building, definition of rights, and linking different systems of knowledge (Berkes 2007, Zurba et al. 2012). The primary mechanism through which a comanagement model addresses the trade-offs between community welfare and conservation is through the distribution of benefits that is assumed to be achieved when power and decision making are decentralized to grassroots levels (Blaikie 2006). Comanagement models were instituted not only to address the issue of power distribution and increase the benefit flow from the state to local communities, but also to legalize the activities of local communities in terms of how they can benefit from the resource (Schaafsma & Bartkowski 2021).

The most common comanagement models found in Africa include the benefit-sharing arrangements where local communities receive wildlife income from trophy hunting, such as CAMPFIRE in Zimbabwe, the Makuleke Contractual Park in South Africa, conservancy communities in Namibia and, most recently, a new model that has emerged in the form of wildlife credits¹ in Kenya, Namibia, and Tanzania. Several other variants of these models exist in different countries on the continent, the most common type being a benefit-sharing arrangement based on revenue from trophy hunting. These models also offer different incentives to the community to engage in wildlife conservation (Matiku et al. 2020, Ntuli & Muchapondwa 2017a, Reid & Turner 2004). Below, we discuss the four main types of comanagement models found in Africa and how they try to balance the trade-offs between community welfare and wildlife conservation. **Table 3** documents some of the benefit-sharing management or comanagement models found in Africa and their status.

3.2.1. Benefit-sharing arrangements. There are several simple designs of benefit-sharing schemes in Africa based on sharing revenue from wildlife conservation. Of course, all the models discussed in this section are viewed as benefit-sharing arrangements, but they have distinct features that differentiate them in terms of incentives and complexity. However, the simple agreements or the methodology of sharing benefits between the state and local communities discussed in this subsection are still unknown to many researchers (Ten Kate & Laird 2019). Revenue-sharing percentages allocated to the communities can differ significantly. **Table 4** shows the revenue-sharing percentages by African country. Revenue-sharing arrangements range from 20% in countries such as Uganda and Mozambique to 51% in CAMPFIRE projects in Zimbabwe and sometimes could be as high as 100% in countries such as Namibia. In Zimbabwe the revenue that goes into the hands of the community is generated through trophy hunting (Muchapondwa 2003, Ntuli & Muchapondwa 2017b), while in Mozambique and a few other African countries, the conceptualization of benefit-sharing arrangements is still young and based on revenues generated mainly through park tourism activities (Nicosia et al. 2022).

CAMPFIRE requires a community to form a wildlife management committee and to have a constitution in place so that they can be recognized as a CAMPFIRE project (Ntuli & Muchapondwa 2018). CAMPFIRE initially experienced success but later experienced some

¹Wildlife credits, also known as biodiversity credits or conservation credits, are a market-based mechanism designed to incentivize and compensate for the protection, restoration, and conservation of natural habitats and wildlife. These credits are similar in concept to carbon credits, which are used to incentivize the reduction of greenhouse gas emissions.

Table 3 Examples of benefit-sharing management or comanagement models found in Africa

Country	Description
Namibia	Namibia is often cited as a leading example of CBNRM initiatives. The country has established conservancies where local communities have a significant say in wildlife management decisions and benefit from conservation-related income, such as tourism and hunting fees.
Zimbabwe	Zimbabwe has CBNRM initiatives, such as the CAMPFIRE. These programs involve local communities in wildlife management and resource use, allowing them to benefit from sustainable wildlife-related activities.
Kenya	Kenya has community conservancies and group ranches where local communities play a role in wildlife conservation and benefit from tourism revenue. The Maasai Mara Conservancies are a well-known example.
Tanzania	Tanzania has community-based WMAs, where local communities are involved in decision-making and revenue-sharing from wildlife-related activities.
South Africa	South Africa has community-based conservation programs in some regions, including conservancies and communal land initiatives, where local communities have a stake in wildlife management and benefit from ecotourism and hunting.
Botswana	Botswana's community-based natural resource management programs involve local communities in conservation efforts, particularly in areas with significant wildlife populations.
Zambia	Zambia's community-based resource management programs aim to engage local communities in wildlife conservation and sustainable resource use.
Mozambique	Mozambique's community conservancies and community-based conservation initiatives empower local communities in wildlife management and tourism.
Uganda	Uganda has community-based conservation programs, such as community wildlife reserves and collaborative forest management, where local communities are involved in conservation and benefit-sharing.
Ghana	Ghana has established CREMAs that allow local communities to participate in the management and conservation of natural resources, including wildlife. These CREMAs enable communities to benefit from ecotourism and other sustainable activities.
Mali	Mali has been working on community-based natural resource management initiatives, which may include comanagement of wildlife and habitats in certain regions.
Senegal	Senegal has implemented community-based conservation programs, often in collaboration with nongovernmental organizations, to involve local communities in wildlife conservation and benefit sharing.
Burkina Faso	Burkina Faso has been developing community-based natural resource management initiatives that may include wildlife comanagement in areas where human-wildlife conflicts occur.
Nigeria	Some states in Nigeria have established community-based conservation programs and wildlife reserves where local communities are involved in conservation efforts and may benefit from ecotourism activities.
Benin	Benin has been exploring community-based conservation approaches to involve local communities in wildlife conservation efforts.

Abbreviations: CAMPFIRE, Communal Areas Management Program for Indigenous Resources; CBNRM, community-based natural resource management; CREMA, community resource management area; WMA, wildlife management area.

difficulties. Available evidence reveals that the intervention managed to reduce poaching and increase biodiversity outcomes in many areas as communities initially embraced the philosophy of the program, but few benefits to the communities resulted in the reversal of some of the achievements (Muchapondwa 2003). Similar sentiments were echoed in studies done in other regions where trophy hunting is used as a tool for conservation (Adhikari et al. 2021, Sarkar & Sinha 2015). The biggest challenge with these schemes is the formula or basis used to arrive at this decision by the state, which is deemed unclear and unfair by the communities because they are never consulted, and no negotiations are done. Little is still known about how the formulas used in these simple benefit-sharing arrangements are reached, as there are no negotiations carried out between the state apparatus and the local communities.

Table 4 Revenue-sharing percentages by African country

Country	Description	Percentage
Namibia, South Africa, and Zimbabwe	<p>Namibia is often cited as a successful model of revenue-sharing with local communities through its conservancy program. Communities can receive up to 100% of the income generated from wildlife-related activities, such as tourism and hunting, with some funds directed toward community development and conservation efforts.</p> <p>In South Africa, community-based natural resource management initiatives vary by province and region from 50% to 100%. Revenue-sharing percentages can differ, but local communities may receive a portion of the income generated from ecotourism and hunting activities. The most recent Wildlife Economy Programme gives wildlife loans to emerging black game rangers.</p> <p>Zimbabwe's CAMPFIRE allocates a significant portion of the revenue from wildlife-related activities to local communities. Exact percentage can vary but is often ~51%, with funds directed toward community development projects and wildlife conservation.</p>	50–100%
Kenya, Tanzania, Uganda, Mozambique, Ghana, and Botswana	<p>In Kenya, community conservancies and group ranches often receive a significant share of the revenue generated from wildlife tourism. Percentage can vary but typically ranges from 10% to 30%, with the funds used for community development projects and wildlife conservation.</p> <p>Tanzania's wildlife management areas aim to allocate a portion of the revenue generated from tourism and hunting activities to local communities. The exact percentage may vary but is often around 20–30%, with some variation depending on specific agreements.</p> <p>Uganda and Mozambique have community wildlife reserves where local communities receive a share of the revenue generated from tourism activities, which can be around 20% or more, with the goal of supporting community development.</p> <p>Revenue-sharing agreements for wildlife-related activities in Ghana are not as common as in other African countries, but there have been efforts to involve local communities in the revenue generated from tourism and other conservation efforts. Specific percentages may vary depending on local agreements and projects.</p> <p>Some community-based natural resource management initiatives in Botswana allocate a portion of revenue from tourism and hunting to local communities, although the percentages can vary from 20% to 35%.</p>	10–35%
Nigeria, Senegal, Benin, and Mali	<p>These countries have been exploring community-based conservation initiatives in certain areas, particularly in regions where human-wildlife conflicts are prevalent, but revenue-sharing percentages can differ based on local arrangements and government policies. Revenue-sharing may be limited compared to countries with more established programs.</p>	Not determined

Another challenge with these initiatives is that local communities are often viewed as mere beneficiaries of a state initiative in a wildlife economy based on a take-it-or-leave-it principle. The government often views such a skewed distribution of benefits as an act of doing good to the community, but not local communities as important stakeholders with a vested interest in wildlife conservation (Bhatasara et al. 2013). The question of whether local communities are interested in wildlife conservation or not is highly controversial and has received considerable attention in the literature, with some researchers taking the government view of these communities as myopic and a threat to conservation (Wolmer 2003). This view is still prevalent in the region and

is demonstrated by the failure of government to increase devolution in the wildlife conservation space (Ntuli & Muchapondwa 2018). What is known is that if the flow of wildlife benefits to the communities is less than the costs of living with wildlife, then the incentives to conserve wildlife are greatly diminished. Evidence shows that the costs of living with wildlife could be higher than the benefit, which warrants the need to increase the flow of benefits to local communities to balance the trade-off between community welfare and conservation (Bauch et al. 2014, Jagger et al. 2018).

CAMPFIRE is one of the first and flagship benefit-sharing arrangements and an example of comanagement models on the continent with a very simple design (Cornelissen 2017). The CAMPFIRE model is based on the idea of allocating a harvest quota to the community to incentivize them to conserve wildlife (Fischer et al. 2011). However, the incentives to conserve wildlife are dissipated simply because the revenue generated from selling the wildlife quota is shared between the Rural District Council (RDC) and safari operators (Ntuli & Muchapondwa 2018). Just like the park agency, the RDC is also viewed in the literature as an arm of the state and has no alignment with community interest (Fischer et al. 2011). The idea of allocating a quota is equivalent to the notion of giving property rights to the community (Johannesen & Skonhoft 2004). The quota is often allocated to local communities through their respective RDCs as the legal custodians of common pool wildlife in rural areas that is usually found outside national parks. The RDC is responsible for selling the quota by engaging a safari operator who will in turn find overseas clients interested in buying the quota for trophy hunting. This situation gives the RDC more power in making important decisions over wildlife matters, including revenue sharing, and the safari operator is also not accountable to local communities (Manyena et al. 2013, Muzirambi et al. 2019). The process of allocating the quota and engaging safari operators is usually not transparent.

Negotiations involving business contracts with the safari operator are done by the RDC, which exercises more power over the management of wildlife, thereby leaving local communities as mere spectators in the game (Manyena et al. 2013, Muzirambi et al. 2019, Ntuli & Muchapondwa 2017a). Unequal power dynamics between the RDC and local communities exacerbate the trade-offs between welfare and conservation. Quite often, the RDC forms an alliance with safari operators because they are very good in extracting rent from the resource while local communities are neglected because they lack the ability to organize to form a vehicle capable of extracting resource rent. The model used in other countries is based on agreements that share revenue generated by state agencies inside protected areas, which is usually very little compared to the revenue generated by the private sector. Under all circumstances the state decides the formula and dictates the terms and conditions of the revenue-sharing arrangements, which is problematic in the eyes of the community (Dube 2019).

3.2.2. Contractual parks in South Africa. The Makuleke Contractual Park in South Africa is an interesting case study because of its unique arrangement that differs from the simple revenue-sharing agreements discussed in the previous section. Under this model, local communities are given ownership to land inside protected areas as residual claimants. In theory, the transfer of land ownership rights from the state to the community can be viewed not only as a transfer of property rights to both land and wildlife, according to South Africa's wildlife policy, but also as a redistribution of wealth (Reid 2001, Reid & Turner 2004, Robins & Waal 2008). The community directly engages a safari operator to run tourism-related businesses such as game viewing, lodges, and filming on its behalf under a revenue-sharing agreement, while the management of wildlife still resides in the hands of SANParks (Matiku et al. 2020). The community has a separate agreement with SANParks to operate tourism-related business only in the form of nonconsumptive wildlife uses because trophy hunting is strictly forbidden inside KNP.

One of the main requirements for a community to launch a successful land claim is the establishment of a community property association (CPA), a legal entity that can enter into an agreement with the state. Researchers have condemned current agreements that CPAs have with SANParks as one-sided because they were not properly negotiated and no proper consultations with the communities were done before drafting the contracts (Reid & Turner 2004, Spierenburg et al. 2008). Furthermore, SANParks seems to exercise more power than the Makuleke CPA in these negotiations (Spierenburg et al. 2008). One of the challenges and also a major limitation with the contractual park model is that the state cannot continue to subdivide land inside the protected areas and give local communities land-ownership rights without affecting the profitability of KNP. Currently, KNP is the only national park in the country (if not in the whole region) that is capable of generating surplus that is also used to subsidize other less-performing parks dotted across the country (Mukanjari et al. 2022). The future management of KNP is also at risk with an increase in the number of successful land claims. This also means that as more communities continue to submit land claims inside KNP, the government will have to find alternative ways of dealing with the trade-offs between community welfare and conservation. Compensation of local communities who lost land due to the creation of protected areas stalled because the willingness to pay by the state falls short of the willingness to accept compensation by local communities. While cost-based payment for ecosystem service schemes have been developed to address the trade-off between conservation and local livelihoods, current schemes often neglect financial compensation for the local people's loss of nonmarketable cultural ecosystem services (Chen 2020).

The model is ideal for reducing the trade-offs between conservation and community welfare because the revenue-sharing agreement between the community and safari operators is negotiated between the two parties while the state plays a regulatory role. Furthermore, there is a fence separating the park from the community, which reduces incidences of HWC. Given that the contractual park model has been able to increase the benefits flow to nearby communities and allow them to negotiate business contracts with the private sector without state interference, this concept is an ideal comanagement tool that makes it superior to other simple benefit-sharing arrangements found in the region (Holden 2012).

3.2.3. The wildlife economy initiatives in South Africa. South Africa has a long history of discrimination through social injustices, which has resulted in an imbalance in income, ownership, and power. The future of conservation in South Africa depends on developing innovative strategies that are not only ecologically sound for species and ecosystem conservation, but are also economically sustainable, socially viable, and inclusive of previously disadvantaged local communities. Many national parks and other protected areas in Africa were created in the colonial era and involved the removal of local people from their ancestral land, inflicting higher levels of poverty within the communities. As poverty is high in South Africa, government policy strives to reduce the levels of poverty and inequality in the country. Government departments are increasingly looking at wildlife as a strategy to foster economic growth and job creation in remote areas where there are few employment opportunities.

The strategy for South Africa's wildlife economy is to transform the wildlife industry from the current regime that seems to preserve the interests of elite rich South Africans in the sector along with historical racial land imbalances. National parks, by virtue of their existence, are considered catalysts for rural and local economic development through the creation of job opportunities. In responding to the Strategy on the Wildlife Economy by the Department of Environmental Affairs, SANParks made a pledge in October 2015 at the Second Biodiversity Economy Indaba to avail more than 500 head of game worth approximately ten million rand over three years to emerging

black game farmers from previously disadvantaged communities. The objectives of this project are to expand land under conservation, enhance community welfare by fostering economic growth and creating jobs, and establish a critical mass of wildlife population outside the protected areas that provides for multiple wildlife products across a spectrum of values supported by alternative supporting businesses buffering wildlife economy volatility.

In order to achieve this, SANParks made wildlife loans available to the previously disadvantaged households. As a pilot, the expression of interest for Window 1 in 2017 was only applicable to wildlife loans by previously disadvantaged individuals, aimed at enhancing their participation in the wildlife industry. The application for a wildlife loan, therefore, is for entrepreneurial development toward socioeconomic empowerment in the wildlife management industry. The application supports emerging game farmers in enhancing their capacity and expertise required for the entrepreneurial development of the loaned wildlife. So far, nothing is known about the performance of this project in terms of social, economic, and ecological viability. Although the beneficiaries of the wildlife economy project were selected based on tight criteria, some experts suspect that the initiative could have been hijacked by both white and black elites in the country.

3.2.4. The conservancy communities in Namibia. Another interesting case study is the conservancy model in Namibia, where local communities contribute their land to wildlife conservation by pooling it together to supply the required wildlife habitat (Schneegg & Kiaka 2018). What made this model feasible is the abundance of land supply in the country and mostly in rural areas, sparsely populated households, or low population densities. This was a deliberate policy by the government to allocate land rights to individual farmers and wildlife policy reforms allowing them to venture into the mainstream of the wildlife economy (Mosimane et al. 2014). Namibia's arid nature makes livestock production and wildlife conservation lucrative, with little potential for rain-fed agriculture (Barnes et al. 2012). The fact that farmers have common interest and can freely participate in wildlife production on their properties in addition to livestock rearing also allows them to internalize the externalities that they might impose on each other (Schneegg & Kiaka 2018). Farmers are also able to select wildlife species that have little impact on livestock production (Tavolaro et al. 2022). Mixed livestock and wildlife ranging also allows farmers to reduce the risk in both activities (Cooney et al. 2017).

Although farmers have managed to dissolve their boundaries, the management of wildlife as a CPR is fraught with challenges that can be addressed by developing robust institutions at the local level (Khumalo & Yung 2015). Despite the issues of cooperation associated with CPR management dilemmas, the Namibian case study is hailed as the best model par excellence in the region because of its ability to generate incentives to conserve wildlife to take good stewardship of the environment. The conservancy model has achieved tremendous success in terms of reducing wildlife crime, such as poaching and illegal wildlife trade, and growing wildlife populations on communal lands in the country. This is perhaps the only model on the African continent where the trade-offs between community welfare and conservation were greatly reduced. Although Namibia is still far from striking a balance between the two goals, it has made significant strides. There are still issues regarding the lack of policies to support public-private partnerships, access to markets, and credit to fund investment projects that will attract more tourism in the country (Mannetti et al. 2017). As a result, the model has not been able to generate employment in rural areas and to attract investment needed to grow these economies. The recent ban in the United Kingdom on the imports of wildlife trophies from Africa spells disaster for future opportunities of a fragile wildlife economy that is still heavily dependent on trophy hunting, which is strongly contested these days (Adhikari et al. 2021).

3.2.5. Wildlife credits in Kenya, Tanzania, and Namibia. The use of wildlife credits is an innovative approach that rewards communities for protecting wildlife and creates opportunities for smart conservation where wildlife thrives and people prosper (Dinerstein et al. 2013, Oberhauser 2019). Just like other payment for ecosystem service (PES) schemes such as carbon credits, wildlife credit schemes are tied to actual performance where the community receives money for growing the wildlife populations in the area (Clements et al. 2023). The design of a PES scheme requires the establishment of a market where sellers of ecosystem services interact with buyers. In the forestry sector, the conditions are good for carbon markets to emerge in developing countries if the local communities are willing to supply forest services such as carbon sequestration and there are buyers of such services such as polluting firms across the globe (Marenja et al. 2012). With wildlife credits, the idea is to pay local communities for supplying wildlife and its habitat, but there is a challenge on the demand side because the only buyers willing to pay for conservation initiatives are NGOs, and this funding is tied to projects with a short life span, which make the scheme unsustainable in the long-run (Oberhauser 2019). Most NGO activities depend on the availability of funding that makes private-sector participation more sustainable in the market for wildlife credits. Innovative policies are needed to encourage private-sector participation in the wildlife and carbon markets in developing countries.

3.2.6. Replicability and scalability of comanagement models. Replicability and scalability of the different models discussed in this section and their success are limited by the context under which they were implemented. A model that works in one country does not necessarily work in another country with different characteristics. Because of this unique characteristic, there is a need to adapt the model to suit local conditions. Common wisdom shows that conservation models that are successful in one area, country, or region often fail when they are copied and pasted in a different context (Nelson & Agrawal 2008). Even under a similar context, it is difficult to replicate the success of the Makuleke Contractual Park model for several reasons. This is because it is not rational to continuously subdivide a national park and give the land to local communities with diverging backgrounds and interests. KNP is managed better under a single regime as a resource with more public than private goods characteristics.

The success of an intervention is either limited or enhanced by scale and number of beneficiaries depending on the nature of benefits and costs (Blaikie 2006). With most interventions in conservation, the benefits are realized at the community level rather than at the household level due to the public goods nature of the resource (Ntuli & Muchapondwa 2017b). Furthermore, revenue generated from wildlife conservation is more efficient if it is invested in public goods that benefit the community rather than distributed to households due to the size of the community.

4. FUTURISTIC VIEWS ABOUT POTENTIAL SOLUTIONS AND DIRECTION OF RESEARCH ON TRADE-OFFS BETWEEN COMMUNITY WELFARE AND WILDLIFE CONSERVATION

Successfully analyzing and managing trade-offs between community welfare and wildlife conservation are complex tasks that require a multidisciplinary approach and consideration of various factors. Bioeconomic modeling provides a structured and quantitative framework for understanding and evaluating the complex interactions between biological systems and economic activities, aiding in the crafting of more effective and sustainable conservation and rural development strategies. Combined with results from other methods such as economic valuation (environmental income analysis, contingent valuation, choice experiments, etc.), risk analysis, institutional analysis, impact evaluation, and framed-field experiments, they can provide guidance on reaching the social planner's optimum.

First, the performance of current comanagement models in terms of addressing conflict between community welfare and conservation falls short of expectations due to inadequacies in the models' design and the policy environment. Africa has to redesign or restructure its comanagement models to create or increase incentives for conservation by local communities through a reduction in these trade-offs. The revised models must also be accompanied by reforms in the wildlife policy or legal environment and governance structures to increase local participation. Deliberate policies that speak to increased participation and access to value chains in the wildlife sector are needed to strengthen the impact of comanagement models. Initially, there is a need to combine interventions or use a mix of different interventions to address the trade-offs between community welfare and wildlife conservation. This could be achieved if conservation players such as state agencies and NGOs operating on the same landscape work together by melding resources and expertise while harmonizing their interventions to ensure the efficient use of resources and maximum impact on targeted outcomes.

Second, the formula for sharing benefits between the state and communities needs to be revised in such a way that the benefits flow to local communities increases to induce incentives for conservation. The formula should comprehensively recognize and reward conservation investments by all players including local communities. Local communities' investments come in unusual ways including giving up ancestral land, accepting restrictions on the use of protected areas, and the cost of living with wildlife. New and innovative ways of generating more revenue from wildlife conservation that involve local communities in the value chain are needed to increase the benefits in addition to the share of income. Wildlife policies need to be revised so that local communities can have increased access to tourism value chains. This could be achieved through a number of interventions that could be embedded either during the design of comanagement models or through reengineering current designs. One way to achieve this is to increase the interaction between tourists and local communities outside protected areas as part of ecotourism business ventures. There is a need to increase participation by local communities in nonconsumptive tourism by establishing new projects outside protected areas. Another way is to incentivize the private sector so that firms can invest in local communities to create more jobs through the establishment of tourism joint ventures or partnerships with local communities. Most of the products that are consumed inside protected areas can be manufactured in local communities and sold with a story about how these communities are involved in conservation so that they can charge a premium. A third way to generate income that could be used to fund community projects is to charge a levy on international travelers to Africa when they purchase air tickets and accommodation. The levy would be earmarked either to conserve a particular species that is endangered, such as rhinos, or to reduce dependence on trophy hunting for targeted species such as lions and elephants that are already showing signs of fragility. However, this requires establishing a separate administration system so that all of the funds are not used to fund the operations of state agencies and other government priorities.

Third, wildlife governance needs to involve local communities from the grassroots level to ensure representation of communities from all levels. There is also a need for more quantitative research to provide evidence on the trade-offs between community welfare and conservation. The research can be used to inform policy interventions such as compensation schemes in Africa so that they can be redesigned to suit local conditions.

Finally, future research on understanding and managing trade-offs between communities' welfare and nature conservation should encompass several critical themes. Gender plays a pivotal role in these dynamics, demanding an exploration of the Harvard Gender Roles Framework, Moser Needs Framework, and Gender Analysis Matrix to comprehend how conservation policies can differentially affect men and women (March et al. 1999, Moser 1993, Parker 1998). In

addition, researchers must acknowledge the profound influence of climate change on both nature and the emerging carbon markets for nature, emphasizing the necessity of designing conservation strategies that account for these evolving environmental conditions. Comprehensive country studies should be a priority, emphasizing nonconsumptive use of nature and employing mixed and integrated methods of analysis to offer holistic insights. Intertwining wildlife management with the management of other resources is crucial, and placing bioeconomic modeling within a computable general equilibrium framework can facilitate a more comprehensive understanding of the economic implications of conservation initiatives, ultimately assisting policymakers in making informed decisions.

5. CONCLUSION AND POLICY RECOMMENDATIONS

In this article, we examine trade-offs between communities' welfare and nature conservation using wildlife management systems in and outside protected areas in Africa. Trade-offs largely emanate from the competing interests and needs of human populations and the natural environment. The consequences of the trade-offs have often manifested as economic hardship and impoverishment for the local communities and unsuccessful conservation outcomes for the park agencies. In real life, attempts at managing the trade-offs have been through the establishment of CBNRM, ICDPs, and TFCAs. Specific to wildlife, five comanagement models have been used on the African continent: benefit-sharing schemes, contractual parks, game donations to communities, community conservancies, and wildlife credits. These models provide varied incentives to beneficiaries that are context-dependent. Results from the literature suggest significant roles for comanagement, benefit-sharing, and sustainable financing of conservation as the key ingredients for managing the trade-offs between communities' welfare and nature conservation. However, comprehensive research tackling multiple problems simultaneously is required to fully understand and manage the trade-offs. Further, mainstreaming gender and climate change in studies of the trade-offs is increasingly becoming an obligation. There is also a need for more funding of empirical research to inform policy and design future interventions such as compensation schemes.

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