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A Qualitative Exploration of Conflicts in Human-Wildlife Interactions in Namibia's Kunene Region

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Abstract: Wildlife numbers are declining globally due to anthropogenic pressures. In Namibia, however, wildlife populations increased with policy instruments that allow private ownership and incentivize their sustainable use. Antithetically, this resulted in increased resource competition between humans and wildlife and triggered conflicts among various stakeholder groups. This paper summarizes the results of a qualitative exploration of conflicts in wildlife management in Namibia's Kunene Region, adjacent to Etosha National Park. We conducted a workshop and expert interviews with stakeholders from relevant sectors. Our qualitative research sheds light on societal conflicts over wildlife that originate from diverging interests, livelihood strategies, moral values, knowledge holders, personal relations and views on institutional procedures. We frame our insights into conflicting human–wildlife interactions with theoretical concepts of social-ecological systems, ecosystem services and ecosystem disservices and open the floor for quantitative assessments. Overall, our results may present a suitable way of understanding biodiversity conflicts in a theoretical way.

Keywords: human–wildlife conflict; biodiversity loss; rangeland system; hunting; livestock farming

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1. Introduction

African savanna landscapes are known for their diversity and abundance of large mammal species. Particularly, eastern and southern African savannas are rangelands of global importance for biodiversity conservation [1] and became popular tourist attractions [2]. These rangeland systems depend on the interplay of large herbivores to maintain ecosystem functions and structure [3] and carnivores to regulate herbivore populations [4].

However, pristine savanna landscapes have become rare since anthropogenic transformation of respective landscapes has reduced the areas available for wildlife over centuries [5]. The creation of productive environments for agricultural utilization is an especially key driver for increased resource competition [6]. In addition, evidence suggests that violent and armed conflicts on the African continent also had a negative impact on wildlife populations [7]. Today, a number of wildlife species are critically endangered, such as the black rhino (*Diceros bicornis*) [8], or vulnerable to extinction, such as the African lion (*Panthera leo*) [9].

Nevertheless, developments in the past decades in certain parts of the continent show positive signs, especially in Namibia [10]. This can primarily be attributed to policy instruments that rendered wildlife as an economic commodity to certain actors [10]. The Namibian Nature Conservation Ordinance of 1975 reinforced the right for wildlife utilization of freehold farmers for own consumption, hunting and tourism purposes [11]. In the 1990s, similar rights were recognized for rural communities [12]. Up to the year 2018, 86 self-governing communal conservancies were founded, covering 20% of Namibia's land area [13]. While the targeted poverty reduction rates have not been achieved for the involved communities [14], the policies supported the recovery of wildlife numbers. However, some species are still highly threatened due to illegal hunting [15,16].

Despite the positive effect of the adapted policy framework, so-called human–wildlife conflicts (HWC) are of increasing concern. The rising wildlife numbers are regarded as causing increasing problems for freehold and communal farmers through livestock and crop losses and infrastructure damage [17]. This challenge is well documented in the developing world, where most of the large wildlife populations persist [18]. In Namibia, recent increases in human–wildlife conflicts with predators and elephants (*Loxodonta africana*) have become a major concern [19]. The tension in human–wildlife interactions is also supported by elevated stress hormone levels of elephants outside of protected areas [20].

Overall, research suggests that most incidences of human–wildlife conflicts are essentially conflicts between societal parties over biodiversity issues and should hence be rather termed human–human conflicts [21,22]. Therein, contrasting viewpoints on the perceived and actual 'costs and benefits' from wildlife are opposed to each other; they are rooted in each stakeholder's individual values and attitudes as well as certain environmental and social risk factors. These diverse perspectives on wildlife species create a certain 'tolerance towards wildlife' or 'level of hostility', which in turn, may lead to conflicts with stakeholders of different perspectives [23,24]. We appreciate this prior work as it clearly carves out the ambivalent perceptions of wildlife, depending on stakeholder attitudes. Here, we consider human–wildlife interactions as original social-ecological processes for which a systemic approach can reveal new insights [25]. The interactions of a system's elements—wildlife species and societal actors—need to be considered as feedback loops embedded in ecological and societal spheres [26]. The interactions generate positive (e.g., recreation, enjoyment, food) and negative outcomes (e.g., loss of livestock and crops, threat to human life) for particular stakeholders. The social-ecological systems (SES) framework, suggested by Mehring et al. [27], captures these interactions conceptually via ecosystem services (ES) and ecosystem disservices (ESD) as positive and negative outcomes, respectively. As to our knowledge, only a few studies looked into ES and ESD of wildlife [28] and did not yet investigate the potential to draw conclusions for investigating conflicts from a systemic perspective.

This paper qualitatively investigates the conflicts between stakeholders that originate from human–wildlife interactions in Namibia's Kunene Region, adjacent to Etosha National Park. As a basis, we shed light on the types and causes of conflicts between actors to conceptualize ES and ESD from wildlife within a SES framework. We intend to provide both new theoretical insights into conflict emergence and new entry points for quantitative assessments.

2. Materials and Methods

For exploring different attitudes towards wildlife, stakeholders were engaged via a workshop and semi-structured expert interviews. The following sub-sections will provide an overview of (i) the study area with its diverse set of land use types, (ii) the stakeholder workshop with its design and goals as well as the expert interviews, (iii) the analysis procedure and (iv) the conflict typology taken up to structure our results.

2.1. Study Area

Conflicts in human–wildlife interactions are a concern not only in Namibia, but also in the neighboring countries Botswana [29], South Africa [30] and Angola [31]. The area of interest for this study is the Kunene Region, south and southwest of Etosha National Park (Figure 1). Therein, multiple land use types and management strategies border and overlap each other.

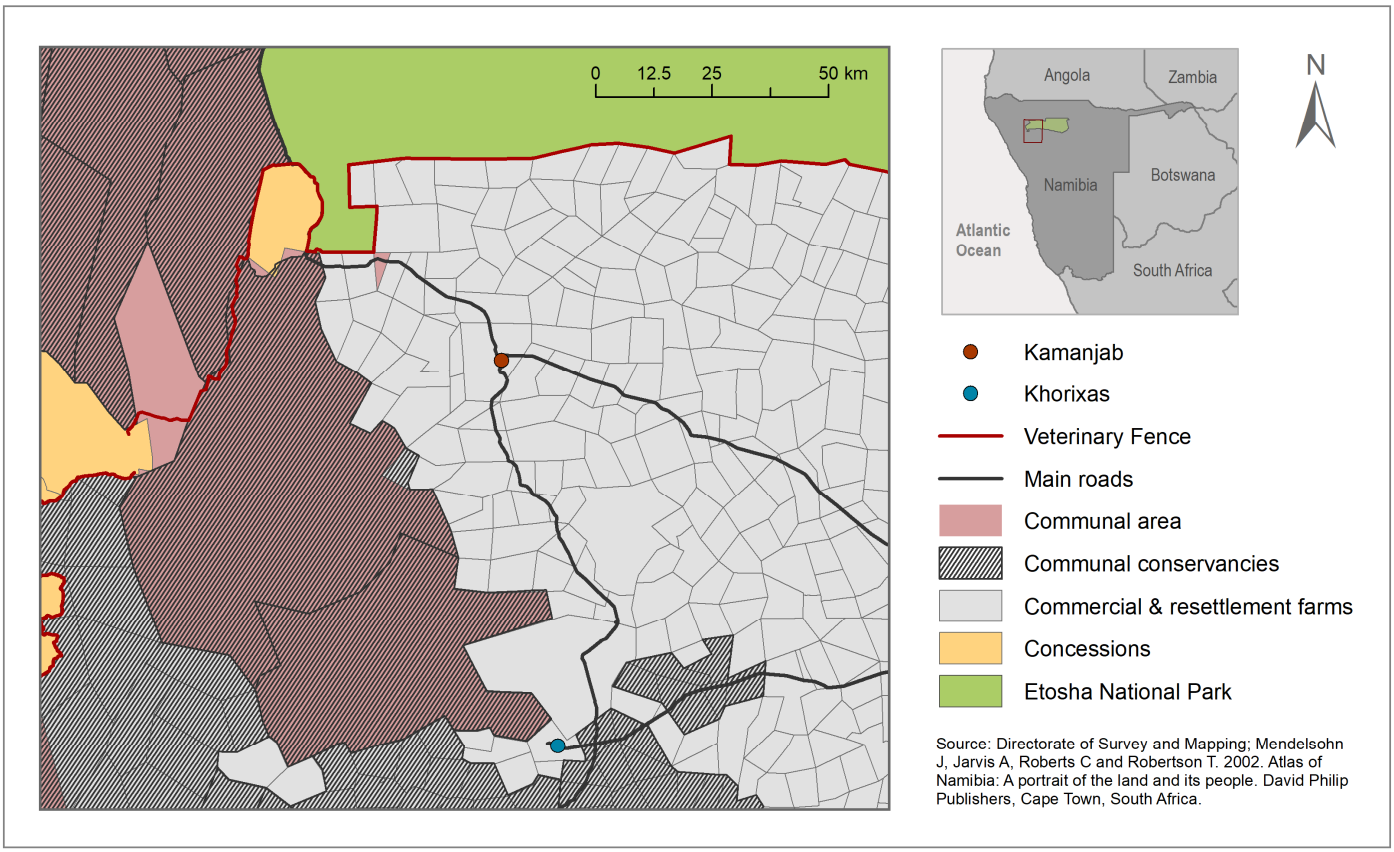

Figure 1. Study area in the northwest of Namibia, south of the Etosha National Park. The map indicates the different land use types, key agglomerations and infrastructural features.

Figure 1 presents its geographical setup with the Etosha National Park as a state-protected area in the north, the communal conservancies in the west and the freehold farming land in the southeast. This region serves as a representative area for the diversity of current land use types and tenure systems that are linked to wildlife management in southern Africa. The management practices of various stakeholders, the emerging conflicts within and between land use types and the effect of the aridity gradient from the southwest to the northeast provide a valuable setting for research on human–wildlife interactions that can serve as a blueprint for similar challenges in other areas.

2.2. Workshop and Semi-Structured Interviews

As part of a Namibian–German transdisciplinary research project on options for sustainable land use adaptations in savanna systems [32], stakeholders were consulted. This integration of stakeholder knowledge is considered a key element for project success and the development of applicable knowledge to support sustainable transformations [33].

As an initial step to engage stakeholders, a workshop, held in 2019, served the purposes of (i) introducing the project's objectives to a broader audience, (ii) obtaining information on the stakeholders' most pressing issues and problems in the field of wildlife management and (iii) assessing their knowledge demands. Stakeholders invited to the

workshop were both individual farmers as well as representatives from governmental and non-governmental organizations (NGO), including conservancies. They were selected based on overall experiences from previous projects, established contacts and a search for studies that conducted stakeholder involvement in a similar manner, e.g., [34]. The participants were engaged via small working groups on topics such as fencing, wildlife management and drought adaptation. Informal meetings between stakeholders and scientists were facilitated during and after the workshop to schedule follow-up interviews (Table 1).

Table 1. Interview partners and participants of the stakeholder workshop. The workshop took place in Outjo, Namibia in April 2019 and the interviews followed in various locations in July 2019.

Category	Number of Interview Respondents	Number of Workshop Participants
National Universities	2	---
Conservation NGOs	3	2
National Government	4	1
Unions	3	---
State-protected areas	1	3
Conservancies	4	1
Freehold farmers	11	13
Total	28	20

Against the background of the observations made during the workshop (e.g., stakeholder viewpoints, actual conflict situations, perceived conflict species), in-depth qualitative expert interviews [35] were conducted with stakeholders relevant to wildlife management. Interviews are a well-established method in conservation science to obtain information on viewpoints of relevant actors in the field [36]. The respondents of the expert interviews were selected via a snowball sampling scheme in order to identify and approach further relevant actors. In total, 28 interviews were conducted, ranging from individual freehold farmers who were visited on their respective farms via agricultural and hunting unions, to conservation NGOs and official governmental bodies. Semi-structured interview guidelines that broadly covered the topics (i) stakeholders and policies, (ii) management challenges and conflicts as well as (iii) knowledge demands were used. While structural questions showed diminishing returns from interview to interview (e.g., who are relevant stakeholders? Which policies are relevant? Which management options exist?), questions on fencing practices and conflict-prone stakeholder constellations became more detailed. Some conversations were audio-recorded with the consent of the respondent. The majority of the interviews were recorded via field notes. In addition to the individual interviews, a participatory observation of a farmers' meeting was conducted that specifically dealt with human–elephant conflicts. Two of the authors participated and observed the conversations by taking hand-written field notes with respect to the abovementioned topics.

2.3. Qualitative Data Analysis

As this qualitative exploration served the purpose of gaining a basic understanding of conflicts in human–wildlife interactions, no quantitative setup was chosen. Hence, this study does not claim to provide representative insights. The focus of the study was rather to create a hypothesis on how conflicts emerge within a social-ecological system's framework including ES and ESD and how stakeholders' attitudes towards wildlife feed into this. Two authors of the study conducted the interviews and the coding exercise. The qualitative material of audio-recorded interviews and hand-written field notes were digitalized and coded to facilitate the subsequent screening of the stakeholders' statements. The coding scheme was initially deducted from the overall questionnaire structure and

evolved inductively while working on the transcripts. Finally, the code spectrum covered (i) the policy and legislative framework, (ii) the respondents' knowledge demands and (iii) different conflict types. The latter category served to analyze why and how conflicts in human–wildlife interactions arise in the study area and how these can be related to the perception of wildlife ES and ESD. As a template, the conceptual conflict typology on biodiversity disputes from Fickel and Hummel [37] was taken up. Therein, the authors assume that conservation conflicts between societal parties always involve a certain matter over which a dispute occurs. Distinguishing these particular matters is key to identify potential entry points for conflict management and resolution. Fickel and Hummel [37] state the following five conflict types:

- Interests: Tangible dispute over the use and allocation of resources;
- Values: Disagreement in fundamental/moral values over 'good' and 'bad';
- Knowledge: Diverging perspectives on validity of different knowledge bases;
- Relations: Lack of trust and recognition of actors in the societal debates;
- Procedures: Institutional procedures over which actors have differing opinions.

3. Results

The following sections present the results of our study: First, perceived problem species and the damage they cause are showcased. Second, exemplary conflicts are classified according to the conflict typology. Third, a brief wrap-up of potential conflict management strategies is provided.

3.1. Wildlife Species of Major Concern

Based on the material collected during the stakeholder workshop and the individual interviews, conflicts seem to arise particularly with elephants and predators such as lions, spotted hyenas (*Crocuta crocuta*) and leopards (*Panthera pardus*). With respect to elephants, the stakeholders highlighted damage to infrastructure such as fences, water points and general private properties (e.g., windows, solar panels, outdoor furniture), as well as crops. Cattle- and game-proof fences do not always stop elephants from moving to preferred areas for grazing or drinking as they easily push down fences with their body height and weight. Only electrified game-proof fences seem to be more effective in preventing elephants from entering certain areas. According to some farmers, damage to fences is observed on a daily basis, putting a high financial burden on the farmers who have to repair them at short notice. Functioning fences are required (i) to protect their livestock from predators, (ii) to prevent the loss of game or livestock to neighbors and (iii) to maintain the possibility for rotational livestock grazing within their farm.

Furthermore, damage occurs to water points that are intended to provide water to livestock and for domestic purposes. While older elephants can access the from reservoirs that are typically protected by higher cement or brick walls, younger elephants cannot reach them. For this reason, one farmer reported that older elephants destroy the walls of the reservoirs to provide water to their calves. In addition to those tangible infrastructural damages, stakeholders assume that elephants may have a degrading influence on the ecosystem as the population may have risen in the past years. This increasing number of elephants may have surpassed local carrying capacities as confirmed by a perceived reduction of certain tree species.

On the one hand, elephants can currently be regarded as a priority species in terms of human–wildlife conflicts for the above-mentioned reasons. On the other hand, predators cause most of the damage to livestock farmers. Respective problems were postulated for freehold and communal farmers living close to Etosha National Park, but particularly, for areas west of the park. Periodically, lions were observed to leave Etosha National Park and prey on livestock in the Ehi-Rovipuka conservancy. While lions primarily prey on livestock, dangerous situations may also arise around water points when people, livestock and predators meet.

3.2. Interests over Resource Use

Conflicts that stem from diverging interests are often associated with disputes over the use and allocation of resources. The involved actors have different opinions on the proper utilization of limited resources [37]. In the study area, contrasting interests can be found in (i) the allocation of limited water and grazing resources in conservancies and (ii) economic benefits from wildlife on freehold land.

The first example can be regarded a result of the drought conditions during the past years and the role of wildlife in communal conservancies. The drought-driven decline in grazing and water resources was further intensified by people and their livestock from northern and western areas who were temporally migrating into the communal conservancies. According to the respondents, these actors did not care about the conservancies' zonation plans that declare certain areas as grazing grounds and other zones exclusively for wildlife-based activities. This zonation is intended to separate different land use types and thereby, ensuring that wildlife populations are conserved and can be utilized for income generation from photo-tourism and hunting. The respondents proclaimed that the incoming people contribute to the depletion of resources and therewith undermine the conservancies' long-term revenue opportunities and increase the incidents of HWC.

> "So, they will move, what we call a little bit south, to come and do some grazing. And remember, from a policy point of view: We don't have rights over land. We don't have rights over grazing. We have rights over wildlife. So, these guys are free to move down." (Stakeholder group "conservation").

The second example concerns the diversity of land use strategies in the freehold area that evolved over the past decades. Some of the freehold farmers changed their land use strategies and moved from livestock farming to wildlife-based business models. The rather homogenous land use of the past, which was dominated by livestock farming, was hence replaced with a complex set of livestock-based and wildlife-based activities that are carried out in close vicinity to one another or in a mixed model.

> "Every farmer should be allowed to decide on his own what to farm. And that's where the conflict comes in. A cattle farmer and then predatory game—that simply does not work!" (Stakeholder group "agriculture").

Though most farmers pursue business management goals of increased revenue, their individual interests to achieve this diverge. Livestock farmers are mostly interested in the intensive control of wildlife populations to keep livestock and young wild herbivores safe from predators and to reduce the financial burden from wildlife-caused infrastructure damage. Contrary to this, wildlife farmers are rather interested in growing wildlife populations for hunting and tourism purposes. These positions can result in conflicts, especially among farmers whose farms are located adjacent to one another.

3.3. Fundamental Moral Values

In contrast to conflicting interests over resource utilization, stakeholders were found to clash over diverging moral values of what is right or wrong. This perspective is a more fundamental one than the discussion of tangible interests as before [37]. In the current study, conflicts that stem from differing values can be found in (i) traditional views on the right to access land and the importance of livestock, (ii) the role of hunting for conservation purposes and (iii) the prevailing problem of poaching.

The first example takes up the aforementioned issue of increased resource pressure in conservancies due to migrating people and livestock from neighboring areas. As communal land in Namibia is state property by definition, no one can be denied access to this land. Hence, communal conservancies have no legal power to regulate the access to their area and to the use of local resources. While they wish for these rights to be recognized, based on the model of the freehold area legislation, communal farmers from outside the conservancies regard communal land in general as common property, which is free to be used by anyone.

> "There is this belief system […] that the land is open, it belongs to all of us. So, […] if I don't have grazing for my cattle, I can move!" (Stakeholder group "conservation").

The second example touches upon a question disputed in conservation science and practice worldwide: the role of hunting for conservation purposes [38]. While many stakeholders in our analysis seem to be in favor of legal hunting activities as these enable actors to generate income from utilizing wildlife, which may result in positive conservation impacts, particular actors differ from this view. These latter stakeholders are primarily NGOs that are not in favor of consumptive use to protect wildlife species or control their population. They consider sustainable co-existence between wildlife and humans as being possible without the need to hunt.

> "There is an international hype around hunting in Namibia [but] fundamental engagement [is] necessary, not hunting!" (Stakeholder group "conservation").

The third example of a conflict of values may be seen in the prevailing poaching activities. While hunting is legally regulated, illegal hunting is condemned by all respondents. Though the number of, e.g., black rhino poaching incidents decreased in the last years in Africa [15], it still constitutes an important challenge for the entire region. The reasons for poaching may be diverse, but essential drivers are seen in prevailing poverty of the local population and a high demand for ivory products in Asia [16,39]. Though illegal hunting of wildlife is highly dangerous for individuals if they are caught, the associated personal benefit for people (e.g., monetary revenue) often outweighs the risks.

> "Some people they go and do poaching because they don't have anything to do. They don't have cattle […]. But the money they can rise it is not like millions per year." (Stakeholder group "conservancy").

3.4. Knowledge Validity

The third type of conflict to be distinguished here builds upon contrasting perspectives on the validity of certain knowledge items by different stakeholders. Conflicts of this category are characterized by actors who maintain certain knowledge stocks that are in contrast to one another—both knowledge holder parties insist that their respective knowledge is correct and the other one is not [37]. In this study, knowledge conflicts can be identified in (i) the reason for the presumed increase of the current elephant population and (ii) the necessity to adapt to climate change.

The first example concerns the human–elephant conflict in the study area. Respondents agree that the local population of elephants increased in the last years, but uncertainty exists if it is a relative increase as elephants migrated into the area, or if the population naturally grew because of a positive reproduction–mortality-ratio. In this respect, various estimates of the total population size in the study area exist. Actors insist on their figures to justify their opinions and actions.

> "The farmers are very tolerant compared to other countries, they love elephants, [and do] not [want to] remove all—but they [elephants] are too much." (Paraphrased from noted interview, stakeholder group "National government").

The second example touches upon the recent drought events [40] and how these should be interpreted for future decision-making. While some stakeholders see the drought as a common characteristic of a semi-arid country like Namibia, others perceive it as a clear sign of climate change that necessitates an adjustment of current land management practices.

> "Well, drought, I see it as a challenge but it's actually not a problem caused by humans. We need to live with it. […] Environmental degradation—something humans caused—we can do something about that." (Stakeholder group unions).

Though scientific evidence is limited, data records and model results suggest that multi-annual droughts are likely to become more frequent and severe [41].

3.5. Stakeholder Relations and Socio-Political Procedures

Finally, disputes over human–wildlife interactions sometimes hide disagreements that are more fundamental. These are complex and touch upon the stakeholders' relationships and the arrangements of certain institutional mechanisms [37]. In this study, these conflicts may be found in (i) the societal discourse concerning the land reform process and (ii) the procedures in drafting and designing the Namibian policy framework relevant to human–wildlife interactions.

In the first example, the stakeholders highlighted the controversial issue of land reform that was initiated after independence in 1990 [42]. The process involves the fair and equitable redistribution of freehold land to "previously disadvantaged landless Namibian citizens who do not own or otherwise have the use of agricultural land or adequate agricultural land" [43] (p. 8). In this regard, the government makes use of its right of first refusal when freehold farmers sell their property. These large properties of several thousands of hectares are either directly used by communal farmers as grazing area, or these properties are subdivided into smaller plots and sold to 'resettlement farmers' who farm their allocated portion of land. Respondents state that the entire public debate around the land reform process creates disputes between the freehold farmers and the communal or resettlement farmers. While some freehold farmers see their survival threatened by an unjustified claim for their land, some communal farmers perceive the unequal current distribution of land as one of the root-causes of the prevailing social-ecological crisis. This conflict specifically touches upon the direct relations between Black and White farmers against the background of the country's colonial history [44]. In these conflicts, wildlife can be regarded as a surrogate that is often the object of disputes, while the core conflict stems from the land reform process.

Associated to these relational conflicts, disputes over the opportunity of stakeholders to participate in decision- or policy-making processes are a second example. This category of conflicts deals with contrasting opinions on socio-political procedures, especially on those for which actors have diverging opinions on the required degree of involvement. In the current study, respondents identified the development of national policies and legislations that touch upon conservation and HWC. While Namibia's legislation and policy framework can be regarded as extensive [14], which is shared by most respondents, criticism was brought forward by stakeholders on the drafting process of policies such as the current HWC policy and the current revision of the Nature Conservation Ordinance. In these processes, stakeholders do not feel that they are adequately represented; for instance, time slots provided for feedbacks are considered too narrow.

> "We are not really involved enough. They only come to us when we have to sign off or when we are to approve it. […] And I don't think that what we say is going to make a lot of changes to it. Because we only have one day to review the draft. What are we going to do in one day? […] It is really not enough time." (Stakeholder group "conservancy").

This triggers conflicts among stakeholders who see themselves as being disadvantaged in the process of policy design. Hence, conflicts of this kind are particularly rooted in the power constellations within the Namibian policy arena.

3.6. Conflict Management Strategies

Based on the qualitative results, the first narrative that could be carved out supports a clear distinction between human land uses for settlement and economic activities from land uses for nature conservation.

> "Elephants [belong] in the park but not on a farm!" (Stakeholder group "agriculture").

The idea builds on the recognition that both objectives are valid in themselves, but as soon as they spatially overlap, a trade-off that does not lead to optimal solutions for both

sides occurs. While this overall idea is reasonable and corresponds to conventional nature conservation approaches, contrasting viewpoints can be identified therein.

Respondents indicated the necessity to expand the existing (state-)protected area network in order to better accommodate wildlife species, to contribute to biodiversity conservation and to reduce HWC incidences. In practical terms, this takes up the long-debated idea of expanding Etosha National Park in a westward direction to connect it with coastal national parks [45]. This would prohibit any other land uses than purely protective schemes in this area. In line with this idea is an expansion of the buffer zone surrounding Etosha National Park, especially to the south and to the west. This would impair farmers in their free land-use decision as legal buffer zones prohibit livestock farming.

Contrasting to the wish to expand conservation areas, respondents indicated the need to continue livestock farming with a focus on beef production. This requires physical infrastructure (e.g., electrified game-proof fences) to protect the farms from those predators and herbivores that might have a negative influence on grazing and water resources as well as livestock health. Hence, exemplary ideas of building a fence between the freehold area in the east and the conservancies in the west were presented, in order to block elephants from their west–east movement. Similar ideas were expressed with respect to the northern boundary fence towards Etosha National Park with demands towards the government and the park administration to upgrade and maintain the existing fences. In addition, strict population control measures such as translocation of elephant herds and higher hunting quotas were supported.

The qualitative results also shed light on viewpoints that differ from the above-mentioned narrative. Supporters of that advocate alternative livelihood strategies away from the dominance of livestock farming towards the utilization of wildlife resources or other farming activities (e.g., backyard gardening, poultry). The major reasoning behind this is the recognition that livestock farming may not be considered a suitable strategy in the face of climate change and more frequent droughts. As wildlife is said to be better adapted to dryness, respondents assumed that it would provide more benefits in the long-term than livestock farming.

In the case of freehold farmers, economic incentives are slowly taking effect in adopting a wildlife-based management scheme. However, it is presumed that in economic terms, this may not be a feasible strategy for the entire area due to the insufficient number of tourists and the high demand for beef. In communal areas, the shift in mindsets for such a transition is slowly gaining momentum, meaning that people do not just want larger livestock herds as a societal symbol of wealth and status.

4. Discussion

Our exploratory research confirms the observations from Young et al. [22] and Redpath et al. [21]: human–wildlife interactions can essentially be broken distinguished into actual human–wildlife impacts and human–human conflicts. On the one hand, our respondents clearly report on damages as a result of direct confrontations between people and animals. On the other hand, it turns out that most of the conflicts in human–wildlife interactions can be traced back to disputes between societal stakeholders. These are rooted in interests, moral values, knowledge, societal relations and socio-political procedures that are projected onto wildlife. In the following, we intend to explore options for managing human–wildlife interactions and for assessing conflict situations between stakeholders using the ecosystem services–disservices approach.

4.1. Managing Human–Wildlife Interactions

Considering our insights into human-wildlife interactions, we see that sharing a landscape and its resources with wildlife is a challenging task, as evidence suggests from around the world [18,46]. The qualitative exploration of this topic for the Namibian context confirms this, despite the country's extensive policy framework that evolved over the

past decades [12,47]. Based on the material collected, human–wildlife impacts occur particularly between stakeholders and elephants, lions, hyenas and leopards. These findings are in line with previous studies [17,48] and the overall problem diagnosis in the current National Policy on Human Wildlife Conflict Management [47]. Our respondents proposed solution strategies for managing human–wildlife impacts that follow a 'separation' or 'co-existence' narrative. While the first suggests a clear separation of areas reserved for nature conservation or human utilization, the second proposes co-existence where humans and wildlife share a landscape. Both narratives can be associated to prominent paradigms in rangeland science, where 'separation' corresponds to conventional conservation approaches and 'co-existence' is rather an expression of resilience theory [49,50]. The latter assumes that the overall resilience of the social-ecological system will be enhanced, when wildlife is adequately integrated into the landscape alongside human activities [51]. The co-existence idea may be realized in practical terms via a corridor approach in which the animals can follow their natural movement patterns to a certain extent [52], while those people affected negatively by them (ecosystem disservice) are being compensated for damages or encouraged to make use of prevention measures. Overall, the corridor idea would require a landscape approach with a multi-stakeholder platform to make decisions. Mistrust among farmers due to various reasons may, however, render required de-fencing activities as a huge challenge. Furthermore, people living in communal areas need to obtain more benefits from wildlife to accept this approach for which more effective benefit-sharing mechanisms within communities may be targeted [14].

4.2. Ecosystem Services–Disservices Ratios

Our views into human–wildlife impacts and stakeholders' interests, moral values, knowledge, societal relations and socio-political procedures show that human–human conflicts feed into people's attitudes towards wildlife. Various authors have described these varying attitudes with different terms such as 'tolerance' [23] or 'level of hostility' [24]. Here, we intend to build upon these scholarly works and take a systemic perspective to conceptualize conflicts as an outcome of the interaction of elements (wildlife and societal actors) within a social-ecological systems. We propose that the dynamic perceptions of wildlife as either ecosystem services or ecosystem disservices can provide a valuable entry point for quantitative studies. In the following paragraphs, we provide a hypothetical example from our study for illustration.

The SES framework by Mehring et al. [27] takes the societal and natural subsystems to be coupled by two essential relations of 'management' and 'ecosystem services and disservices'. It hence puts more emphasis on temporal dynamics of reproducing incentives for action to enhance/maintain well-being. While the term 'management' refers to intentional and unintentional societal actions which alter ecosystem conditions, 'ecosystem services and disservices' depict the 'end points of nature', which societal agents can utilize for their well-being, as Boyd and Banzhaf [53] phrased it. Both subsystems are embedded in larger-scale contexts of, e.g., policies, traditions and economies on the one hand and, e.g., climate, hydrology and geology on the other hand [27].

The cyclic mechanism of 'management' and the returning flow of 'ecosystem services and disservices' are controlled by dynamic institutions, practices, knowledge and technology. While the SES framework from Mehring et al. [27] primarily serves to organize knowledge and to foster mutual understanding of a system's complexity among stakeholders, it can also be formalized to serve as an analytical model of human–nature interactions. In this respect, Figure 2 intends to adapt the generic SES framework to the current case of human–wildlife interactions and resulting conflicts.

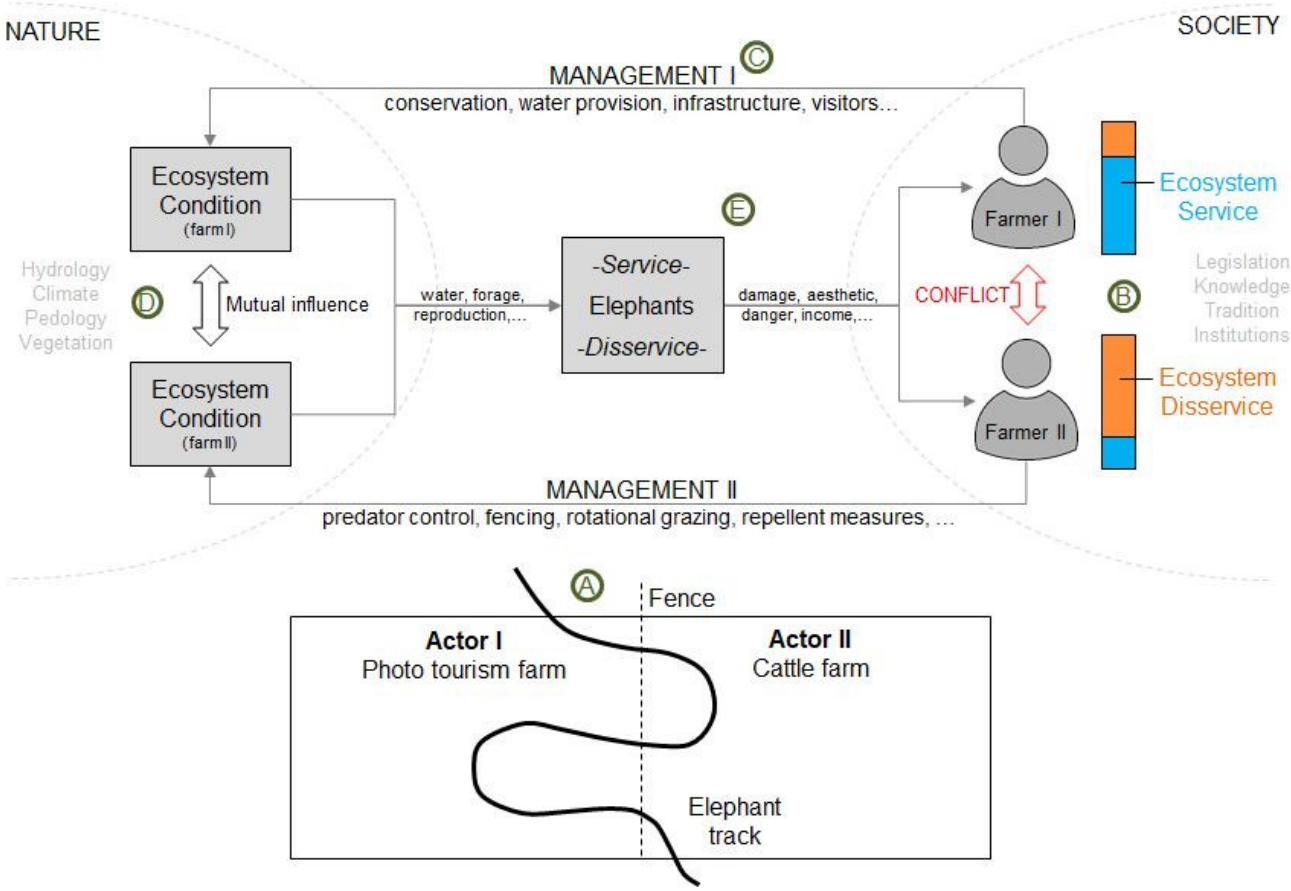

Figure 2. Conceptualization of how conflicts between stakeholders emerge due to diverging views on elephants as either ES or ESD. Adapted from [27].

In order to shed light on how conflicts over wildlife among societal parties emerge, we provide an example that may be found in our study area. Let us assume that two neighboring farmers (Actor I and Actor II) share a certain area (A) which is populated by migrating elephants. Actor I recently switched to photo tourism and abandoned cattle farming as recent drought years diminished regular economic returns. Actor II, however, continues cattle farming as most farmers currently do in the region. Overall, both farmers hold a certain knowledge of how human–nature interactions are structured and both are embedded in larger-scale contexts of the Namibian legislation, certain traditions and institutions (B). Each farmer manages his/her farm in a way that subjectively enhances local ecosystem conditions (C) in favor of their personal (economic) targets. Though both farms share the same overall climatic, hydrological and geological conditions (D), the individual ecosystem conditions that are aimed for by the farmers will mutually influence each other (e.g., via micro-climate alterations, changes in groundwater levels due to water abstraction practices and the ecosystem attractiveness for migratory wildlife). In essence, each farmer manages his/her ecosystem plot in a way to maximize personal 'ecosystem services' and minimize 'ecosystem disservice' (E). It is important to note that both farmers are likely to receive services and disservices from elephants simultaneously, but based on a farmer's (economic) target, the 'service' character of elephants may outweigh the negative 'disservice' aspects, or vice-versa. While the photo tourism farmer may suffer from elephant damage, this negative impact may not be considered significant as the benefits from gaining tourism revenue outweigh it. In a similar manner, a cattle farmer may experience personal satisfaction in viewing elephants or knowing that they exist. This service, however, does not outweigh the disservices the farmer receives due to damage to fences and water infrastructure. As a result, the Ecosystem Services–Disservices Ratio (ESDR) of

the two farmers do not match, leading to a conflict between them. Would they have the same or at least similar ESDRs, conflicts would be less likely.

In a similar manner, conflicts between stakeholders over predators such as lions, hyenas and leopards could be explored using ESDRs. In contrast to elephants, the disservices perception by certain actors is primarily caused by predators threating livestock and human lives. Both communal citizens and livestock farmers are likely to have a stronger disservices perception than stakeholders who obtain (economic) benefits from having predators around, especially for tourism purposes.

We hypothesize that conflicts between stakeholders in human–wildlife interactions emerge between societal actors, as their individual Ecosystem Services–Disservices Ratios do not match. While both parties experience services and disservices from wildlife simultaneously, their subjective perspectives, rooted in interests, moral values, knowledge, relations and institutions may lead to 'net positive' or 'net negative' ESDRs. When these ESDRs differ strongly among the actors, conflicts can emerge.

5. Conclusions

This study qualitatively explored the conflicts in human–wildlife interactions in Namibia's Kunene Region in order to gain an understanding of how these conflicts can be depicted in a social-ecological system. Our results indicate that the notion of ecosystem services and ecosystem disservices may be an applicable way of understanding conflicts in a theoretical way. It enables us to contextualize activities of actors on the ground and in the Namibian policy arena as they have certain attitudes towards nature's components (e.g., elephants) as either services or disservices. When stakeholders' attitudes towards nature's components are not aligned—conceptually framed as Ecosystem Services-Disservices Ratios—conflicts over wildlife emerge. Our research explicitly takes up insights from previous studies such as Carter et al. [25], Dorresteijn et al. [54], Ceaușu et al. [28], Redpath et al. [55] and Dickmann [24] and further develops the conception of how ecosystem services and disservices perceptions may lead to biodiversity conflicts. Further research needs to evaluate our theoretical hypothesis in an empirical setting in order to give additional insights and a deeper understanding of its applicability in other regional settings and for different wildlife species.

Against the background of the COVID-19 pandemic, future research should particularly focus how severe systemic shocks threaten the resilience of such socio-ecological systems, policy success and the future of hard-won conservation partnerships. For years, most wildlife farmers in Namibia and many other African countries were forced to jeopardize their contribution to biodiversity conservation since wildlife, as an economic commodity, is primarily financed through tourism [56]. Lacking tourism-generated income creates additional and unforeseen mismatches in the perceptions of ecosystem services and disservices and changes the activities of various stakeholders. Now, the photo tourism farmer perceives elephant damage as a disservice. Wildlife farmers may switch back to livestock or charcoal production, even against their opinion. Therefore, pandemic-like shocks can potentially be regarded as tipping points. Research and policy are required to increase the resilience of these systems, e.g., via the development and implementation of new landscape approaches with multi-stakeholder platforms.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy concerns.

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