



OPEN ACCESS

EDITED BY

Chiedza Ngonidzashe Mutanga,
University of Botswana, Botswana

REVIEWED BY

Gaseitsiwe Masunga,
University of Botswana, Botswana
Boyceen Mudzengi,
Great Zimbabwe University, Zimbabwe

*CORRESPONDENCE

Power Mupunga
✉ mupungapower@yahoo.com

RECEIVED 26 October 2023

ACCEPTED 22 April 2024

PUBLISHED 13 May 2024

CITATION

Mupunga P and Shoko J (2024) Local
community perceptions on human wildlife
interactions in the face of climate variability. A
case of Nyaminyami community, Zimbabwe.
Front. Sustain. Tour. 3:1328510.
doi: 10.3389/frsut.2024.1328510

COPYRIGHT

© 2024 Mupunga and Shoko. This is an
open-access article distributed under the
terms of the [Creative Commons Attribution
License \(CC BY\)](#). The use, distribution or
reproduction in other forums is permitted,
provided the original author(s) and the
copyright owner(s) are credited and that the
original publication in this journal is cited, in
accordance with accepted academic practice.
No use, distribution or reproduction is
permitted which does not comply with these
terms.

Local community perceptions on human wildlife interactions in the face of climate variability. A case of Nyaminyami community, Zimbabwe

Power Mupunga* and Joseph Shoko

Department of Wildlife Ecology and Conservation, Chinhoyi University of Technology, Chinhoyi, Zimbabwe

Human interactions with wildlife, both positive and negative, have defined the nature of human wildlife relations throughout history. Along with human wildlife interaction, Climate change exacerbates the complexity and consequences of human wildlife interactions, particularly those that rely on flora and fauna for tourism and development. This study assesses the interrelatedness and causes of human wildlife interactions and climate variability and the impact they have on livelihood. Two hundred and fourteen people randomly selected from four wards in the Nyaminyami community in Mashonaland West, Zimbabwe were interviewed. Four focus group discussion sessions with randomly selected residents were also conducted in each ward. Results from the study show that respondents were concerned that human wildlife interactions resulted in human wildlife conflict, and that anthropogenic factors contributed immensely to an increase in the problems faced by local communities. Most of these concerns stemmed from specific areas (wards) where factors such as competition for resources, settlement in wildlife corridors, agricultural activities, tourism and increasing human induced climate change are accelerating human wildlife conflict. Results also show that human related practices contributed to human wildlife interaction in all the four wards. Discussants reported climate change, competition over resources and living close to protected areas as the major factors influencing human-wildlife conflict. It is recommended that communities be educated on, and need to embrace climate change and adapt to it. It is also important that any tourism ventures in the district involve the communities so that they directly benefit from and see the value of living with wildlife and learn to coexist. Proper land use planning is also paramount before any settlements are allocated to avoid living close to protected areas.

KEYWORDS

climate change, coexistence, human wildlife conflict, land use planning, protected area, wildlife damage, problem animals

1 Introduction

Human interactions with wildlife, both positive and negative, have defined the nature of human wildlife relations throughout history (Nyhus, 2016). Protected areas have been one of the main tools for maintaining and improving biodiversity conservation (Geldman et al., 2013; Watson et al., 2014; Pringle, 2017). However, there are always tensions between wildlife conservation and the development of communities adjacent to protected

areas (Sanderson and Redford, 2003; Ferraro et al., 2011). This is mainly because the establishment of protected areas (although not happening at a large scale now) deprived communities of their natural resources and restricted agricultural activities, suggesting that to conserve ecosystems and wildlife, communities have to sacrifice economic opportunities (Brockington et al., 2008; Barua et al., 2013; Ma et al., 2019). This is true when communities are not involved and are not part of decision making processes in wildlife related activities, making them not to be pro-conservation. Moreover, wildlife often moves out of protected areas and enter communities causing human wildlife conflict (Manfredo and Dayer, 2004; Treves et al., 2006), and the costs that wildlife impose upon people include crop raiding, livestock depredation, human attacks as well as opportunity and transaction costs (Barua et al., 2013). Those communities who suffer economic, social and health losses will in turn become hostile to wildlife and conservation efforts to an extent of killing wildlife in revenge (Madden, 2004; Dickman, 2010).

According to Estes (2012) increased anthropogenic activities close to the protected areas influence the magnitude and intensity of the human wildlife interaction. Both humans and wild animals face new challenges for survival because of competition for limited space, but also due to threats from the impacts of rapidly increasing climate change (Nyhus, 2016). People compete with wildlife for food and other resources such as water and space. These interactions between wildlife and humans in the context of tourism constitute a complex socio-ecological system in which both humans and wild animals can be affected positively and negatively. While opportunities abound for communities to uplift their livelihoods and standard of living through tourism which is largely wildlife based, challenges that come with such opportunities are not to be neglected, and these have largely been attributed to changes in climate and human wildlife conflict (Stone and Stone, 2020). Specific challenges include loss of life for both human and wild animals, injuries and properties damage to humans and crop destruction (Barua et al., 2013).

Human wildlife interaction is a broad and complex subject due to the increasing populations of both people and wildlife. Human wildlife interactions vary on a continuum from positive to negative, in intensity from minor to severe, and in frequency from rare to common (Nyhus, 2016). Human wildlife interaction can be defined as a neutral term referring to any encounter between people and wildlife (Gross et al., 2021). When the interaction between humans and wildlife becomes negative it is called human wildlife conflict (HWC). Human wildlife conflict refers to the struggles that arise when the presence or behavior of wildlife poses actual or perceived direct and recurring threats to human interests or needs (Gross et al., 2021). Adams and Hutton (2007) defined HWC as any interaction between humans and wildlife that results in negative impacts on human social, economic or cultural life, on the conservation of wildlife population, or on the environment. Brockington et al. (2008) also defines HWC as the interface between humans and any forms of undomesticated animal that result in damage, injury or death of both. Madden (2004) opines that HWC occurs when the needs of both humans and wildlife negatively impacts each other. Thus, HWC is a form of interaction which happens when

the actions of humans or wildlife have an adverse impact on the other.

HWC can degenerate from an interaction where shortage of food to wild-animals within their habitats naturally force them to migrate to community lands to feed on crops cultivated by local people who live close to protected areas. The growth of human populations in many developing countries continue to influence the extent of human wildlife interaction. Thus, as human settlements encroach into wildlife habitat, competition for shared natural resources arises and HWC emerges as a threat both to people and wildlife that rely on these resources for their survival. According to Shilongo et al. (2018), conflict between wildlife and humans undermines their mutual wellbeing and increasingly threaten the conservation of many other species involved throughout the world. HWCs are most intense interactions between humans and wildlife in developing countries where the majority of the populations live in rural areas which are mostly characterized by livelihoods centered on agriculture, that is growing of crops and rearing of livestock (De Boer and Baquete, 1998; Anand and Radhakrishna, 2017). Thus, HWC is a recognized occurrence as a result of a relationship between wild animals and people.

There are controversial arguments about whether and how tourism development mitigates negative human wildlife interaction in communities close to protected areas. Some studies endorse that tourism benefits that accrue to local residents can raise villagers' environmental awareness especially, to do with human wildlife interaction and increase their tolerance of wildlife (Frank, 2016) and possibly enhance their traditional livelihood (Wunder, 2000).

It is evident that local communities do not get enough benefits from protected areas and in particular from wildlife resources and other wildlife related economic enterprises. Understanding the benefits and costs of conservation to people living within or adjacent to protected areas is fundamental to balancing both conservation goals and human needs (Naughton-Treves et al., 2005; Bruyere et al., 2009; Karanth and DeFries, 2010). Protected area-related benefits include employment opportunities from tourism, ecotourism benefits, access to protected area resources such as grazing land, thatching grass, water sources as well as support for community development projects (Mkonyi, 2021). People living close or adjacent to protected areas interact with ecotourism as a source of revenue to support protected areas and local communities (West et al., 2006). However, the same ecotourism may lead to undesirable social, cultural and economic consequences such as conflict with wildlife, changes in land use and land tenure rights (Bookbinder et al., 1998). Protected areas in Zimbabwe such as Matusadona National Park, are also somehow influenced by human activities from people living around the park, and the wildlife are being affected negatively as a result of the interaction. It is from this perspective that it becomes imperative to understand the cause and effect of human interaction with wildlife and the related tourism ventures in the face of changing climatic conditions. The objective of the study was therefore to understand the local people's perceptions on human wildlife interaction in the face of climate change in the Nyaminyami community. The specific objectives were to assess the interrelatedness and causes of human wildlife interactions and climate variability and, the impact they have on community livelihood.

2 A brief literature review

2.1 Human wildlife interaction and climate change

Climate change is one of the most important threats facing people and wildlife in their interaction, and has attracted considerable attention from researchers in every discipline, including biodiversity conservation (Mushawemhuka et al., 2022). Due to population increase of both humans and wildlife, land use and land cover as well as ecosystems are changing. Efforts to conserve the growing wildlife populations and balance it with growing human population will present some challenges in the future (Mkonyi, 2021). The rapidly increasing and aggressive climate change has an influence on human wildlife interactions because the changing climate brings about changes in ecosystem functioning. These changes in ecosystem functioning will in turn influence the nature and severity of human wildlife interaction.

The effects of human-induced global warming, for example, green-house gases are happening now, and are irreversible for people alive today and will worsen as long as humans add greenhouse gases to the atmosphere (Smith and Fitchett, 2020). The effects are occurring in the form of displacement of wildlife, water scarcity, reduced recreational capacity and huge stress on biodiversity (Saarinen, 2014). The severity of the effects caused by climate change on human and wildlife interaction largely depend on the type and intensity of human activities (climate.nasa.gov). Therefore, the impacts of climate change on different sectors of society are interrelated.

Climate change has also impacted areas that rely on flora and fauna for tourism and development (Dube and Nhamo, 2020). This is due to extreme temperatures giving rise to frequent drought and thus decreased biodiversity and health of plant and animal life. Changes in climate could potentially have a negative influence on tourism through the deterioration of flora, fauna and hydrology (Dube and Nhamo, 2020; Mushawemhuka et al., 2022). These climatic changes and the associated threats to the Zimbabwean wildlife-based tourism sector are influencing human wildlife interaction due to the increased severity and frequency of droughts, heatwaves, tropical cyclones and floods. Understanding human wildlife interactions and balancing them with wildlife tourism as an industry in the face of the ever-increasing effects of climate change needs special attention, and focus should be finding solutions to deal with the challenges emanating from it. Climate change has been thought to have great influence on human wildlife interactions in rural communities in Zimbabwe, with negative consequences. Meanwhile, lack of enough or few benefits from tourism and low community participation in tourism related activities for local residents has further worsened the communities' attitudes toward wildlife conservation (Mutanga et al., 2016).

2.2 Community based natural resources management and human wildlife interaction

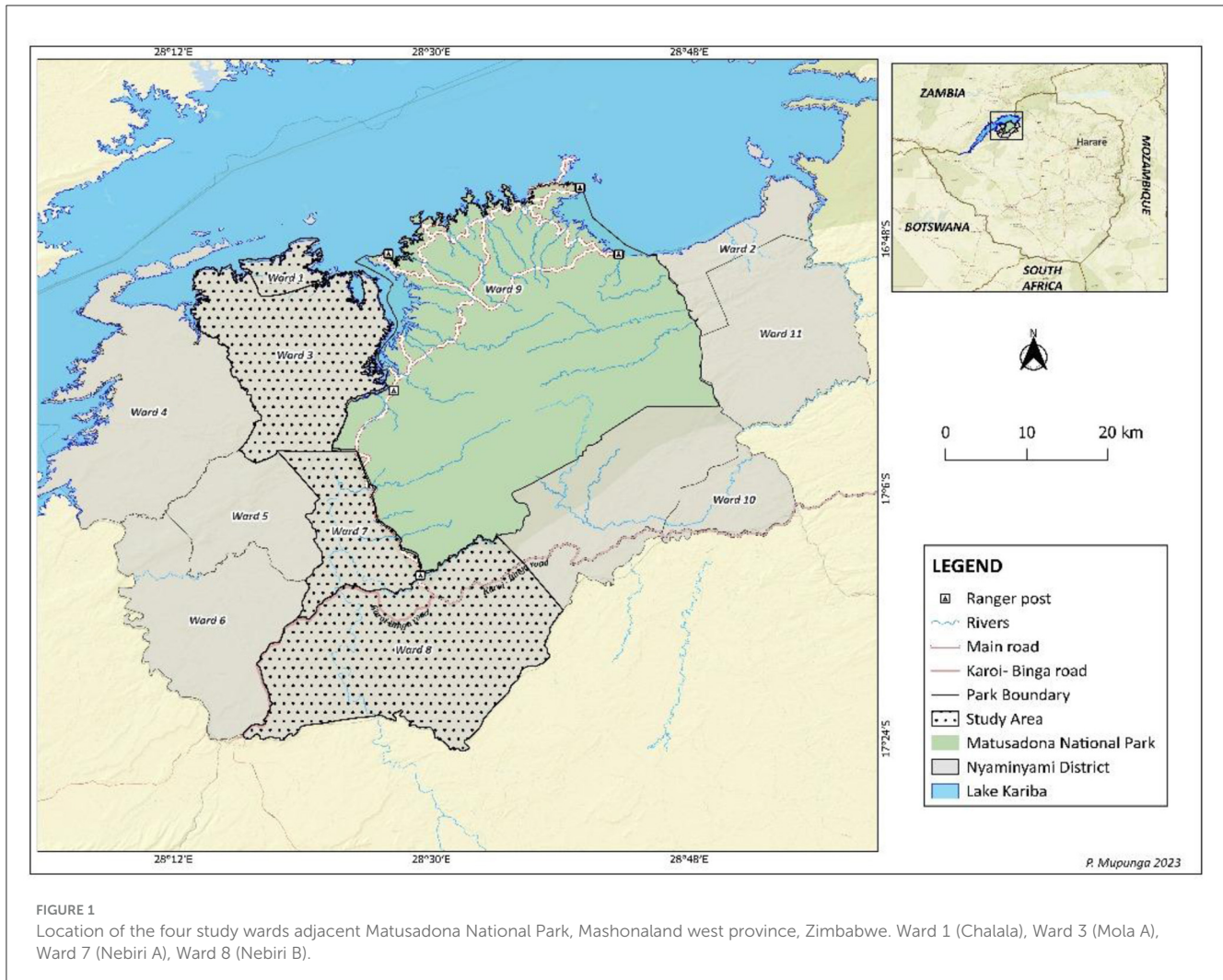
The Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) initiative is Zimbabwe's main

Community Based Natural Resources Management (CBNRM). The programme, which was launched in the late 80s on communal lands adjacent to protected areas was considered to be one of the key initiatives adopted to ensure that there was no conflict between economic survival of agricultural communities and the foraging needs of wild animals (Wolmer et al., 2004) while generating considerable income, benefits and promoting conservation as well as empowering local communities (Child, 2000; Murphree, 2009). The CBNRM initiative was adopted by other countries (Botswana, Malawi, Mozambique, Namibia and Zambia) within the region as it was based on the principle that land and natural resources should be managed by those people who live with and depend on them. However, the Zimbabwean CAMPFIRE was aimed at integrating biodiversity conservation and rural development through the commercial use of wildlife resources communities living close to protected areas (Child, 2003). CAMPFIRE has been recognized as one of the most innovative CBNRM initiative in the world because of the perceived success in directing policy and rewards to poorer people (Balint and Mashinya, 2006). However, studies and experiences echo a decline in the effectiveness and performance of CAMPFIRE (Gandiwa, 2014). CAMPFIRE programs went through a period of intense development during the 1990s and have inevitably suffered from the recent crisis in the country; however, in that first decade, there were some important signs of success but also some considerable difficulties (Fischer et al., 2011). Between 1989 and 2003, the CAMPFIRE program was funded by numerous international donors, in particular, the United States Agency for International Development (Mapedza, 2009). Funding for CAMPFIRE programs was withdrawn after 2002 following the fast track land reform processes, and this led to local communities relying on money raised from wildlife-based projects in their communities; hence, the decline in benefits accrued (Balint and Mashinya, 2006). Nyaminyami Rural District Council was one of the first districts to acquire appropriate authority (AA) status and were given control over wildlife resources existing, with some policy guidelines providing for further devolution to sub-district administrative groups such as wards (Harrison et al., 2014). However, further devolution to the village or ward level did not happen in the study area, thus limiting the achievement of the original CAMPFIRE objectives and threatened its long term objectives. The Nyaminyami community therefore lack the incentive for participating in natural resources conservation particularly wildlife, leading to hostile attitudes as they interact with wild animals.

3 Methods and materials

3.1 Study area

The study was restricted to the communities living adjacent (within a 20 km zone from park boundary) Matusadona National Park (MNP) in Nyaminyami Rural District Council in Kariba district of Mashonaland West province of Zimbabwe. The four wards namely Chalala (ward1), Mola A (ward 3), Nebiri A (ward 7) and Nebiri B (ward 8) were purposively selected for the study (Figure 1). The distance from the park boundary across the four study wards divided into zones 5–10 km, 10–15 km, and 15–20 km. The selection was based on (i) the existence of



communities living close or adjacent to an unfenced protected area, and close to Lake Kariba, (ii) the existence of wildlife including big dangerous game which roam around freely, and (iii) the existence of community based natural resources management program, CAMPFIRE in particular which is meant to benefit the community.

The area lies in a semi-arid rocky and hilly ecosystem and supports a variety of large herbivores species which include elephant (*Loxodonta africana*), hippopotamus (*Hippopotamus amphibious*), buffalo (*Syncerus cafer*), plains zebra (*Equus quagga*), waterbuck (*Kobus ellipsiprymnus*) among others. The area also has a variety of large carnivores such as lion (*Panthera leo*), leopard (*Panthera pardus*) and spotted hyena (*Crocuta crocuta*). The communities rely on rain-fed subsistence agriculture, growing drought resistant small grain crops. The main crops grown include sorghum (*Sorghum bicolor*), pearl millet (*Pennisetum glaucum*) and to a lesser extent maize (*Zea mays*). The dominant ethnic group in the study area is Tonga. Traditionally the Tonga people are known for being fishermen, but subsistence agriculture also forms part of their livelihood.

3.2 Data collection

The study adopted a mixed methods approach within a case study framework to gather data on the nexus between human wildlife interactions and climate change in Nyaminyami rural district council community, Zimbabwe. Four wards (Chalala ward 1, Mola A ward 3, Nebiri A ward 7 and Nebiri B ward 8) were purposefully selected in the Nyaminyami RDC area for data collection. The total population size for the four wards was 15,113 comprising 3,896 households (Zimbabwe Statistics, 2022). However, since the study area only covered part of the four wards (within 20 km zone from the protected area boundary), the number of households found within the study area was estimated using the traditional Chiefs' registers and was $\pm 1,200$ households. To select respondents for the interviews, two sampling techniques were adopted. Firstly, methods outlined by Creswell (1998, p. 65, 113) and Boyd (2001) were followed. The choice was based on the fact that these four wards experience wildlife movements, human wildlife interaction and encounters with dangerous game species. Therefore, the selection was made purposefully, considering the

TABLE 1 Survey questions asked and the option answers available.

Questions	Possible answers
What do you do when you come across with wildlife?	No action/report/not sure
Have you had any experiences with wild animals in your area?	Yes/no
Has the experience been a good or a bad one?	Good/bad/not sure
Which animals would you consider problematic in your area?	Open
Do you think human wildlife interaction has increased in your area?	Yes/no/not sure
What could be the cause of increased human wildlife interaction?	Open
Is climate change occurring in this region?	Yes/no/not sure
What could be the extreme events that you would associate with CC?	Open
What are the threats from CC and how do you think they can be avoided?	Open
How do you think the extreme events from CC influence HWI?	Open

presence of agricultural activities, dangerous game species as well as human-wildlife interaction. Secondly, all targeted households were randomly selected.

The study targeted 300 household heads or any adult aged 18 years and above in the absence of a household head. A total of 214 local residents comprising 138 (64.5%) men and 76 (35.5%) women were interviewed. These were randomly drawn from the four wards (ward 1: 49 households, ward 3: 58 households, ward 7: 53 households, and ward 8: 54 households). The interviews were conducted from February to September 2022 to gather information on human experiences with wildlife, animals involved and the resultant impact to livelihood. Current village registers of the four study wards formed the sampling pool, and households were randomly selected by picking numbers from a hat; the numbers corresponded to the households from each study ward register. Prior consent was sought from every individual before the interviews commenced. A pre-test was done on the staff at Bumi Hills safari lodge which is outside of the study communities to ensure clarity of the questions before the actual interviews. Questions were structured to gather data on the respondents' experiences and interaction with wildlife, problematic animals, and the causative factors to conflicts occurring in their areas (Table 1). Each interview session lasted for about 30–45 min depending on how quick the interviewee comprehended the questions.

The dates for the interviews were communicated in advance to the respondents, and upon arriving in the area, a community leader, mainly the kraal head would be approached and permission to conduct interviews sought. Once permission is granted, a local research assistant would be engaged in order to facilitate the translation into vernacular language which is Tonga for the comfort and benefit of everyone. He would explain the general purpose of the study and assured every one of the confidentiality of the information they would give. It was important to engage a local

research assistant as the participants would feel welcome and understand their own person speaking in their language.

In addition to the structured interviews, four focus group discussions (FGDs) with 20 participants each were conducted following standard procedures (Krueger and Casey, 2000). The group discussion sessions with residents of the selected wards (one at each ward) were conducted during the period January to April 2023. The discussants from each focus group were guaranteed confidentiality so that they would freely discuss and open up as much as possible. A discussion guide was developed in order to guide the discussion throughout to avoid unnecessary questions as well as to avoid digressing from the main purpose of the study. Each of the four discussion groups had 20 participants (broken down into two sessions of 10 men and ten females per ward) including the village heads and their secretaries, giving a total of 80 people involved in the focus group discussions altogether, and there was a ratio of 48 men and 32 women, thus 60 and 40%, respectively. The village heads and their secretaries were very important in the discussion because of their knowledge of the study subject and events happening in their respective wards which would include human wildlife conflict events reported to them. Selection for participants was spearheaded by the village heads using their registers and a set criteria of period of stay within each ward. The period of stay agreed upon was 10 years and above, having suffered/experienced and reported a human wildlife interaction incident to the authorities. The discussions were organized to coincide with weekends so that participants would be available, and each discussion lasted for about an hour on average, but would extend to 1 h 20 min at most. For the benefit of all parties, a local research assistant was tasked to translate the vernacular Tonga language to English and vice versa, and that made easy the communication amongst the discussants. Guided by the questions formulated prior, the discussions touched on issues to do with the presence and types of wild animals particularly big game species and their impact to the ordinary person, factors contributing to heightened perceived human wildlife conflict, nature of conflicts and their meaning to ordinary residents, community projects and community involvement in decision making processes in natural resources management, as well as climate change issues bedeviling their community. Overall, of the 294 total respondents in this study (structured interviews and focus group discussions), 63.3% ($n = 186$) were men while 36.7% ($n = 108$) were women. Of the total respondents, 15.7% ($n = 46$) were in the age range 18–29, 27.2% ($n = 80$) were in the age range 30–39, 36.7% ($n = 108$) were in the age range 40–49 while 20.4% ($n = 60$) were 50 years and above.

3.3 Data preparation and analysis

Data on human wildlife interaction and the associated impact on livelihood were prepared using two methods. First was the recording of the total number of negative conflict incidents recorded or reported to determine human wildlife conflict. Secondly, extraction of data on wildlife species involved in the interaction and conflict with humans was also done and compared across the four communities. Simple descriptive statistics were used to summarize responses from both focus group discussions

and interviews. The thematic content analysis method was used to analyse qualitative data in this survey. According to Anderson (2007), thematic content analysis provides a descriptive presentation of qualitative data and portrays the thematic content in interview transcripts (or other texts) by identifying common themes in the texts provided for analysis. Key informant data were also descriptively analyzed using thematic analysis. Regarding proposed solutions to the issues raised, the participants' views were put into three categories: negative, positive and neutral. A Likert scale of 1–5 ranking was also used to analyse responses of nature and extent of human wildlife interaction where: (1) *strongly disagree*, (2) *disagree*, (3) *neither agree nor disagree*, (4) *agree* and (5) *strongly agree*.

4 Results

4.1 Nature of human wildlife interaction and the associated impact on livelihood

During the interviews, the respondents were asked for their knowledge and information about human wildlife interaction. Two types of human wildlife interaction were reported to exist in all the four study wards and these are: (i) when the people and their livestock move into the protected areas to access the resources that they need but lack in their areas, and (ii) when animals move from their original habitats into the communal areas either to feed on the crops and livestock or when they move on their normal migrations to their feeding or breeding areas. Respondents also indicated that most of the time the animals either do one or more of the following; injure or kill people, eat or destroy crops in the fields, kill or injure livestock, transmit diseases or disease causing parasites to livestock, and also utilize the grazing resources meant for community livestock.

Majority of the respondents (85%; $n = 214$) reported that they strongly agree that the nature of interaction between humans and wildlife was negative [*Likert scale: (1) strongly disagree, (2) disagree (3) neither agree nor disagree, (4) agree and (5) strongly agree*]. The same respondents also reported that they had experienced some conflict with wildlife one way or the other and admitted having lost some crops and livestock and criticized the authorities for taking a long time to react to HWC incidents. A paltry 15% strongly disagreed that the nature of interaction was not as negative, and they have not had any bad experiences with wildlife interaction, and they applauded and supported the wildlife authorities for reacting to HWC incidents on time during the period 2021 to 2022.

The main livelihood impact caused by the presence of negative human wildlife interaction as reported by the respondents in the study area include crop damage, livestock depredation, killing of wildlife and habitat fragmentation or disturbance by local people. About 70% of the respondents reported to have lost livestock and crops to wildlife without any compensation from the government or the rural district council as the responsible authorities for wildlife. However, the number of people (150) who reported economic losses due to livestock depredation have no association with the number of livestock killed.

Results from this study also show that villagers in all the four wards have lost some goats and cattle to stray lions and hyenas

TABLE 2 Livestock killed per ward (with an average total of USD\$435 for goats and USD\$ 700 for cattle per ward) and the estimated costs in USD.

Ward	Goats killed	Costs in USD	Cattle killed	Costs in USD
1	17	340	1	200
3	28	560	10	2,000
7	30	600	1	200
8	12	240	2	400
Totals	87	1,740	14	2,800

as well as losing crops to elephants and hippos during the period 2021 to 2022. Goats were killed in large numbers (87) because they stray into wildlife area and are not herded during the day, and sometimes not penned at night. Cattle are well taken care of and most people pen their cattle at night. A few that have been killed (14) were not in the kraals hence falling victim to the roaming lions. Livestock losses were experienced in all study wards (Table 2), with respondents reporting that goats were killed in large quantities, as many people own them and they thrive well in the area. This shows how a negative human wildlife interaction exist in the Mola community to the detriment of humans. Losing a cow or so many goats was reported to be a big loss as owning cattle and goats is a form of wealth in communities. For example, the average price of a goat is reported to be USD\$20 and for cattle is USD\$200 per beast.

Losing livestock worth thousands of dollars (\$1,740 for goats and \$2,800 for cattle) in a space of 2 years has a huge impact on the livelihood of a rural population as livestock forms the basis of their wealth and means of survival.

Elephants and spotted hyena had a fairly high frequency in terms of being responsible for interacting and conflicting with people in all the four wards, followed by buffalo, lions, hippopotamus and lastly crocodiles (Table 3). Respondents also indicated that response or reaction time from the responsible authorities in the event of human wildlife conflict incident (negative interaction) was very low and people would resort to chasing the dangerous animals using their own traditional methods. The traditional methods include drumming to make noise, use of fire and vuvuzelas among other methods. The respondents indicated that there is serious need to put in place or improve the response mechanisms for dealing with incidences of human wildlife conflict by the responsible authorities in the study area if not the whole district at large.

Hippopotamus and crocodiles appeared and were mentioned by almost all (95%) respondents in two wards (ward 1 and 3) because these are the wards close to Lake Kariba and they interact with both humans and livestock at the water point. They reported that Hippopotamus also come out at night to graze and sometimes find themselves in human habitation.

Our results also show that the most common methods being used for mitigating negative human wildlife interactions are in the form of finding ways to keep wildlife out of areas with high human population or agricultural density. We also observed from the field visits that the local communities often defend their crops and livestock from wildlife by either fencing using thorn trees

TABLE 3 Common animals reported to be involved in negative human wildlife interaction in the four study communities.

Common name (B)	Scientific name	Ward 1 (Chalala)	Ward 3 (Mola A)	Ward 7 (Nebiri A)	Ward 8 (Nebiri B)
Buffalo	<i>Syncerus caffer</i>		x	x	x
Crocodile	<i>Crocodylus niloticus</i>	x	x		
Elephant	<i>Loxodonta Africana</i>	x	x	x	x
Hippopotamus	<i>Hippopotamus amphibious</i>	x	x		
Lion	<i>Panther leo</i>		x	x	x
Spotted hyena	<i>Crocuta crocuta</i>	x	x	x	x

x represent animal species recorded to be involved in interaction with humans in the four wards.

and branches put right round the fields, or using scarecrows as well as physical guarding of the fields. These traditional methods also include erecting observation platforms, making fires and making noise when animals raid crops. Planting unpalatable and unattractive crops such as sunflower and chili pepper was also reported and encouraged to be another strategy in use to discourage destruction of their food crops. However, it is the market of such crops that discourage communities from growing them as the respondents reported that there were no ready buyers in the area.

4.2 Causes of human wildlife interaction

The major causes of human wildlife interaction in the study area have been found to be the human settlement and agricultural activities in wildlife areas and corridors, deforestation, expansion of arable land into forest areas and wildlife habitats, and poaching. Respondents highlighted that as people lose their crops and livestock, retaliation against the wildlife species involved ensues and resultantly loss of life for both humans and wildlife occur.

Respondents also mentioned the need to introduce compensation and suggested that if there is a policy on compensation it will help out in times of stress and losses particularly losses involving livestock and staple food crops such as maize and sorghum. Loss of human life was generally regarded as irreplaceable, but some funeral assistance in the form of money, some funds to help out with school fees and other related needs in the event of a breadwinner getting killed by wildlife was frequently mentioned during the discussions.

4.2.1 Nature and complexity of factors contributing to human wildlife conflict

Results from the focus group discussions indicated a variety of factors (Table 4) that are contributing to human wildlife conflict in the study area. Results show that in addition to the perceived increasing climate change, human related practices have also contributed to human wildlife conflict in all the four wards. Discussants reported climate change, competition over resources and living close to protected areas as the major factors influencing human-wildlife conflict.

Almost all (92%, $n = 80$) the discussants concerted that resource competition has negatively contributed to human wildlife

TABLE 4 Community factors contributing to HWC in the four study wards.

Community factors	Respondent %	Ranking
Resource competition	$n = 80$ (92%)	1
Weather patterns (climate change)	$n = 80$ (80%)	2
Lake Kariba	$n = 80$ (51%)	3
Settlement in wildlife corridors	$n = 80$ (50%)	4
Living near protected area	$n = 39$ (50%)	4

interaction, while 51% lamented the creation of Lake Kariba as another addition to their problems as the lake harbors more crocodiles than they were in the river Zambezi, and hippos which are a cause for concern for the communities as they access water from the lake. It was discussed that the lake was primarily created for hydro-electric generation, but also for the fishing industry and tourism. Unfortunately, it is viewed as a major contributor to negative human-wildlife interaction, as discussants associate it with the forced removal of local people from their original areas of residence along the Zambezi River, where they lived peacefully without encountering many of the problems they face today. Discussants reported that the people were relocated into the wildlife corridors and game areas where agriculture is almost impossible due to the rugged terrain and erratic rainfall. This they said, has compounded human wildlife interaction with negative impacts as there is now prohibition to access the resources such as fish in the lake.

Approximately 80% of the discussants pointed out that weather patterns have changed from being bad to worse, and to the detriment of Mola communities that rely on rain-fed agriculture. They reported that indeed climate change has affected many aspects of their livelihood in the study area. One aspect of the weather that the local people admitted to was that extreme weather events, such as prolonged dry spells and drought conditions, have increased since 2002. One elderly woman in an interview had this to say, "we think climate change is playing a major role in shrinking wildlife habitats, for example the rise in lake water levels endangers many islands to disappear and therefore will result in either loss of biodiversity or migrating of the animals into human habitation to the detriment of local people." The area under study also experienced some mudslides sometime in 2021 to which the elderly people in the community attributed to a shift in climate and weather patterns.

5 Discussion

Human wildlife interaction in the Mola community is on a trajectory and causing growing frustration as well as negative perception toward wildlife by the communities. Our results show that the surveyed area is affected by negative human wildlife interaction in terms of crop damage and livestock depredation and sometimes injury and death of people because the area is close to close to a protected wildlife area which is Matusadona National Park. This closely agrees with a study done by [Deodatus \(2000\)](#) and [Woodroffe et al. \(2005\)](#) when they asserted that living in close proximity to protected areas imposes costs such as damage to or loss of crops and livestock, and occasionally injury or death of local people. These costs increase as conservation efforts lead to the recovery of animal populations in protected areas, and as human population growth leads to an increase in the proportion of land outside the parks that is used for agriculture ([Richardson et al., 2012](#)). [Mateketsa et al. \(2019\)](#) also confirmed that HWC is a growing problem for communities located at the borders of protected areas.

As is the case with the Mola community, the livelihoods of these communities often involve the direct exploitation of natural resources (e.g., firewood, water, thatching grass etc.), bringing the communities into direct conflict with wildlife and parks authorities. Climate change, settlement in migratory routes, expansion of agricultural activities, have had a significant bearing on the magnitude human wildlife interaction in the area.

Human wildlife interaction has existed for a long time in the Nyaminyami district ([Jeke, 2014](#)), and the Mola community which is found within the district has not been spared. The area experiences wildlife movements as the animals move from Matusadona National Park into the community in search of food leading to human wildlife interaction. This interaction has been perceived to be very negative lately, that is, it has degenerated into serious conflicts. This is due to the conflict that arise as a result of the devastation caused by wildlife to crops and livestock as well as retaliatory killing by people to wildlife. Most local community members consent that the creation of the Lake Kariba has been associated with forced removal of the local people from their original areas of residency and coupled with prohibition of access to resources such as fish in the lake, has further worsened attitudes and perceptions toward wildlife conservation and tourism in the Mola community. This closely agrees with the assertion by [Mombeshora and Le Bel \(2009\)](#), [Fischer et al. \(2011\)](#), and [Borrini-Feyerabend \(2013\)](#); when they argued that evictions of local inhabitants to pave way for protected areas has had challenges with the local people accepting wildlife conservation as a land use option. A study by [Jeke \(2014\)](#) also stated that the construction of Kariba dam has resulted in the submergence of ~5,500 square kilometers of terrain which was largely home to various species of wildlife. Not only did the animals and humans lose their habitat, they also lost rich natural resource base in fertile alluvial soils from the Zambezi river tributaries which then allowed population densities to build up to levels which are high ([Scudder, 2005](#)). The dam therefore consumed much of the land that was available for both humans, wildlife and livestock. This has led to human wildlife interaction

exacerbated currently as human population of local communities and wildlife has grown.

In line with earlier studies on HWC (e.g., [Kideghesho et al., 2007](#); [Tessema et al., 2010](#)), it is also argued that local communities with minimal interaction with wildlife and who experience less costs differ in perception from those with serious interaction. Those with minimal conflicts have good and more positive perception and attitude about their relationship with protected areas. This has also been established by this study where for example about 85% of the respondents criticized wildlife authorities for delayed responses and giving top priority to wildlife when a conflict happens, while about 15% acknowledged that they respond fairly quickly. However, studies by [Mehta and Heinen \(2001\)](#), [Arjunan et al. \(2006\)](#), and [Mutanga et al. \(2015\)](#) show that the level of damage and costs caused by wildlife does not affect community perception toward wildlife and conservation, hence showing the contextual differences among regions and/or countries. Nevertheless, [Redpath et al. \(2013\)](#) points out that the ability of wildlife and humans to coexist depends on the willingness of later to recognize problems as shared ones and to discuss them collaboratively with wildlife authorities.

Our assessment of the current situation in the Mola community was that the impacts of the forced removals were not taken into account when Lake Kariba was created. Management of the Lake does not currently involve local communities and has led to problems emanating from human wildlife interactions which often result in conflicts further creating social, economic, and sometimes political tension amongst community members.

As reported in this study that interactions between people and wildlife have degenerated into hostility and serious conflict as a result of growing populations of both humans and wildlife, as well as in development and effects of increasing climate change. This shows that there has been a shift in weather patterns which also shifted both human and animal behavior which is affecting their interaction in a negative way.

However, as has been found elsewhere ([Osborn and Parker, 2002](#)), these methods only provide temporary respite from the problem, as wild animals such as elephants soon become used to the disturbance and therefore either ignore or move on to an adjacent field and continue with the destruction. According to [Frost and Bond \(2008\)](#), the CAMPFIRE program was established in order to protect wildlife and local people, especially those living close to or adjacent to protected areas, hence fostering the human wildlife interaction. [Logan and Moseley \(2002\)](#), again highlighted that the program was developed to curb environmental problems and to alleviate poverty in rural areas close to the national parks. However, according to the interviewed respondents, it would seem that the CAMPFIRE program was not successful due to several factors. Rampant corruption was one of the factors; one participant explained that they were asked to pay a certain amount of money every month for subscriptions, but nothing fruitful was delivered to the communities from the program.

Human wildlife interactions in the context of tourism can bring about various adaptive ecological and behavioral changes that cause wildlife to become a nuisance and make human wildlife conflict difficult to manage ([Barrett et al., 2019](#)). For example, the emergence of profit driven wildlife tourism in protected areas such as Matusadona has triggered complicity

in relation to human wildlife interaction and has resulted in complete divergence from original conservation principles to profit maximization (Mutanga et al., 2020). The gap can necessarily be bridged by a holistic approach that synthesizes social and ecological perspectives to examine the interactions among tourism businesses, local communities and wildlife conservation, especially more so in the face of ever increasing climate change regimes within the Mola community and the district as a whole.

6 Conclusion

Human wildlife interaction in the study area has negative implications for the communities and their livelihoods since they rely on rain fed crop production and rearing of livestock for subsistence. There is severe emotional trauma and insecurity when a family member is lost to wildlife, especially so when the person is eaten and not accorded a decent burial. It would appear from this study that crop damage, habitat disturbances, livestock depredation, and killings of wildlife (poaching) are the root causes of the negative human wildlife interaction in the study area. This then calls for large scale planning to prevent fragmentation of forests and to even restore connections between disjunct forests in the district in order to reduce the interface between wildlife habitats and people. Equipping some keystone species with satellite location collars may also serve to alert villagers to the seasonal approach of habitual offenders.

Despite the differences in opinion and experiences with human wildlife interaction among the four study communities, our results show that climate change has a role to play in influencing the changing and influencing human wildlife interaction and therefore conflicts. Tourism is also not benefiting the communities fully and can be said to be influencing a change in wildlife behavior which then affect the interactions when they move into communities. Our study, therefore, provides an important lesson to the communities and the district at large: climate change is real, and communities need to be educated about it so they can embrace and adapt to it. It is also equally important that tourism ventures in the communities benefit them so that they see the value of living with wildlife and learn to coexist as they will be drawing some benefits from the wildlife. Conservation awareness, climate change awareness and decision making in tourism ventures are key in the study area. It is also important for the whole district to enhance and improve attitudes toward problematic animal species as well as embracing the changes in climatic conditions.

References

- Adams, W. M., and Hutton, J. (2007). Parks and poverty: the political ecology of conservation. *Conserv. Soc.* 5, 147–183. Available online at: <https://www.jstor.org/stable/26392879>
- Anand, S., and Radhakrishna, S. (2017). Investigating trends in human wildlife conflict: is conflict escalation real or imagined? *J. Asia Pac. Biodivers.* 10, 154–161. doi: 10.1016/j.japb.2017.02.003

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Ethical approval was not required for the studies involving humans because of the nature of the study. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required from the participants or the participants' legal guardians/next of kin in accordance with the national legislation and institutional requirements because a verbal consent was given prior to the research. Ethical approval was not required for the study involving animals in accordance with the local legislation and institutional requirements because it doesn't apply in this type of a study since it is not funded.

Author contributions

PM: Conceptualization, Writing—original draft. JS: Data curation, Methodology, Writing—review & editing.

Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

- Anderson, R. (2007). Thematic content analysis (TCA). *Descript. Present. Qual. Data* 3, 1–4. Available online at: <http://rosemarieanderson.com/wp-content/uploads>
- Arjunan, M., Holmes, C., Puyravaud, J. P., and Davidar, P. (2006). Do developmental initiatives influence local attitudes toward conservation? A case study from Kalakad - Mundanthurai Tiger Reserve, India. *J. Environ. Manage.* 79, 188–197. doi: 10.1016/j.jenvman.2005.06.007

- Balint, P. J., and Mashinya, J. (2006). The decline of a model community-based conservation project: governance, capacity, and devolution in Mahenyé, Zimbabwe. *Geoforum* 35, 805–815. doi: 10.1016/j.geoforum.2005.01.011
- Barrett, L. P., Stanton, L. A., and Benson-Amram, S. (2019). The cognition of nuisance species. *Anim. Behav.* 147, 167–177. doi: 10.1016/j.anbehav.2018.05.005
- Barua, M. S., Bhagwat, A., and Jadhav, S. (2013). The hidden dimensions of human-wildlife conflict: health impacts, opportunity and transaction costs. *Biol. Conserv.* 157, 309–316. doi: 10.1016/j.biocon.2012.07.014
- Bookbinder, M. P., Dinerstein, E., Rijal, A., Clause, H., and Rajouria, A. (1998). Ecotourism's support of biodiversity conservation. *Conserv. Biol.* 12, 1399–1404. doi: 10.1046/j.1523-1739.1998.97229.x
- Borrini-Feyerabend, G. (2013). *Governance of Protected Areas - From Understanding to Action*. Switzerland: IUCN Gland.
- Boyd, C. O. (2001). "Phenomenology: the method," in *Nursing Research: A Qualitative Perspective, 3rd Edn*, ed P. Munhall (Massachusetts: Jones and Bartlett Publishers), 93–122.
- Brockington, D., Duffy, R., and Igoe, J. (2008). *Nature Unbound*. London: Earthscan.
- Bruyere, B. I., Beh, A. W., and Lelegula, G. (2009). Differences in perception of communication, tourism benefits, and management issues in a protected area of rural Kenya. *Environ. Manage.* 43, 49–59. doi: 10.1007/s00267-008-9190-7
- Child, B. (2000). "Making wildlife pay: converting wildlife's comparative advantage into real incentives for having wildlife in African savannas, case studies in Zimbabwe and Zambia," in *Wildlife Conservation by Sustainable Use, Volume 18*, eds H. H. T. Prins, and J. G. Grootenhuys (New York, NY: Springer), 335–387. doi: 10.1007/978-94-011-4012-6_1
- Child, B. (2003). *Origins and Efficacy of Modern Community Based Natural Resources Management (CBNRM) Practices in the Southern African Region*. IUCN.
- Creswell, J. (1998). *Qualitative inquiry and Research Design: Choosing Among Five Traditions*. Thousand Oaks, CA: SAGE Publications, Inc.
- De Boer, W. F., and Baquete, D. S. (1998). Natural resource use, crop damage and attitudes of rural people in the vicinity of Maputo Elephant Reserve, Mozambique. *Environ. Conserv.* 25, 208–218. doi: 10.1017/S0376892998000265
- Deodatus, F. (2000). "Wildlife damage in rural areas with emphasis on Malawi," in *Wildlife Conservation by Sustainable Use*, eds H. H. T. Prins, J. G. Grootenhuys, and T. T. Dolan (Boston, MA: Kluwer Academic Publishers), 115–140.
- Dickman, A. J. (2010). Complexities of conflict: the importance of considering social factors for effective resolving human wildlife conflict. *Anim. Conserv.* 13, 458–466. doi: 10.1111/j.1469-1795.2010.00368.x
- Dube, K., and Nhamo, G. (2020). Vulnerability of nature-based tourism to climate variability and change: case of Kariba resort town, Zimbabwe. *J. Outdoor Recreat. Tour.* 29, 1–12. doi: 10.1016/j.jort.2020.100281
- Estes, R. D. (2012). *The Safari Companion: A Guide to Watching African Mammals*. Chelsea Green Publishing, United States.
- Ferraro, P. J., Hanauer, M. M., and Sims, K. R. E. (2011). Conditions associated with protected areas success in conservation and poverty reduction. *Proc. Natl. Acad. Sci. U. S. A.* 108, 13913–13918. doi: 10.1073/pnas.1011529108
- Fischer, C., Muchapondwa, E., and Sterner, T. (2011). A bio-economic model of community initiatives for wildlife management under CAMPFIRE. *Environ. Resour. Econ.* 48, 303–319. doi: 10.1007/s10640-010-9409-y
- Frank, B. (2016). Huma wildlife conflict and the need to include tolerance and existence: an introductory comment. *Soc. Nat. Resour.* 29, 738–743. doi: 10.1080/08941920.2015.1103388
- Frost, P., and Bond, I. (2008). The CAMPFIRE programme in Zimbabwe: payments for wildlife services. *Ecol. Econ.* 65, 776–787. doi: 10.1016/j.ecolecon.2007.09.018
- Gandiwa, E. (2014). Local people's knowledge and perceptions of wildlife conservation in Southeast Lowveld, Zimbabwe. *J. Environ. Prot.* 5:475. doi: 10.4236/jep.2014.56050
- Geldman, J., Barnes, M., Coad, L., Craig, I. D., Hockings, M., and Burges, N. D. (2013). Effectiveness of terrestrial protected areas in reducing habitat loss and population declines. *Biol. Conserv.* 161, 230–238. doi: 10.1016/j.biocon.2013.02.018
- Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R., and Hilderink-Koopmans, F. (2021). *A Future for All: the Need for Human-Wildlife Coexistence*. Gland: WWF.
- Harrison, E. P., Stringer, I. C., and Dougill, A. J. (2014). *The Importance of the Sub-District Level for Community-Based Natural Resources Management in Rural Zimbabwe*. Centre for Climate Change and Economic Policy (CCCEP) Working Paper Series, 183. UNEP-WCMC.
- Jeke, L. (2014). Human-wildlife coexistence in Omay communal land, Nyaminyami Rural District Council in Zimbabwe. *Mediterr. J. Soc. Sci.* 5:809. doi: 10.36941/mjss
- Karant, K. K., and DeFries, R. (2010). Conservation and management in human-dominated landscapes: case study from India. *Biol. Conserv.* 143, 2865–2964. doi: 10.1016/j.biocon.2010.05.002
- Kideghesho, J. R., Roskaf, E., and Kaltenborn, B. P. (2007). Factors influencing conservation attitudes of local people in Western Serengeti, Tanzania. *Biodivers. Conserv.* 16, 2213–2230. doi: 10.1007/s10531-006-9132-8
- Krueger, R., and Casey, M. (2000). *Focus Groups: A Practical Guide for Applied Research*. London: Sage.
- Logan, B. I., and Moseley, W. G. (2002). The political ecology of poverty alleviation in Zimbabwe's Communal Areas Management Programme for Indigenous Resources (CAMPFIRE). *Geoforum* 33, 1–14. doi: 10.1016/S0016-7185(01)00027-6
- Ma, B., Cai, Z., Zheng, J., and Wen, Y. (2019). Conservation, ecotourism, poverty and income inequality—A case study of nature reserves in Qinling, China. *World Develop.* 115, 236–244. doi: 10.1016/j.worlddev.2018.11.017
- Madden, F. (2004). Creating coexistence between humans and wildlife: global perspectives on local efforts to address human wildlife conflict. *Hum. Dimens. Wildlife* 9, 247–257. doi: 10.1080/10871200490505675
- Manfredo, M. J., and Dayer, A. A. (2004). Concepts for exploring the social aspects of human wildlife conflict in a global context. *Hum. Dimens. Wildlife* 9, 1–20. doi: 10.1080/10871200490505765
- Mapedza, E. (2009). "Decentralisation outcomes in the context of political uncertainty in Zimbabwe: a comparative assessment from co-management and CAMPFIRE and implications for policy," *Governing Africa's Forests in a Globalized World*, eds L. A. German, A. Karsenty, and A. M. Tiani (London: Earthscan), 215–233.
- Mateketsa, G., Muboko, N., Gandiwa, E., Kombora, D. M., and Chibememe, G. (2019). An assessment of human wildlife conflicts in local communities bordering the western part of Save Valley Conservancy, Zimbabwe. *Global Ecol. Conserv.* 20:e00737. doi: 10.1016/j.gecco.2019.e00737
- Mehta, J. N., and Heinen, J. T. (2001). Does community-based conservation shape favourable attitudes among locals? An empirical study from Nepal. *Environ. Manage.* 28, 165–117. doi: 10.1007/s002670010215
- Mkonyi, F. J. (2021). Local people's perceptions of benefits and costs of protected areas: the case of Tarangire National Park and the surrounding Ecosystem, Northern Tanzania. *J. Ecol. Anthropol.* 23, 5–31.
- Mombeshora, S., and Le Bel, S. (2009). Parks-people conflicts. The case of Gonarezhou National Park and the Chitsa community in South-East Lowveld of Zimbabwe. *Biodivers. Conserv.* 18, 2601–2623. doi: 10.1007/s10531-009-9676-5
- Murphree, M. (2009). The strategic pillars of communal natural resource management: benefit, empowerment and conservation. *Biodivers. Conserv.* 18, 2551–2562. doi: 10.1007/s10531-009-9644-0
- Mushawemhuka, W., Fitchett, J. M., and Hoogendoorn, G. (2022). Stakeholder perceptions of climate change threats to Zimbabwean nature-based tourism sector. *Environ. Dev.* 4:100779. doi: 10.1016/j.envdev.2022.100779
- Mutanga, C. N., Chikuta, O., Muboko, N., Gandiwa, E., Kabote, F., and Kaswaurere, T. W. (2020). *Wildlife tourism, conservation and community benefits in Zimbabwe from: Routledge Handbook of Tourism in Africa* Routledge. Available online at: <https://www.routledgebooks.com/doi/10.4324/9781351022545-43> (accessed December 13, 2023).
- Mutanga, C. N., Muboko, N., Gandiwa, E., and Vengesayi, S. (2016). Beyond a single perspective to conservation relationships: exploring factors influencing protected area staff and local community relationships in Zimbabwe. *Int. J. Biodivers. Sci. Ecosyst. Serv. Manag.* 12, 212–226. doi: 10.1080/21513732.2016.1183712
- Mutanga, C. N., Vengesayi, S., Gandiwa, E., and Muboko, N. (2015). Community perceptions of wildlife conservation and tourism: a case study of communities adjacent to four protected areas in Zimbabwe. *Trop. Conserv. Sci.* 8, 564–582. doi: 10.1177/194008291500800218
- Naughton-Treves, L., Holland, M., and Brandon, K. (2005). The role of protected areas in conserving biodiversity and sustaining local livelihoods. *Ann. Rev. Environ. Resour.* 17, 219–252. doi: 10.1146/annurev.energy.30.050504.164507
- Nyhus, P. J. (2016). Human-wildlife conflict and coexistence. *Ann. Rev. Environ. Resour.* 41, 143–171. doi: 10.1146/annurev-environ-110615-085634
- Osborn, F. V., and Parker, G. E. (2002). Community based methods to reduce crop loss to elephants: experiments in the communal lands of Zimbabwe. *Pachyderm* 33, 32–38.
- Pringle, R. M. (2017). Upgrading protected areas to conserve wild biodiversity. *Nature* 546, 91–99. doi: 10.1038/nature22902
- Redpath, S. M., Young, J., Evely, A., Adams, W. M., Sutherland, W. J., Whitehouse, A., et al. (2013). Understanding and managing conservation conflicts. *Trends Ecol. Evol.* 28, 100–109. doi: 10.1016/j.tree.2012.08.021
- Richardson, R. B., Fernandez, A., Tschirley, D., and Tembo, G. (2012). Wildlife conservation in Zambia: impacts on rural household welfare. *World Dev.* 40, 1068–1081. doi: 10.1016/j.worlddev.2011.09.019
- Saarinén, J. (2014). Using indicators to assess sustainable tourism development: a review. *Tour. Geogr.* 16:867530. doi: 10.1080/14616688.2013.867530
- Sanderson, S. E., and Redford, K. H. (2003). Contested relationships between biodiversity conservation and poverty reduction. *Oryx* 37, 389–390. doi: 10.1017/S003060530300070X

- Scudder, T. T. (2005). *The Future of Large Dams: Dealing With Social, Environmental, Institutional and Political Costs*.
- Shilongo, S. M., Sam, M., and Simuela, A. (2018). Using incentives as mitigation measure for human wildlife conflict management in Namibia. *Int. J. Res. Publ.* 8, 677–682. doi: 10.29322/IJSRP.8.11.2018.p8374
- Smith, T., and Fitchett, J. M. (2020). Drought challenges for nature tourism in the Sabi Sands Game Reserve in the eastern region of South Africa. *Afr. J. Range For. Sci.* 37, 107–117. doi: 10.2989/10220119.2019.1700162
- Stone, M. T., and Stone, L. S. (2020). Challenges of community-based tourism in Botswana: a review of literature. *Transact. R. Soc. South Afr.* 75, 1–13 doi: 10.1080/0035919X.2020.1715510
- Tessema, M. E., Lilieholm, R. J., Ashenafi, Z. T., and Leader-Williams, N. (2010). Community attitudes toward wildlife and protected areas in Ethiopia. *Soc. Nat. Resour.* 23, 489–506. doi: 10.1080/08941920903177867
- Treves, A., Wallace, R. B., Naughton-Treves, L., and Morales, A. (2006). Co-managing human wildlife conflict: a review. *Hum. Dimens. Wildlife* 11, 383–396. doi: 10.1080/10871200600984265
- Watson, J. M. E., Dudley, N., Segon, D. B., and Hockings, M. (2014). Performance and potential of protected areas. *Nature* 515, 67–73. doi: 10.1038/nature13947
- West, P., Igoe, J., and Brockington, D. (2006). Peoples and parks: the social impact of protected areas. *Annu. Rev. Anthropol.* 35, 251–277. doi: 10.1146/annurev.anthro.35.081705.123308
- Wolmer, W., Chaumba, J., and Scoones, I. (2004). Wildlife management and land reform in southeastern Zimbabwe: a compatible pairing or a contradiction in terms? *Geoforum* 35, 87–98. doi: 10.1016/S0016-7185(03)0031-9
- Woodroffe, R., Thirgood, S., and Rabinowitz, A. (2005). *People and Wildlife: Conflict or Coexistence?* Cambridge: Cambridge University Press.
- Wunder, S. (2000). Ecotourism and economic incentives. An empirical approach. *Ecol. Econ.* 32, 465–479. doi: 10.1016/S0921-8009(99)00119-6
- Zimbabwe Statistics (2022). *Zimbabwe Population and Housing Census Report, Volume 1*. Available online at: <https://www.zimstat.co.zw>