



HWC management scheme

Vwaza Marsh Wildlife Reserve & Nyika National Park, Malawi

Consultancy commissioned by
Transfrontier Management Unit Malawi Zambia Transfrontier Conservation Area Project
and KfW

Final approved 24.02.2022

Carried out by:

Dr. Eva M. Gross
Freelance Consultant, Germany
mail@eva-gross.com

Tadeyo Shaba
Freelance Consultant, Malawi
tadeyo@royalplaceltd.com

Table of Contents

Table of Contents	2
Acknowledgements	4
List of Abbreviations.....	5
Executive summary	6
1. Introduction	9
Geography and ecology of VMWR and NNP	10
People and the Reserve	12
Human-wildlife conflict	12
Area of consideration	13
2. Methodology	14
Rapid Rural Appraisal	14
Stakeholder mapping.....	14
HWC data analysis	14
Community consultations.....	15
Expert interviews.....	16
Literature review	16
3. Understanding the interaction of wildlife and people in VMWR & NNP	17
3.1 Positive impact of living alongside VMWR and NNP	17
3.2 Negative impact of living alongside VMWR and NNP	18
Crop damage by herbivores.....	18
Livestock predation	19
Safety concerns	20
Local Measures in use to Prevent Damage	20
3.3 Community attitudes towards wildlife and conservation	21
Underlying causes for fence vandalism in the past	21
4. Understanding drivers of HWC in VMWR and NNP	22
Understanding the levels of HWC	23
5. Institutional Framework for a holistic and integrated HWCMS for VMWR and NNP...	25
5.1 Stakeholder mapping	25
Group A: high interest and high influence	26
Group B: high interest and low influence	26
Group C: low interest and low influence	26
Group D: low interest high influence	27
5.2 Institutional framework for HWC management and coexistence in VMWR&NNP	27

Requirements of an institutional framework for HWC management.....	30
The roles of governmental and non-governmental institutions in integrated HWC management and Coexistence strategies	33
6. Tools and strategies for a holistic and integrated HWCMS for VMWR and NNP	36
6.1 Legal framework for HWC management and coexistence.....	37
6.2 Technical strategies	42
6.2.1 Sustainable livelihood development – reducing dependency on natural resources of PAs	43
6.2.2 Strategic water supply	47
6.2.3 Separating wildlife from people and their assets through electric fencing	48
6.2.4 Response to wildlife outside the PA	55
6.2.5 Wildlife deterrents.....	58
6.3 Social strategies	62
6.3.1 Stakeholder involvement.....	63
6.3.2 Building strong community representation	69
6.4 Financial strategies	73
6.4.1 Revenue sharing scheme (RSS)	73
6.4.2 Payment schemes to foster coexistence	74
6.4.3 Cash-for-work	78
6.5 Spatial planning for human-wildlife coexistence	79
6.5.1 Macro-level planning	79
6.5.2 Micro-level planning	81
6.6 Monitoring of HWC and the HWCMS.....	83
6.6.1 HWC monitoring.....	83
6.6.2 Fence monitoring.....	85
6.6.3 Monitoring of Rapid HWC Response	86
6.6.4 Monitoring of problematic species.....	87
6.6.5 Monitoring of socio-economic parameters	88
6.6.6 Monitoring – Evaluation - Learning.....	89
7. References	90
8. APPENDIX	94

Acknowledgements

The development of a human-wildlife conflict management scheme (HWCMS) for Vwaza Marsh Wildlife Reserve (VMWR) and Nyika National Park (NNP) was commissioned by the Transfrontier Management Unit (TMU) of the Malawi Zambia Trans-Frontier Conservation Area (TFCA) Project and the German Development Bank (KfW) as a twinning consultancy of an international and a national consultant. Transfrontier conservation areas do not only reach across national borders, they also include landscapes shared by wildlife and people. In such areas conservation and development goals are strongly interlinked and need to be approached with holistic and integrated strategies. The ultimate goal, a peaceful and mutually beneficial coexistence of people and wildlife at large spatial scale requires mainstreaming HWC management across sectors and needs to unlock the full potential of living with wildlife.

Conducting this work would not have been possible without the valuable input of many people, whom we would like to thank sincerely. We would like to acknowledge the team of local interviewers, who have carried out participatory rural assessments in nine zones of VMWR and NNP. We also thank all representatives from the communities, especially NRCs and Traditional leaders, living adjacent to VMWR and NNP, who shared their experiences, knowledge, and concerns with us in multiple meetings, focus group discussions and interviews. We further thank 20 experts for sharing their multiple and extensive experiences and reflections on the HWC situation and its management with us. Thank you so much for allocating your precious time to this study and process.

Lastly, but not least, our profound thanks go to the Director DNPW, the Divisional Manager North, the management and staff of both VMWR and NNP, Rumphi District Council, Senior Project Manager Peace Parks Foundation, the Project Manager Malawi-Zambia TFCA and his entire team for the exceptional support and guidance rendered during the entire course of the assignment.

Note of the authors:

The study covers a large array of different topics. Technical terms might have been used in a broader sense, as different stakeholders often use them with slightly different meanings. The main focus was to ensure comprehensibility and coherence.

If you identify any mistakes or have the feeling that information you provided is not reflected correctly/adequately, please get in touch with the authors.

List of Abbreviations

ADC	Area Development Committee
CBO	Community Based Organisation
CBNRM	Community-based natural resource management
Cx	Coexistence (here human-wildlife coexistence)
DNPW	Department of National Parks and Wildlife, Malawi
EIA	Environmental Impact Assessment
FGD	Focus Group Discussions
HWC	Human-wildlife conflict
HWCMS	Human-wildlife conflict management scheme
IUCN	International Union for the Conservation of Nature
KfW	Kreditanstalt für Wiederaufbau
LWT	Lilongwe Wildlife Trust
MAZA-TFCA	Malawi-Zambia Transfrontier Conservation Area
MoU	Memorandum of Understanding
NEP	National Environmental Policy, Malawi
NGO	Non-governmental organisation
NNP	Nyika National Park
NRC	Natural Resource Committee
PA	Protected Area
PAP	People affected by Project
PAC	Problem Animal Control
PF	Process Framework
PPF	Peace Parks Foundation
RUP	Resource Utilization Programme
RSS	Revenue Sharing Scheme
SOP	Standard operational procedure
TA	Traditional Authority
TFCA	Transfrontier Conservation Area
TLC	Total Land Care
TMU	Technical Management Unit
VDC	Village Development Committee
VMWR	Vwaza Marsh Wildlife Reserve
VNRMC	Village Natural Resource Management Committee

Executive summary

In the areas adjacent to VMWR and NNP crop damage by herbivores, livestock damage by carnivores, and human accidents mainly with elephants are an important concern for the local population. HWC management challenges both, DNPW and local communities, and killing of wildlife species in retaliation and a decreased support for conservation activities are the consequences.

In order to decrease the pressure of wildlife on the safety of people living adjacent to VMWR and NNP and their livelihoods, TMU, DNPW and KfW have agreed to construct a game proof fence along 72 km of the southern and eastern boundary of VMWR. Furthermore, an electric fence shall be installed along the southern Nyika boundary, with a focus on keeping the elephant population (which was supplemented through translocation in 2017) of Nyika within the PA. It is understood by the implementers that the construction of a fence is not the only solution to HWC and that longevity and sustainability of HWC management measures need to be embedded in a holistic and integrated system. For the development of such an HWCMS TMU and KfW contracted an international and a national consultant. Due to the travel restrictions caused by the Covid-19 crisis the work by the international consultant had to be conducted remotely, while the national consultant was able to conduct on-site visits following strict hygiene and safety measures during June to November 2021.

The collected information provided a good overview on the levels of HWC in the communities adjacent to VMWR and NNP as well as challenges and opportunities going along with it. This report builds on the Situation Analysis Report of Phase 1 of this consultancy, which gives an overview on the impacts of HWC in VMWR and NNP (chapter 3). The situation analysis was used to develop a framework for the analysis of drivers of HWC, pressures exerted from these conflicts, changed state/socio-ecological situation and the resulting impact on people and wildlife, which guides the way forward for the development of a holistic and integrated HWCMS (chapter 4). While the objective of a HWCMS is to develop most effective, suitable and feasible management actions to prevent and mitigate HWC, this scheme takes a step further and integrates sustainable rural and livelihood development with a strong consciousness about the neighbourhood of wildlife and its importance. Such strategies, which embrace human safety, health, and development together with wildlife conservation, are called human-wildlife coexistence strategies.

As any conservation or development management scheme needs suitable institutional arrangements for implementation, a framework for stakeholder engagement and an institutional framework was drafted (chapter 5). The requirements for such structures in socio-ecological systems, such as a TFCA, are complex. While development shall be fostered, negative side-effects to the ecosystem need to be prevented and mitigated and simultaneously conservation compliance of communities and individuals shall be fostered. The success or failure of socio-ecological systems depends on the fit of institutional structures to serve both, development and conservation. Basic requirements for such a system were developed, based on the current socio-demographic and administrative situation in VMWR and NNP. The institutional framework for the HWCMS is based on the current structure of community-based natural resource management. On grassroots level for communal governance and decision making in the border zones natural resource committees (NRCs) are involved. The NRCs will elect 2-3 Coexistence in-charges (Cx in-charge), who are trained on the HWCMS and its tools (e.g. fence maintenance requirements, crowd control, rapid response and community sensitization). The NRCs are

clustered in zone NRCs. On these Zone levels Coexistence committees (Cx committees) are formed, where Cx in-charges represent their NRCs. The Cx committees play a central role for the HWCMS and deals with all HWC management and coexistence related issues on communal level (e.g. supervision of fence attendants, financing fence repairs, supervision of community-based Rapid HWC Response) and closely collaborates with DNPW Extension officers.

A close collaboration of the Cx committee, with the Cx Unit, and with DNPW extension workers is maintained and at least monthly meetings are held to coordinate activities between DNPW, Cx committees, Cx Unit, NRCs, and district administration. All Cx committees of one management area (i.e. VMWR border zones and South-West NNP border zones) will be monitored and guided by Coexistence Unit (Cx Unit). This will be a Special team charged with general oversight over HWC management. Coexistence strategies and monitoring of activities and financial resources. The Cx Unit will be in-charge of planning, budgeting, implementation, including reporting. The Cx Unit will also be responsible for general financial prudence regarding funds that will be channelled directly to zones in support of activities carried out and implemented by NRCs. The institutional framework needs to be further validated, discussed and fine-tuned through a transparent and professionally implemented participatory process.

Finally, this document describes a set of tools, to implement HWCMS in an integrated and holistic way (chapter 6). Policies, laws and regulations set the legal frameworks within which HWC management and coexistence strategies are implemented (chapter 6.1). As HWC management and coexistence strategies touch upon multiple legal frameworks (e.g. wildlife, agriculture, human-rights). Harmonisation of laws and prevention of undesirable side-effects should be considered in a separate assessment.

A multitude of technical strategies to address the prevention of damage by wildlife, the effective deterrence of wildlife, in case prevention failed, and increasing safety and resilience of people living in the neighbourhood of wildlife has been developed and tested in the past years. These technical tools play a vital role in HWC management and coexistence strategies and need to be carefully selected, planned and professionally implemented (chapter 6.2).

If technical strategies are the hands of a HWCMS, social strategies can be seen as its heart (chapter 6.3). Involving interest groups on various levels and with a suitable target-group oriented communication strategy is as important as building up a strong well capacitated community representation. Integrated management schemes will only be successfully implemented, if all partners work together towards a common goal in transparent way and have developed a level of trust and respect among each other.

Financial strategies are powerful tools to manage HWC and to strive towards sustainable coexistence (chapter 6.4). However, they need to be based on strong local institutions and need to be guided by principles of good governance, to avoid corrupted systems. Combining performance payments with community fence maintenance is an innovative pilot for VMWR and NNP and needs further investment in building capacity on community levels, to unfold its full potential.

A fundamental requirement for coexistence landscapes are safe space for people and safe space for wildlife (chapter 6.5). Thus, the spatial organisation of a landscape on macro and micro level is vital for HWC management and for developing long-term perspectives for both, people and wildlife. Spatial planning allows defining zones for specific actions and utilization of

natural resources, based on scientific evidence considering wildlife needs and behaviour, population dynamics, HWC drivers, and people's needs and aspirations.

Last, but definitely not least, monitoring of HWC and the HWCMS is of utmost importance to guide and inform evidence based management decisions (chapter 6.6). Monitoring of HWC needs to be improved and harmonized across the TFCA, to enable comparative analysis, understand shifting effects of HWC and to build a common understanding for HWC management and coexistence strategies.

The HWCMS is accompanied by a HWC management Manual, which encompasses a detailed action plan, outlines for curricula and draft decision support systems, as well as monitoring tools for HWC and its management.

The future of conservation in VMWR and NNP depends on the success of holistic and integrated HWC management and the development of long-term coexistence strategies benefitting both, people and wildlife.

Priorities for implementing the VMWR/NNP HWCMS

The HWCMS consists of multiple strategies, which need to be integrated and implemented on various levels by various stakeholders. Not all measures need to be realised at the same time and everywhere, but can be developed step by step and in succession. However, there are some key components that are imperative for implementation, as other measures dock onto them. Others need immediate implementation because fence construction has already started and maintenance needs to be strategically organised. Here, key actions are summarized:

1. Continue professional stakeholder process in preparation of fence construction in south-west NNP

- Conduct profound community consultation process prior to fence construction
- Assess fence specifics to comply with general and current standards on specie's and people's safety and sustainability criteria
- Identify and implement further measures to increase effectiveness of fence

Details on this topic are explained in HWCMS chapters 6.2.3 and action plan output 2.3

2. Set-up and capacitate community-based Cx institutions:

- Cx Unit
- Cx Committee
- Cx in-charges

Details on this topic are explained in HWCMS chapters 5.2 and 6.3.2 and action plan output 3.2

3. Install monitoring schemes

- HWC monitoring by community
- DNPW-led monitoring
- Alignment of HWC monitoring across TFCA
- Fence and HWC Response Team monitoring

Details on this topic are explained in HWCMS chapter 6.6 and action plan output 6.6

4. Set-up and capacitate Rapid HWC Response Teams

- DNPW-led teams
- Community-based teams
- Collaboration for handling problem animals

Details on this topic are explained in HWCMS chapter 6.2.4 and action plan output 2.4

5. Install fence attendants

- Training
- Equipment
- Employment

Details on this topic are explained in HWCMS chapter 6.2.3 and action plan output 2.3

6. Guarantee safe water access outside of fence

- Rapid assessment/identification
- Implement short-term water supply for dry season
- Develop water point development plan based on groundwater availability, geology, wildlife movement, and community development plans

Details on this topic are explained in HWCMS chapter 6.2.2 and action plan output 2.2

7. Create fence maintenance depots

- Equipment inventory
- Purchase
- Stock-keeping

Details on this topic are explained in HWCMS chapter 6.2.3 and action plan output 2.3

8. Install fence maintenance and performance payment scheme

- Define criteria/payment modalities
- Install thorough supervision and control mechanisms
- Create bank accounts
- Release fence maintenance performance funds

Details on this topic are explained in HWCMS chapter 6.4.2 and action plan output 4.2

1. Introduction

Vwaza Marsh Wildlife Reserve (VMWR) (986 km²) and Nyika National Park (NNP) (3134 km²) are located in northern Malawi and are part of the Malawi-Zambia Transfrontier Conservation Area (TFCA) (32,278 km²), which was formally established in 2015 (PPF 2021). The objective of the TFCA is to support the improvement of ecosystem connectivity, efficient and sustainable use and management of shared natural resources for biodiversity conservation and socio-economic development in the TFCA.

The Governments of Malawi and Zambia through the Departments of Parks and Wildlife (DNPWs) have received funds from the Government of the Federal Republic of Germany, through Kreditanstalt für Wiederaufbau (KfW) towards the development of the northern part of the TFCA. The objective of the project is to support the improvement of ecosystem connectivity, efficient and sustainable use and management of shared natural resources for biodiversity conservation and socio-economic development in the TFCA. Its outcome is defined as follows: The protection of the Malawi-Zambia TFCA is improved significantly by fostering a supra-regional park management, by the creation of necessary infrastructure as well as active integration of the local population and the advancement of Public Private Partnership approaches with and without Non-Governmental Organization participation. The support would therefore be expected to not only support the conservation of natural resources but also to mitigate poverty. The HWCMS, which is outlined in this document, is based on the present situation on site and serves reaching the Malawi-Zambia TFCA objectives.

Geography and ecology of VMWR and NNP

VMWR is a flat terrain located in the Central African Plateau on the watershed between Lake Malawi and the eastern lip of the Luangwa rift to the south east of the Nyika Plateau. The western half of the reserve comprises plateau Miombo woodland, clay soils dominated by Mopane (*Colophospermum mopane*) woodland and wetland marshes, while the eastern half of the reserve contains Miombo and broad-leaved (*Combretum*) woodlands in the foothills of the Nyika plateau (Harwood et al. 2019). VMWR is home to many species of ungulates (impala, reedbuck, kudu, bushbuck and buffalo) and carnivores (spotted hyaena, leopard, side-striped jackal) and has healthy populations of elephants and hippo. Lions are seen occasionally (Harwood et al. 2019). There are an estimated 300 elephants in VMWR which are heavily dependent on a few water resources remaining available in the dry season (May-November) located in the southern part of the reserve (e.g. Lake Kazuni and South Rukuru River) (Harwood et al. 2019).

NNP encompasses the Nyika massif, the largest montane complex in south central Africa (Willis et al. 2001) with an extensive high altitude plateau, which lies between 1800 m and 2606 m, while steep escarpments ring the plateau (Meadows and Linder 1993). Rivers are draining the watershed area and have cut wide and deep erosional valleys. The plateau is characterised by short grasses, while at the foot of the escarpment Miombo woodlands are dominant. The range of vegetation on the plateau attracts a great diversity of animals and birdlife, over 400 bird species were recorded (Dowsett-Lemaire 1983). Carnivore species include leopard, lion, spotted hyena, and side-striped jackal, ungulates encompass reedbuck, bushbuck, eland, roan antelope, and klipspringer (Ndhlovu 2013). Due to heavy poaching fewer than 50 elephants remained in the park, and the population was enforced by 34 elephants translocated from Liwonde NP in 2017, which remained in a 7000 ha sanctuary, before being released to the plateau.



Figure 1 Malawi-Zambia TFCA with target area for HWCMS (orange) in border zones of VMWR and NNP. Map: PPF

While VMWR is directly connected to large wildlife habitat towards the west (Musalangu GMA, Zambia), to which wildlife can move freely, the south and eastern boundary of the reserve is partially fenced and villages/farmland are located right up to the reserve boundaries. NNP is currently unfenced and is surrounded by dense human population, villages and farmland. Its only connection to a contiguous wildlife habitat is at its western tip by a corridor on Zambian territory towards the Zambian part of the TFCA (Figure 1).

People and the Reserve

Vwaza was a home to people from the Early Iron Age who practiced subsistence agriculture and iron smelting. A site at Phopo Hill was excavated and revealed pottery, iron slags, tuyere fragments and bone fragments. This indicates human occupation during the third century A.D (McShane 1985). Records indicate that during the last half of eighteenth century, the Balowoka people came into the area due to abundant numbers of elephants at that time and Ivory was plentiful resulting in extensive trade for cloth, beads and similar merchandise (McShane 1985). As such VMWR is an outstanding example of traditional human settlement and land-use and a historic burial site to some ancestors of the local inhabitants.

In 1977 the area was proclaimed a Wildlife Reserve and a series of village evictions took place during the establishment of VMWR. Then, in VMWR, two boundary realignments were done in 1985 and 1994 in response to local pressure for access to land and water. Approximately 9 km² of the reserve were excised. The new boundary has neither been surveyed nor the changes gazetted (Vwaza Marsh Wildlife Reserve Revised Master Plan 2004). Protection of the area as a group reserve began in 1941 with the proclamation of Lake Kazuni Game Reserve (Government Notice no. 166 of 1941; Clarke 1983b). This included all land and water within a 5-mile distance of the centre of Lake Kazuni.

NNP was declared a protected area in 1965 and in 1978 the park was expanded to its present size of 3,134 km² from 940 km² by inclusion of the plateau's northern and southern foothills. The primary reasons for extending the park boundaries were to protect important catchments that supply the northern region with water for domestic consumption, irrigation and hydro-power generation and to maintain habitat for large mammal migration between the plateau and surrounding woodlands. Expansion of the park required the resettlement of about 5,000 people. The evictions were undertaken over a protracted period between 1975 and 1978, largely by district government officials. Many of the evicted families lost their property during the resettlement and were often placed on inferior land, which has resulted in increased confrontation between the park and its neighbouring communities. Some have not been compensated up to date (Nxumayo et al. 2008 citing Nyika National Park Revised Master Plan 2004).

Human-wildlife conflict

Local communities living adjacent to VMWR and NNP coexist with wildlife, sharing the same landscape and resources. During the past two to three decades, the area has witnessed escalation in human-wildlife conflict (HWC) developing into a growing concern for wildlife conservation in Malawi. HWC describes the interaction between people and wildlife, whereby both parties impact negatively on the other (Madden 2008). Information and data gathered by the DNPW shows increasing damage by wildlife (by elephant, hippo, bush pig, baboon) on the farms of the neighbouring local populations (TMU 2021). The worst affected segments of the local communities are subsistence farmers growing maize, a staple crop. This damage is in addition to predation on livestock, human injury and death. All segments of the local population are

affected, i.e., men, women, the elderly and youth. Family units and households occupying the strip of land within the 5 km belt along the protected area boundary suffer serious loss in harvest due to elephants in search for food and space, negatively impacting on local food security and peoples' livelihoods. According to reports by DNPW over the past two decades, entire crop stands and granaries of maize have been destroyed and lost to increasing frequency of raids by wildlife. Reports by VMWR highlight HWC as an ongoing challenge with local communities demanding some form of compensation (MAZA TFCA Project 2019). Substantial losses and safety concerns decrease the moral for conservation, prepare the ground for wildlife crime and makes good copy for media and propaganda. The killing of three elephants around VMWR between 2016 and 2021 were due to HWC and political pressure and results of growing and insufficiently addressed HWC within the past years.

Area of consideration

The HWCMS was developed for wildlife and people sharing the landscape of Vwaza and southwestern Nyika. People living adjacent to VMR and NNP are most strongly impacted by wildlife incursions on their designated farmland and settlements. They encounter the full brunt of devastation arising from living in close proximity to the protected area (Anthony&Wasambo 2009), e.g. through crop damage by large herbivores, livestock predation by carnivores and safety threats through wild species. Therefore a 5 km belt adjacent to the VMWR and NNP was defined as border zone area (DNPW 2018). This zone encompasses communities legitimate to benefit from a resource utilisation programme. For the operation of the resource utilisation programme Natural Resource Committees (NRC) were set up and a collaborative Management Agreement was signed (DNPW 2017). The NRC is the institutional structure through which DNPW works and liaises with communities. Each member in the committee represents local communities (DNPW 2018). The NRCs of VMWR and NNP are represented by the Nyika-Vwaza Association for Natural Resources and Rural Development (NVA).

2. Methodology

To explore the complexity of HWC in communities adjacent to VMWR and western NNP the study adopted a mixed-methods approach. During the Phase I of this assignment (June to September 2021) a situation analysis was carried out to capture, analyse and present information and data on direct and indirect impact of HWC to people and wildlife, to understand roles and perspectives of various stakeholders and explore institutional structures for HWC management.

Rapid Rural Appraisal

Qualitative data on the impact of HWC and requirements, needs and challenges in HWC management was obtained from primary sources through use of Rapid Rural Appraisal (RRA) techniques between 6 and 18 June 2021 by conducting:

- 9 Focus Group Discussions (FGD) with representatives of 31 NRCs,
- Participatory mapping exercises during these FGDs,
- 85 semi-structured interviews with individual households in 9 zones,
- 20 Key Informant interviews with NGO/Government agencies stakeholder representatives drawn mostly from the District Executive Committee of Rumphi District Council. It included officials from DNPW, trustees of NVA and partner agencies under MAZA TFCA.
- Data collection through 79 questionnaires (79 NRCs encompassing 630 villages) filled by 8 DNPW Extension workers in a total of 16 survey zones
- Participatory mapping and FGDs were held purposively with selected respondents from directly affected community groups (farmers, natural resource collectors, vulnerable groups) and key stakeholders on-site (DNPW staff, District Council Officials, Natural Resource Committees). Interview/discussion guide tailored to specific respondent categories were used.

Consultations and meetings with DNPW officials were used to obtain information on details regarding the level of HWC in VMWR and NNP, the spatial distribution of HWC, and other factors that led to an increase in HWC. Site and field missions to pre-selected project/study sites were conducted to directly collect information/data from stakeholders. In the interest of time, FGDs with homogeneous groups (e.g., NRCs/groups of specific resource collectors, subsistence farmers) were arranged to deepen discussions on all study variables and respondent categories. RRAs focused on gathering data and information on local people's farming practices, perceptions/attitudes, positive and negative impact of wildlife, and engaging them to contribute and lead in the elaboration of HWC levels/strategies.

Stakeholder mapping

Stakeholders on all levels were identified considering how they are affected by or influence HWC (e.g., park management, district authorities, NRCs, affected community groups, NGOs, CBOs, the media). Based on this information a stakeholder matrix on HWC management has been drafted to understand connections, roles and needs, and define potential tasks and responsibilities in the HWC context. Information for stakeholder mapping was collected through active networking, conducting expert interviews and peer-group discussions. Stakeholder identification was also part of the inception meeting.

HWC data analysis

Existing Data on HWC collected by DNPW was reviewed. Due to patchiness and inconsistency a participatory HWC mapping exercise was conducted during the FGDs. Furthermore,

Extension workers were asked to list the most strongly involved species in conflict of the respective NRCs. They were also asked to rank HWC according to frequency and severity of damage. From this information a rough spatial and temporal analysis was done and compared to similar maps produced in the year 2009 (Anthony & Wasambo 2009). During field data collection HWC impact related questions were used (e.g., on food security, guarding efforts and the feeling of safety).

Community consultations

The consultation with NRCs was undertaken in-person by the national consultant who was assisted by two independent researchers to ensure neutrality. The FGDs were facilitated in-person by the national consultant in a participatory manner.

The Natural Resource Committees (NRCs) are grouped into zones which collectively form the Nyika-Vwaza Association (NVA). The zones provide the strata and the NRCs were selected through the stratified random sampling approach (Table 1).

Table 1 NRCs selected for sampling around VMWR and South Western NNP

	Zone	NRC
VMWR	Lake Kazuni	Lake Kazuni
	Bowe	Bowe
	Kabila	Thandaviyuni
	Zaro	Chisamba
	Kamphenda	Kamphenda
	Mwazisi	Nsulira
	Zolokere	Jandalavu
NNP	Kazovo	Kasasa
	Thazima	Mphofwa

To guide discussions and consultations, a checklist/interview guide was used with the following main categories or themes:

- Institutional framework: Which structure do NRCs see as best fit/most suitable for their involvement in the HWCMS?
- Fence maintenance: How will duties of fence attendants be organised? Employment on which level?
- HWC monitoring: Where do communities see their role? Are communities willing to assess damages that may occur despite presence of fence?
- Spatial & land-use planning: Willingness to get involved in land-use planning

On average 9 to 10 members of the NRC attended the FGDs, in all the sites visited. This included zone chairpersons and patrons (local Traditional Leaders, i.e. Group Village Headmen).

Expert interviews

In October 2021 eight expert interviews were conducted with 18 experts and stakeholders of VMWR/NNP and across Malawi. Analysis and information based on this data is referenced anonymously as “EI No.”. A list of interview partners is found in the Appendix.

Literature review

The consultant conducted additional review of reports and other literature on HWC and gathered further data from secondary sources through archival analysis of relevant legislation, policies, records and various published reports on allied programs in-country, regionally and internationally on HWC. This included review of relevant regulations under VMWR and NNP (e.g., access restrictions, resource use agreements and regulations). This was to help identify and assess drivers of the conflict and existing approaches and mechanisms in management of HWC, to inform the situation analysis process. A complete reference list is part of this document.

3. Understanding the interaction of wildlife and people in VMWR & NNP

The majority of residents within the Border Zones of VMWR and NNP are subsistence/small holder farmers, often desperately poor and already economically and nutritionally vulnerable. They are forced by circumstances to encroach into the protected areas to collect resources for own use and trade. The collection of resources is regulated in the Reserve Resource Utilisation Programme Guidelines (DNPW 2018).

VMWR and NNP are important habitats for many large herbivores and carnivores. While baboons, monkeys and bush pigs can cause continuous crop damage to farms, crop damage by elephants often leads to situations in which a subsistence farmer can lose an entire livelihood overnight. Wildlife visits crop fields resulting in loss or reduced harvest, leading to food shortages and food insecure households. The presence of wildlife in villages and close to roads also poses safety concerns of community members.

At the same time, an increasing human populations within the border zone is associated with opening of more land to farming. According to population estimates based on data collection in Phase I of this assignment, the population in the 5 km border zone of VMWR has more than doubled since 2007 (Table 2). Natural places for wildlife to move into are increasingly getting reduced and corridors for wildlife species with large territories and migratory behaviour, such as elephants, are blocked due to human encroachment. This will likely bring wildlife into contact with more densely populated human areas, thereby exacerbating situations of HWC.

Table 2 Population data of VMWR and NNP border zone, according to data from TLC

Year	No. of households VMWR border zone	No. of inhabitants VMWR border zone	No. of inhabitants NNP border zone
2007	~4700*	21,222*	96194**
2021	12,200***	55,000***	n.n.

* data TLC and Development officer Mpherembe 2007

** data source unknown, date unknown

*** own data Shaba&Gross 2021

DNPW supports communities in crop guarding by the provision of fire crackers to drive wildlife off the farms and by sending patrols to support crop guarding efforts. Communities, represented by NRCs, further receive 25% of the income generated by the WR and NP. However, resentments against conservation has grown in the past years and HWC have peaked in the retaliatory killings of elephants. In July 2020 an elephant bull had been shot on communal land in Lusani. It died inside the reserve and one tusk had been stolen. In May 2021 a collared elephant was shot by unknown individuals 18 km from the VMWR towards NNP. The topic gained attention on high political levels, making it a priority issue to address adequately.

The following information is based on the HWC situation analysis conducted in Phase I of this assignment. For further reading refer to Shaba and Gross (2021).

3.1 Positive impact of living alongside VMWR and NNP

Communities are generally benefiting from the protected areas in various ways. The access to natural resources, such as non-timber forest products (NTFPs), as well as employment and ecosystem services derived from VMWR and NNP were mentioned as important for the

communities. Furthermore, communities recognize that livelihood development programs are implemented by NGOs due to the presence of the protected areas.

In essence, communities living on the frontiers of VMWR and NNP are natural resource dependent communities. This also confirms the historical economic and socio-cultural links the people have with the two protected areas. In the majority of the NRCs at least half of the households use natural resources of the protected areas. Based on the estimates by Zone Extension Workers approximately 5200 households of the VMWR (5 km border zone) regularly collect natural resources in the reserve, mostly mushroom, fish and thatch grass. The level of dependency on the natural resources varies strongly between the NRCs. However, in the majority of NRCs at least 25% of the resource collectors are highly dependent on natural resources as livelihood.

Furthermore, many villages are sourcing their water from the protected areas. Local communities settled on the immediate fringes of the protected areas, notably at Bowe, Emcisweni, and Chisimuka, are dependent on the protected areas as source of water for domestic use. While the TFCA project has undertaken commendable work in supporting several settlements with a piped water scheme, others do not have the same privilege. Women and girls enter the reserve on a daily basis to fetch water from unprotected wells and springs.

Connected to the availability of water is the use of the protected area as ground for tobacco nurseries. This mainly applies to the southern part of VMWR, where Rukuru River forms the Reserves southern boundary. Tobacco is an important cash crop in the area.

3.2 Negative impact of living alongside VMWR and NNP

Communities living within the 5 km zone adjacent to VMWR and NNP predominantly are subsistence farmers. Commonly grown crops are maize, groundnuts, soya beans, beans, potatoes, cassava, and tobacco. Maize is the staple food crop, soya bean and tobacco the main cash crop. The second most important livelihood activity is farming of livestock, in particular goats, pigs, and poultry. Farmers face challenges due to threat or damage through wildlife negatively impacting on their food security, safety and property. With the fence along VMWR in a vandalized state, wild animals leave the reserve and freely wander into the border zone where they destroy people's crops, threaten and have even killed humans.

Crop damage by herbivores

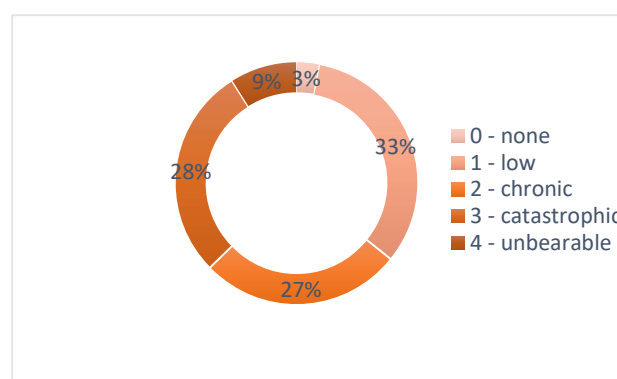
Crop damage by wildlife species is ranked as the most important reason for crop loss by farmers, followed by losses due to pest insect and drought. Elephant is mentioned as the main cause of crop damage in most zones, followed by baboons/monkeys, hippos, bush pigs and porcupines. Throughout the past years farmers observed an increase in crop loss, challenging their livelihood situation.

Crop damage may vary strongly in its levels of magnitude and frequency (Table 3). While some communities observe small damage every now and then (e.g. through smaller antelopes, visiting fields infrequently), others experience small damage on a regular basis, summing up to significant damage over time (e.g. through primates visiting farms daily). Again others may experience severe damage every now and then (e.g. through elephants feeding on crops while they are ripening) and again others may experience regular crop damage with high severity (e.g.

through elephants or hippos feeding regularly on fields or a combination of various herbivores through time).

Table 3: Categorizations of crop damage based on magnitude and frequency of damage (Shaba&Gross 2021)

Damage level	Characteristic	Level of frequency and magnitude
Level 0: no damage	Crops are not damaged by wildlife species	zero
Level 1: low damage	Crops are damaged every now and then to a lesser extent	low frequency low magnitude
Level 2: chronic damage	Crops are regularly damaged in smaller quantities and losses are adding up through time	high frequency low magnitude
Level 3: catastrophic damage	Crops are damaged every now and then with high magnitude	low frequency high magnitude
Level 4: Unbearable damage	Crops are regularly damaged with high severity	high frequency high magnitude



During the cropping season 9% of the NRCs (n=72) face unbearable crop loss, while 28% suffer from catastrophic and 27% from chronic crop damage (Figure 2). Low crop damage is observed in 33% of the NRCs, only 3% face no crop damage.

Figure 2: Level of crop damage by wildlife species per NRC during cropping season

Crop loss due to wildlife damage leaves local inhabitants living in the Border Zone with food shortage, limited options and alternative ways of survival, let alone sources of income. Food insecurity not only has negative impact on societal fabric but on wildlife conservation as well. Communities report that food insecurity forces community members to search for other alternatives to bring food on the table, including piece works while others are forced to engage in poaching and fence vandalism to get the wire and sell it in order to get money to meet basic needs. The study further established that some carnivores find their way into village settlements and prey on livestock.

Livestock predation

In addition, carnivores predate on livestock such as goats and chicken. Even though livestock predation is ranked lower than crop damage by wildlife species, RRA in Phase I revealed livestock predation in 41% of the households of the study area.

Larger livestock (goats and pigs) fall prey to carnivores such as hyenas which makes the inhabitants poorer and food insecure as most of them depend on their livestock as a source of

income and relish. Smaller carnivores, such as honey badgers and wild cats prey on chicken, pigeons and ducks. Rare cases of lions have been recorded in zones like Chisimuka, Zaro and Emcisweni.

Safety concerns

During RRAs in Phase I it was reported that on a number of occasions men, women and children around VMWR have been threatened by elephants while guarding their crops or undertaking other farm activities and whilst travelling or walking to school. Thus, communities had to adjust their lifestyle and routine. For instance, people no longer feel safe to go out at night or to wake up early in the morning as they used to do in the past and have reduced their movement during dawn and dusk. In areas such as Lusani, Kamalaviwinda and Phetekezi pupils fail to attend classes occasionally because of elephants that frequent their villages. Students and learners are unable to return to school for their night studies because they are threatened by animals from the reserve. Furthermore, farmers do not sleep at night during the growing season as they guard their farms and gardens from elephants.

Local Measures in use to Prevent Damage

Farmers adjacent to VMWR and NNP use multiple measures to prevent or reduce damage by wildlife species. While in some NRCs parts of the solar fence are still remaining, others rely solely on guarding crops and livestock, employing community patrols and being supported by DNPW for patrolling, scaring wildlife with fire, fire crackers or other loud noises (Figure 3).

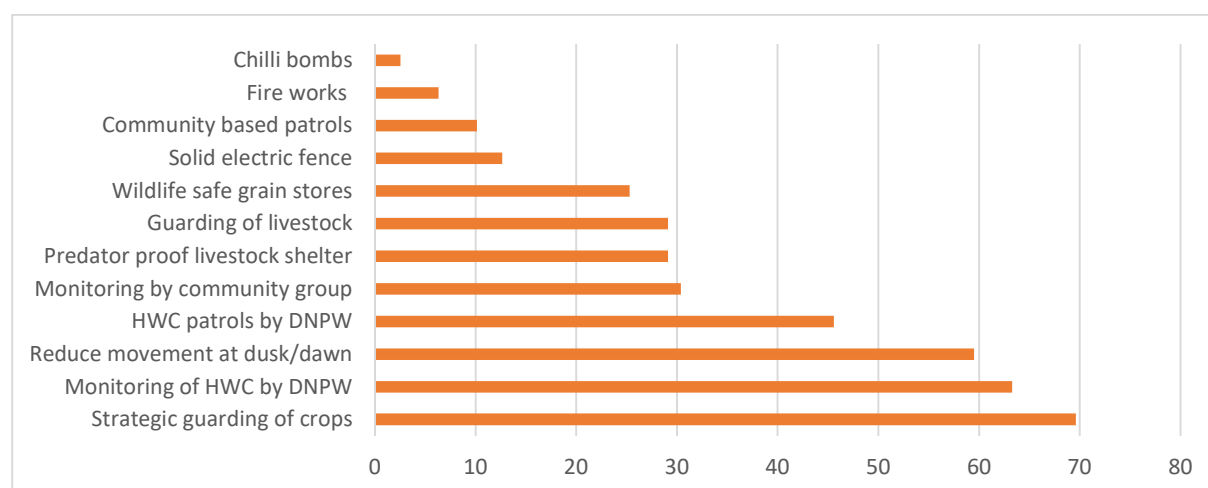


Figure 3: Number of NRCs using HWC management measures (n=72, extension worker data)

The utilization of measures to prevent or reduce wildlife damage are not all regarded as successful. During RRAs the old fence with three strand wires and wooden post was regarded as not successful at all, while beating of tins (*Vibekete*) is regarded as partly successful. The engagement of DNPW in HWC management, e.g. through monitoring of HWC and HWC patrols and the provision of fire crackers was regarded as partly successful. Livestock related measures, such as the construction and use of predator proof shelters, guarding of livestock are regarded as partly successful, only. The provision of livestock to the communities in the boarder-zone (e.g. goat pass-on program), the provision of farm inputs such as crop seeds, and provision of labour as a source of income, e.g. for fence line clearance, are seen as partly successful to reduce HWC. Only strategic guarding of crops, reducing the movement at dusk and dawn as well as the use of fireworks to scare away wildlife are regarded as very successful.

Victims complain of no compensation for crop loss which leads to loss of livelihood with families becoming destitute. Some members of NRCs complain that even when the problem animals are killed by wildlife personnel, income realized goes to DNPW and not to the victims.

3.3 Community attitudes towards wildlife and conservation

Conflicts between people and wildlife actually are disagreements between different groups of people over the management of wildlife species (Madden and McQuinn 2014). These conflicts are particularly complex when protected species are concerned. Understanding the attitudes and perceptions of communities towards the institutions responsible for wildlife management, and towards wildlife conservation in general, is important to gain an insight into the underlying and deep-rooting causes of HWC (see also chapter 4). During FGDs a multitude of thoughts and perceptions were shared, pointing at some deficits and grievances on various levels: Feeling of exclusion from decision making, slow response to HWC from agencies, delayed payments for communal services, lack of monitoring, limited transparency in the use of funds, bad management of funds, lack of accountability of the revenue sharing scheme and elite capture within agencies. Whether or not these views are justified, they point at underlying conflicts and a weak basis of trust among the community representatives and governmental agencies. This results in resentments, mistrust, and misgiving towards wildlife conservation and animosity towards wildlife authorities.

Underlying causes for fence vandalism in the past

In the past, electric game fences along VMWR have been vandalised, wire has been cut and used for snaring, and maintenance was missed. Discussions with NRCs reveal that vandalism of the fence originated in a lack of ownership of the projects, because local communities were not involved in planning and construction of the fence. The lack of ownership and a limited understanding of the importance of conservation and the reserve caused people from the local communities to indulge into poaching. It was explained that people from afar vandalized the fence and killed game in the reserve. People from further away would break the fence because they were not directly affected by e.g. crop damage from wildlife.

Community members hesitate to report cases of vandalism and poaching because they are not encouraged to report cases, e.g. through incentives, but fear a lack of confidentiality after reporting cases.

4. Understanding drivers of HWC in VMWR and NNP

HWC is the consequence of multiple drivers exerting pressure on the people, wildlife and their way of coexistence. These drivers can originate in wildlife behaviour, ecology, geography, and climate and in the anthropogenic influence, such as land-use, use of natural resources and economic factors. VMWR is located at the Zambian border and is connected to a large contiguous wildlife habitat on the Zambian side. In the southern part water is available all year round, making the reserve vitally important for many large mammals. The area between VMWR and NNP once was an important natural bridge to the Nyika ecosystem but has been converted to farm land with fertile soils by a high and growing human population. Given these environmental features and multitude of various stakeholders with diverse values, perceptions and objectives, VMWR and NNP are affected by multiple drivers of HWC.

In order to develop a HWC management scheme the drivers of HWC need to be identified, understood and addressed. Key HWC drivers were identified during expert interviews, data analysis and literature research, by using a DPSIR framework (Figure 4). The framework defines natural and anthropogenic drivers, which lead to pressures and change the state for wildlife and people, which again generates impacts on both sides. Short-term responses to HWC are targeted at the direct negative impact of HWC, while long-term strategies need to address drivers and pressures. Therefore, a HWCMS for VMWR&NNP needs to combine short-term measures targeting on immediately decreasing the negative impact of HWC on people and wildlife and simultaneously develop long-term strategies to ensure sustainability and enable the transition from conflict to a beneficial coexistence of people and wildlife. For this an integrated and holistic HWCMS needs to be developed, with interplay of legal frameworks, spatial planning, social, financial and technical strategies, backed by comprehensive monitoring.

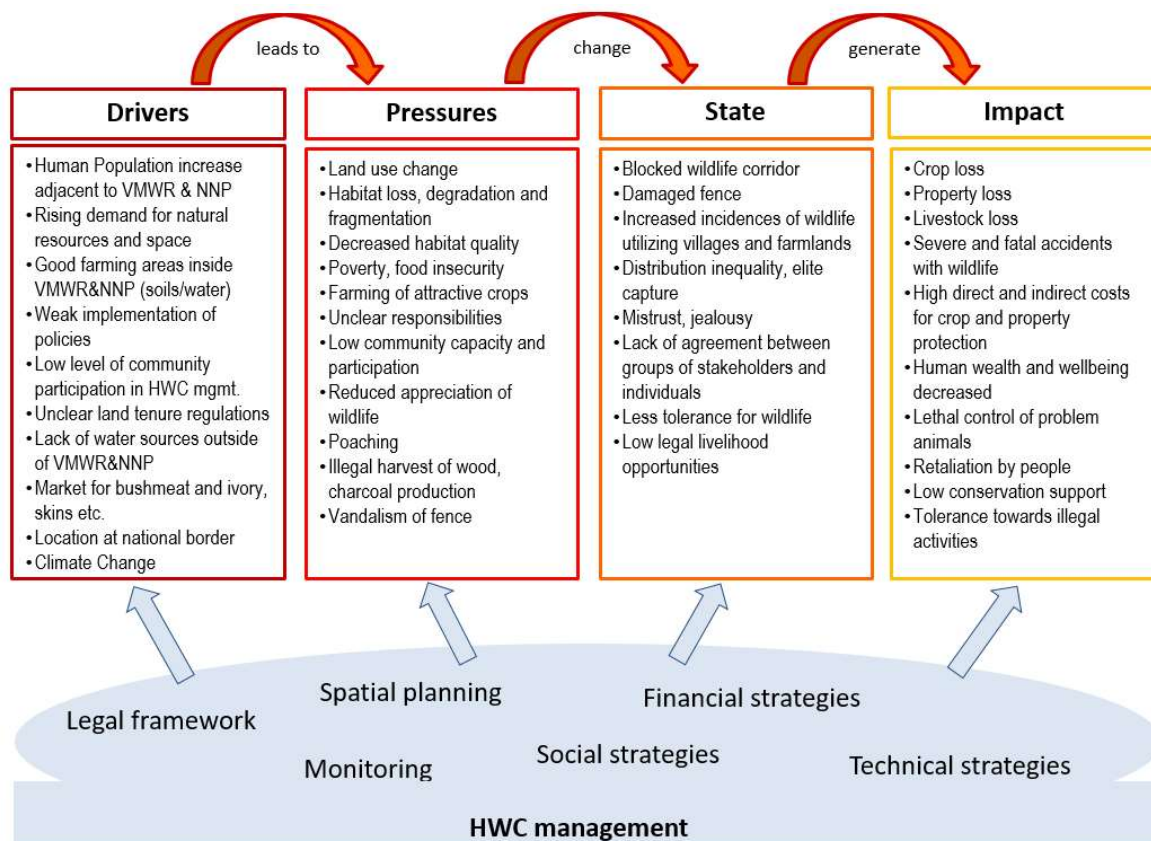


Figure 4 DPSIR Framework for HWC management in VMWR&NNP

Understanding the levels of HWC

Multiple studies of the past have shown and explained that HWC does not only include wildlife on the one side and people on the other. It is much more a conflict between different groups of people over the use of resources and over the management of species. The levels of HWC have been characterized as three layers (Madden and McQuinn 2014, Zimmermann et al. 2020) (Figure 5). While the upper dispute level, which is characterised e.g. by loss of crops can be addressed by practical solutions, underlying and deep rooted conflicts can only be solved through shaping trustful relationship and professionally guided reconciliation processes.

The Levels of Conflict over Wildlife



Figure 5 The levels of conflict over wildlife. Source: Zimmermann et al. 2020

History has shown that targeting HWC management only on the dispute level with practical, mostly technical solutions, risks failure in the long-term.

The RRA, as well as key informant and expert interviews held in VMWR & NNP, point at conflicts over wildlife and at deep-rooted conflicts. Some excerpts of quotations from FGDs support this finding (Figure 6).

In VMWR and NNP, crop and livestock damage severely impact particularly community members living close to the boundary of the protected area. Additionally, weak structures, mistrust towards wildlife authorities and lacking opportunities for income generation fuel this conflict on an underlying level. For some individuals and groups the HWC in VMWR and NNP roots deep in the history of the park development, connected to resettlements and evictions. The perception that VMWR could make good farmland and as such create much better income to the people is prevalent in some segments of the population. Decreasing the number of damage caused by wildlife species, therefore cannot be the only goal of an HWC management scheme. Another focus needs to be set on fostering adapted agricultural practices and sustainable natural resource management programmes within the border zones of VMWR and NNP as part of strategies to reduce the pressure on the PAs and simultaneously reduce poverty.

Another important fact to be considered is that damage size, risk perception and attitudes are not linear connected. This means decreasing the frequency and/or amount of damage will not directly increase tolerance for conservation and wildlife species. Therefore, communication and education as well as the development of benefits for communities living in the vicinity of VMWR and NNP needs to be considered in the HWCMS as well.

"Wildlife damages our crops, mostly maize, potatoes, and cassava. Carnivores kill our livestock. Yet there is no compensation when crops have been damaged or even when an individual has been killed. People are not able to move freely due to presence of wildlife. Tsetse fly is another problem and targets are not distributed fairly."

Phopho and Kamalaviwinda NRCs

"There is too much work for very little pay and there is no transparency on payment during fence clearance. There is no consultation or involvement of the NRC in planning on the fence clearance. They take very long to pay people. Patrons are promised to be paid but this has never been fulfilled. The NVA has overstayed and there is need for change. We don't benefit from the revenue scheme. The funding resources should come straight to the NRC because the NVA and Zone are corrupt

Kapiri and Kasangani NRCs

"They promised an electric fence but the one which was installed did not have electricity. The type of materials used were poor. People from distant communities used to steal the wire. Some staff members from the DNPW were also involved in stealing fence wire. There was no civic education to the community on the value of the fence. Children are the most affected group, as it is risky for them to go to school due to wildlife presence in the village, and cases of malnutrition as most of our crops are damaged by animals. In addition, the fence line has been shifting into our land over the years but we don't know the reasons".

Kapiri and Kasangani NRCs

"We receive no compensation from crop damages. And time to harvest fish is not adequate, DNPW is not managing the fence well, often there is no power in the fence line. There is need for more commitment from DNPW. They use poor materials for the fence. And local communities are paid low for works."

Chinofu and Pholozi NRCs

Figure 6 Excerpts of quotations from FGDs held in various NRCs in the border zone of VMWR and NNP.

Among the herbivorous species, baboons and bushpigs are causing a high amount of crop damage, but elephants are perceived as highest risk for crop damage. When decreasing the damage by elephant through the electric fence, baboon and bushpig damage may still persist.

Shifting crop damage from one species to another, or from one area to another are effects that need to be considered and discussed comprehensively with community members before any action is taken. If not done so, false expectations may be created and unintended negative side effects evoked. This may lead to even stronger mistrust and discontent between people and conservation management.

5. Institutional Framework for a holistic and integrated HWCMS for VMWR and NNP

To adequately address the scale and complexity of HWC, its management needs to consider all groups that are affected by HWC directly and indirectly as well as those groups that influence drivers of HWC and intensify pressures. The limitations of top-down HWC management with a strong technical focus are obvious and have failed in many African landscapes, as they tend to pit people against wildlife, are highly cost and labour intensive and miss out on a sustainable long-term perspective. Therefore, a collaborative and community-based approach has to be considered for scaling up and professionalizing HWC management in VMWR and NNP. Affected communities need to be regarded as partners and collaborators in joint HWC management. Roles and responsibilities have to be clearly defined and common objectives have to be developed. Importantly, affected communities need capacity and well-functioning transparent and equal structures to act as strong partners in HWC management.

For the implementation of the HWCMS responsibilities and rights have to be understood by all involved groups, such as rangers, DNPW officers and administration, NRC members, users of natural resources, farmers etc. This chapter gives an overview of the interest groups affected by and influencing HWC management and how they need to be considered. Importantly, the current institutional framework to implement HWC management is analysed and recommendations for restructuring are given, to enable all players to effectively integrate and implement HWC management.

5.1 Stakeholder mapping

About 35 stakeholder groups were identified for VMWR and NNP to be affected by and affecting HWC management. A stakeholder group was defined on organisation level (e.g. NRC, TMU, KfW), while community groups were split with regard the HWC they may face (livestock keepers, fishermen, subsistence farmers etc.). Individuals may be part of various stakeholder groups (e.g. subsistence farmer, fisherman and NRC member).

The NRCs throughout VMWR and NNP are most frequently in contact with DNPW, particularly its extension workers, whereby contacts range from weekly to monthly. Contacts with DNPW are followed by contacts with Total Land Care (TLC), which vary between weekly in a few NRCs to monthly or even annual meeting frequencies in other NRCs. Furthermore, NRCs are frequently in contact with the Area Development Committee (ADC) and Village Development Committee (VDC). Meetings with other NRCs take place much less frequently, on average nine times per year, followed by meetings with NVA. While some NRCs generally had low meeting frequencies with other stakeholder groups, others were very active on meetings and networking. The low level of meeting frequency and diversity in stakeholder exchange of some NRCs points at weak networking and activity levels.

Stakeholder mapping according to the level of interest in having HWC managed and the level of influence on HWC management (Figure 7) revealed four strong groups pointing at important management considerations with regard to HWC. For each group detailed social strategies need to be developed, such as participatory processes, capacity development and specific communication strategies (see chapter 6.3).

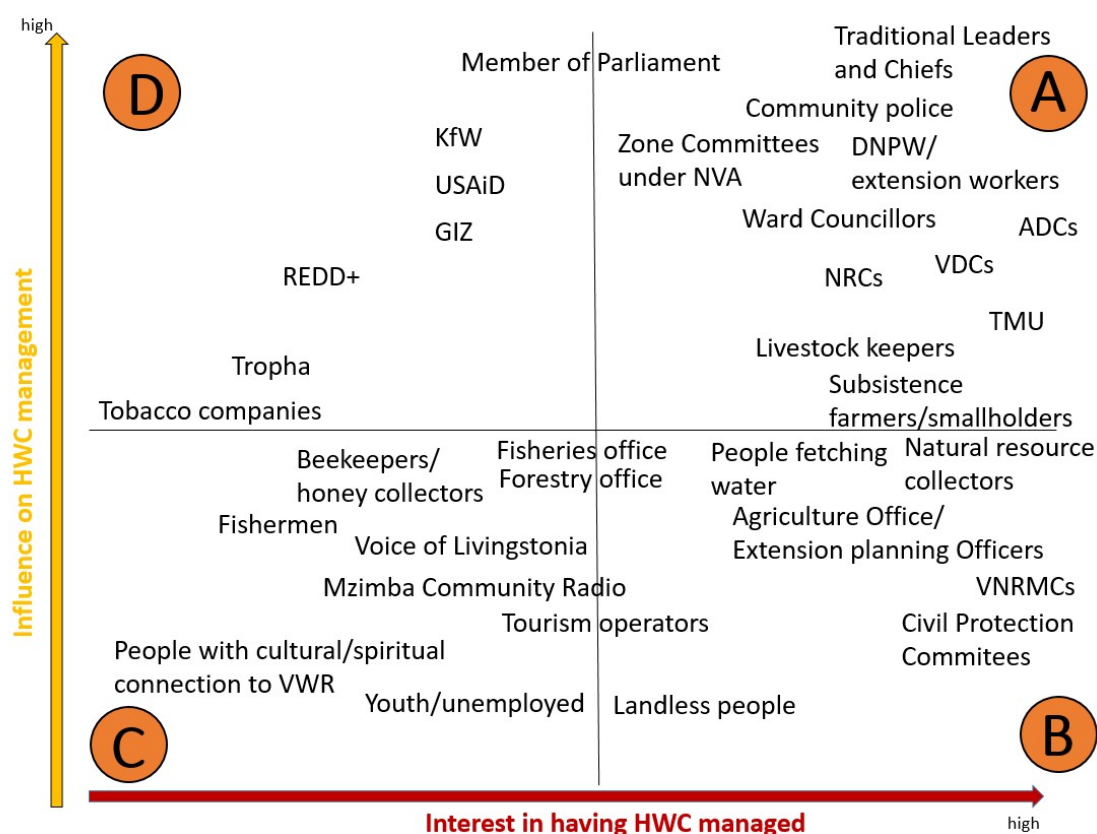


Figure 7 HWC management stakeholder map considering the level of interest in having HWC managed and level of influence in managing HWC

Group A: high interest and high influence

Stakeholders having a high interest in managing HWC and simultaneously having a high influence on HWC management are the core stakeholders of HWC management. They need to be involved and managed closely to take an active and clearly defined role in the process of HWC management. The level of influence within this group varies in the context of political influence (e.g. shaping attitudes and motivation) and direct management influence (e.g. using crop or livestock protection measures). Depending on the type of influence stakeholders have their capacity needs to be enhanced or managed.

Group B: high interest and low influence

Stakeholders having a high interest in HWC management but low influence are important groups to consider in HWC management, as they hold high motivation for HWC management but need capacity to be involved. Building up the capacity of HWC management measures for these groups may enable them to play a stronger role in the process of HWC management and let them play a more active role, decreasing frustration about low influence.

Group C: low interest and low influence

Stakeholders with relatively low interest and low influence on HWC management must not be forgotten in the process of HWC management but may play a less active role. They need to be included in regular information and communication on HWC management actions, to make sure they are always aware on what is going on, and how they could play on a localized level. Stakeholders from this group may well shift into other groups if their interest in HWC management rises or their influence builds up in the projects process.

Group D: low interest high influence

With its high level of influence towards HWC management and other fields of development and conservation this group needs to be proactively involved in the process of HWC management. As stakeholders among this group are characterized by high economic and/or political influence, they need to be informed about the importance of holistic HWC management and how to consider drivers of HWC in their programme development and design. If not involved appropriately stakeholders of this group may develop their influence in a contradictory way, undermining HWC management and driving HWC. However, if involved and guided appropriately, these stakeholders have the potential to enforce HWC management in a more programmatic, holistic and integrated way.

5.2 Institutional framework for HWC management and coexistence in VMWR&NNP

Any conservation or development action plan needs suitable institutional arrangements for implementation. In socio-ecological systems, such as a TFCA, the requirements for such structures are complex. While development shall be fostered, negative side-effects to the ecosystem need to be prevented and mitigated and simultaneously conservation compliance of communities and individuals shall be fostered. Ideally, such a system enables sustainable development on local and regional level and supports communities to take over a stewardship role for the environment including its wildlife. For this, revenues generated through the presence of wildlife and ecosystem services will serve the community to firstly decrease the negative impact of living with wildlife and secondly enable sustainable development.

The success or failure of socio-ecological systems depends on the fit of institutional structures to serve both, development and conservation. Here, we outline the basic requirements for such a system, based on the current socio-demographic and administrative situation in Vwaza and Nyika. We call this a system fit for coexistence.

The Nyika Vwaza Association (NVA) was formed in 2000 and registered in 2003 as an umbrella organisation for all 167 NRCs located in the 5 km border zone of VMWR and NNP. It was established with the objective of conserving and managing natural resources in the protected areas of Nyika and Vwaza and the surrounding areas in collaboration with communities within the 5 km border zone. Its constitutional aim is to collaborate with DNPW on management of Revenue Sharing Scheme (RSS) and other community funds for the support of small-scale development projects in the surrounding communities. Its trustees are traditional leaders. The NVA secretariat is headed by a chairperson elected on a five-year cycle by the representatives from NRCs as its constituents. NVA is an intermediary institution between local communities and DNPW.

Details on the constitution of the NVA

1. The Association shall have trustees in whom all assets, funds and property of Association shall vest
2. There shall be five trustees
3. Such trustees shall be members of the Association and shall be appointed at each Annual General Meeting (AGM) of the Association.
4. During the said AGM a chairman for the Trustees for the ensuing year will be elected amongst the appointed Trustees
5. The Division Manager North shall act as Secretary for the Trustees.

The Constitution of the NVA further states that there shall be the following original trustees

1. Paramount Chief Chikulamayembe
2. Traditional Authority Mpherembe
3. Traditional Authority Nthalire
4. Traditional Authority Mwirang'ombe
5. The Division Manager (North), Parks and Wildlife

Each Trustee shall hold office from the AGM to the next, unless he retires or dies. Retiring Trustees shall not be eligible for re-appointment. Upon the death or retirement, the executive committee shall forthwith appoint another member, not being a member of the executive committee to fill the vacancy thereby created.

The DNPW through a MoU with NVA implements the Revenue Sharing Scheme (RSS) designed to distribute 25% of the revenue generated from park entrance fees with neighbouring rural communities as a way of encouraging the communities to take part in wildlife conservation. In addition, NVA receives funding from the REDD+ to support local communities with resources for developmental activities. The funds from the RRS are provided and channelled through the NVA to provide local community level benefits, such as the construction of amenities e.g. health centres, water supply, classrooms/teachers houses, and bridges.

As such, NVAs role is to represent all NRCs of VMWR and NNP during project development, raise funds for NRC projects and administer resources for the NRCs. This role is particularly important, as NRCs currently do not have own bank accounts.

However, the NVA accuses the DNPW of not fulfilling its obligation to provide funds to the federation, pointing out that the DNPW is not providing funds to the NVA as agreed. Furthermore, NVA argues that at the moment a good number of DNPW staff do not really understand the concept of Collaborative Management and urgently need to address violation of civil rights. Vice versa DNPW lets criticism be heard that NVA lacks transparency and monitoring. The NVA is aware of its own capacity constraints, notably regarding human resource.

The friction between NVA and DNPW also affects the perceptions within NRCs. While most NRCs did not fully grasp the role and responsibility of the NVA, some felt that the NVA was corrupt and therefore had shown resentments against the NVA.

The NRCs are the cardinal structures for performing crucial functions at grassroots level (Figure 8). The NRC is elected through a democratic process by its constituting communities, may represent one or more villages in an area and needs to represent both genders (DNPW 2018). Each NRC has its constitution, which sets out in detail the procedures of how an institution will

manage its daily affairs. The NRC contains a maximum of 10 executive members plus honouree members. According to DNPW (2018) the roles and obligations of the NRC are:

- Responsibility for organisation of resource use programme activities on the side of the communities
- Responsibility to work with DNPW on management activities (e.g., boundary clearing, fire control, fence maintenance and erection)
- Sensitisation of communities on environmental issues
- Participation in illegal incidence monitoring activities
- Engagement in other natural resources management activities
- Promotion of development activities within their communities in conjunction with the VDC
- Responsibility to manage NRC funds

Multiple (5-12) NRCs are clustered into Zone NRCs, which are represented by Zone NRC boards, encompassing NRC chairpersons.

Furthermore, Village Natural Resource Management Committees (VNRMCs) were established by the Forestry department and whose mandate and functions overlap with those of the NRCs. The VNRMCs are responsible for assisting the village heads in the management of Village Forest Areas (VFAs), woodlots, reforestation programmes and government protected forests close to the village. These committees are elected by the community, but are usually constituted under the auspices of and with the facilitation and advice of the Forestry Department. It is expected that these structures should be sub-committees under the VDCs, but in some instances they are operating independent of the VDCs. All of them often involve the same members but the committees are poorly coordinated and follow different rules. The issue is that NRCs and VNRMCs in the VMWR and NNP border zones are running in parallel, duplicating roles and responsibilities. To increase efficiency harmonization of both institutions should be considered.

NRCs are aware of their niche i.e. functioning as the intermediary between the local community and DNPW. The primary roles being liaison with DNPW through engagement with Extension Workers, building relationships between NRC and the VMWR/NNP, including delivering complaints/ concerns from local people, educating/sensitizing communities on the importance of VMWR/NNP, conservation of biodiversity and indeed on the importance of the fence. However, NRCs are fully dependant on funding by NVA. The lack of funding and transparent accounting implies that most NRCs are unable to undertake meaningful investments and capacity building of their own nor perform the expected duties from them. NRCs consulted during the survey indicated that they do not maintain bank accounts, an indicator that financial transactions, if any, are non-procedural and unsystematic.

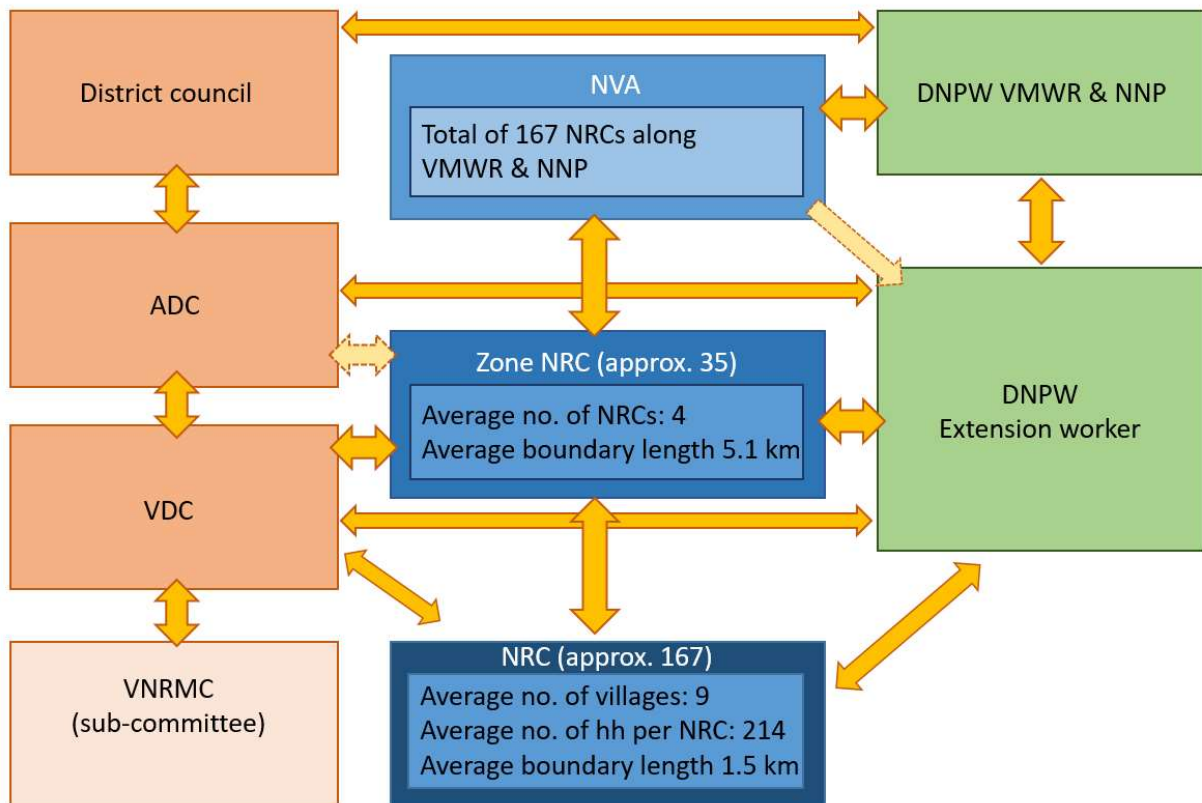


Figure 8 Current institutional set-up of natural resource management on community level in border zone of VMWR and NNP and its interplay with local administration and conservation agencies.

Requirements of an institutional framework for HWC management

Stakeholders agree that for the HWCMS to succeed, there is need for concerted efforts, intra-agency collaboration and coordination (e.g. DNPW has skills and the community has workforce).

From the onset, partners working under the HWCMS need to consider a common goal and set of objectives to work towards to and clearly set out each of the partnership interests. This requires joint planning among the respective partners and regular planning meetings of the players. Written partnership agreements will ensure transparency on roles and responsibilities. While each partner must focus on delivering on its partnership objectives and targets they need the requisite resources to support implementation of set activities. Therefore, each partner should allocate sufficient people, budget, and other resources to allow attainment of desired outputs. Sufficient review and monitoring processes need to be installed and institutionalized for trouble-shooting, examining and evaluating performance of the integrated HWCMS.

The HWCMS builds upon the present community structures and involves current stakeholders. The community structures are essential for the HWCMS and need to be further developed and adequately capacitated. The roles and responsibilities of the key community institutions implementing the HWCMS are described below and the institutional structure is for the HWCMS is outlined in Figure 9. The present NRCs shall play a vital role in being directly involved in fence maintenance and planning of localized coexistence strategies and will identify a Cx-in-charge to represent the NRC in all matters relating to HWC management and coexistence strategies. One zone level the Cx committee will organise HWC management

activities, work in close contact with DNPW EE officers and supervise the community-based Rapid HWC Response Teams. As proposed by stakeholders, the Co-existence Unit will be established to build a special team charged with general oversight over community-based HWC management and Coexistence strategies, their monitoring and financial resources. Its composition will have representatives from DNPW, NVA, TLC, District Council. To maintain a manageable size VMWR and south-western NNP shall receive separate Cx Units.

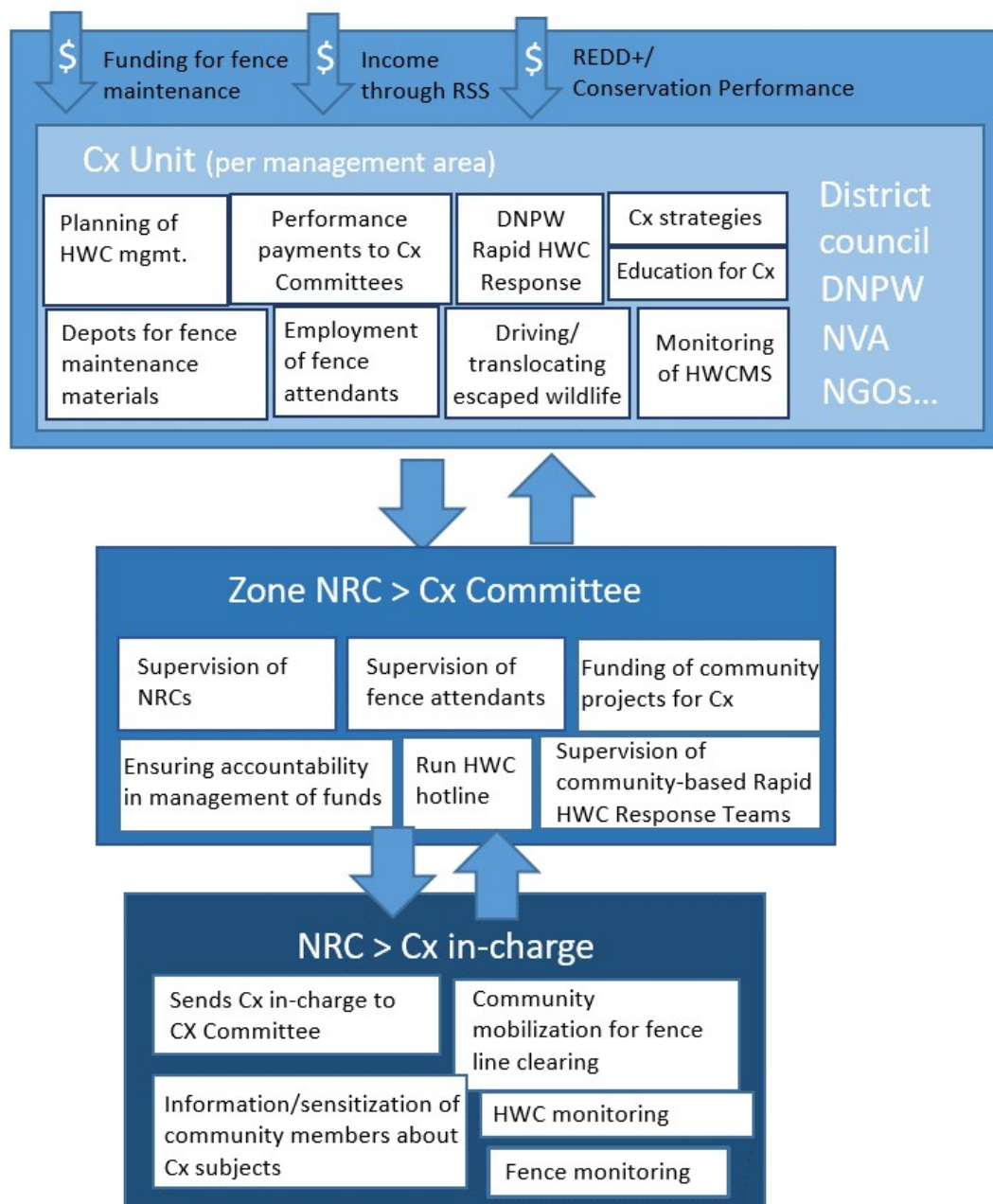


Figure 9 Proposed Framework to integrate the development of human-wildlife coexistence and HWC management in a revised institutional structure

In order to ensure robust community participation under the HWCMS, there is need to establish strong community institutions. Each institution on each administrative level will play important roles and take over their responsibilities. To fulfil their roles certain requirements need to be met (Table 4). Besides community institutions governmental agencies/departments as well as CBOs play a vital role for the implementation of an integrated and holistic HWCMS. Further details on community representation for the HWCMS are given in chapter 6.3.2 (Building strong community representation)

Table 4 Institutions implementing the HWCMS in VMWR and NNP, their prospective roles and responsibilities as well as requirements to fulfil their duties.

Institution	Role & responsibility for HWCMS	Requirements
NRC with Cx in-charge	•Fence monitoring by fence attendants •Active participation in maintenance of the fence line •Fence line clearing •HWC monitoring by Cx in charge •Reporting to zone on illegal activities taking place •Conducting awareness meetings	•Training (Cx personnel and fence attendants) •Protective gear •Communication equipment (radios/phones) •Transport (pushbike) to enhance mobility
Zone NRC/Cx committee	•Supervision of NRCs •Supervision of fence attendants •Financing fence repairs by the fence attendant •Supervision of community-based Rapid HWC Response Teams •Joint planning of fence related programmes with NRCs •Approval of proposed work plans from NRCs •Ensuring accountability in management of funds •Monitoring utilization of funds under the Fence Maintenance Performance Scheme •Exchange/coordination with adjacent Cx committees •Run HWC hotline	•Bank account •Accountant •Training (Cx personnel) •Communication equipment (radios/phones)
Cx Unit	•Planning of community-based HWC management activities and Cx strategies •Channelling of funds to Cx committees (Zone NRCs) •Release funds under Fence Maintenance Performance Scheme •Employment of fence attendants •Monitoring of plans and activities delivered by Cx committees (Zone NRCs) •Ensure accountability and transparency - Transparent reporting	•Bank account •Accountant •Training (Cx personnel) •SOPs/code of conduct •Safeguards to ensure good governance
DNPW management	•Overall supervision and quality control for all HWC management activities and Cx strategies (technical backstopping) •Provide training and capacity building •Spatial planning •Operation of DNPW-based Rapid HWC Response Teams	•Motorbikes and motor vehicles (transport) •Communication e.g. phones, handsets •Fence spares •Protective gear •Training •First aid skills, drugs

	•Monitoring of HWC and DNPW-related operations	•SOPs/decision support schemes
DNPW extension workers	•Operate HWC management depots (fence repair materials) •Provide training and capacity building •Information and sensitisation •Receiving and attending to reports	•Motorbikes (transport) •Communication e.g. phones, handsets •Training •First aid skills, drugs •SOPs/decision support schemes
TMU	•Grant management •Supervision and quality control for HWC management activities and Cx strategies •Facilitation of cooperation for Cx	•Sufficient and skilled staff
District Executive Committee	•Reviewing quarterly/half yearly reports by Agriculture and Natural Resources Sub-Committee •Trouble shooting and provision of guidance and direction	•Logistical Support for convening meetings
Community police	•Assisting Patrol Teams in apprehending and Handling of culprits	
Ministries/Departments having a stake (Agriculture, Fishery, Forestry, Water ...)	•Implementation of livelihoods interventions in the buffer zone	•Project support
Traditional Governance structures (TA: Village heads, chiefs)	•Assisting in mobilising local communities to support fence maintenance activities •Sensitisation and awareness on the importance of the fence	
ADC, VDC	•Endorsement / Approval and buy-in of planned fence operations •Trouble shooting	
CBOs, NGOs and other agencies	•Support development of Cx strategies at large scale •Support with expertise in specific topics/niches (e.g. veterinary support for translocation, human health and safety, disaster management, involvement of youth etc.)	•Training/Information on HWCMS and HWC drivers •Project support

The roles of governmental and non-governmental institutions in integrated HWC management and Coexistence strategies

While the HWCMS for VMWR and NNP is community centred and takes a decentralised bottom-up approach, governmental institutions play an important role in framing the implementation of the HWCMS. Policy frameworks and established structures guide the HWCMS on various levels. Furthermore, where governmental institutions and CBOs are touching upon aspects of the HWCMS or impact on drivers of HWC they need to be involved and take an active role. Their integration is required for comprehensive mainstreaming of HWC management and the implementation of Cx strategies.

The role of DNPW and its extension officers in HWC management and Coexistence strategies

In order to comprehensively address HWC issues, DNPW has to work towards enlisting the support of a cross-section of stakeholders. This includes building strategic partnerships with

community structures, local authorities, and private sector in implementation of strategies to roll-out appropriate HWC management and mitigation plans. Amongst these strategies are those functions on land-use planning. Carrying out some of these measures will necessitate formulation of Memorandum of Understanding (MOU) to be signed by relevant parties. Spatial planning is a strategic imperative to work towards for implementation of development programs within the border zone. This process requires early negotiation with stakeholders. It must be the responsibility of all citizens to spell out their roles and responsibilities with regard to HWC management and coexistence strategies. Government through DNPW has to encourage every party/agency to actively participate.

DNPW should devise technical guidelines for management of the fence, and monitoring of HWC in general. DNPW should work with relevant government ministries, NGOs to support development interventions within the border zones targeting households that suffer losses from HWC. DNPW needs to take the lead in mainstreaming HWC issues into district planning frameworks, such as agricultural schemes, irrigation, aquaculture, and other development sectors and regard this matter as a prime obligation. For many years, the strategies pursued by DNPW can be described as having been inward-looking. The reality is that protected areas do not exist in a vacuum. Equal and deserving attention should be paid to what happens and takes place around protected areas. In that regard, DNPW has to marshal and galvanise resources in support of interventions that foster harmony and co-existence between protected areas and what happens on the outskirts, particularly rural development programmes that seek to address socio-economic well-being of local communities. Therefore, a need for DNPW is to consider partnerships with a range of development players and in some of its strategies DNPW may have to increase and step-up efforts in funding rural livelihoods improvement interventions. Furthermore, DNPW and the project should review the job occupation of extension staff and ascertain whether this would not over-stretch them. It might mean upgrading the positions or even creating new positions.

Role of DNPW extension workers:

In general, DNPW / the project ought to review the job occupation of Extension Workers. It is envisaged that implementation of activities under the HWCMS will bring added responsibilities to the DNPW Extension Workers. Currently Extension officers undertake the following duties:

- Maintain regular contacts with assigned border zone communities;
- Monitor adherence to resource harvesting quotas;
- Responsible for receiving queries/complaints from communities and their communication to PA management; and
- Supervise extension activities on resource harvesting.

It is now expected that the Extension Workers in an expanded role will work closely with Cx in-charges and Cx Committees. Specifically, DNPW Extension workers are to:

- Provide regular technical guidance and support to Cx In-charges;
- Ensure that fence maintenance and management operations are fully undertaken by NRCs;
- Monitor and supervise fence attendants
- Assist in planning and budgeting of fence management operations by NRCs and Zones;

- Ensure functionality of the DNPW Community-led Rapid Response Team;
- Monitor fence operations; and
- Undertake general capacity building to improve functionality of Cx In-charges.

The role of CBOs and NGOs in HWC management and Coexistence strategies

Implementing an effective HWC management and sustainable Cx strategies is a cross-sectoral endeavour for which a wide expertise is required. While community institutions and governmental agencies take the lead in the HWCMS, they will not be able to succeed without the support of CBOs and NGOs. Rural development and livelihood support programmes need to be scaled-up to reach a critical mass of interventions to enable economic viable market access, upgrade local economy and overcome poverty. NGOs working in partnership with the governmental structures may deliver satisfactory results and initiate further economical collaborations. Other NGOs may bring veterinary expertise in handling wildlife species for translocation and others may support safety and health infrastructure.

While most of those institutions facilitate their own platforms, the HWCMS needs to bring all players on board. Working towards unified governance structure/platform to achieve a harmonized approach in HWC management and CX strategies seems to be a way forward (EI05).

6. Tools and strategies for a holistic and integrated HWCMS for VMWR and NNP

The various ecological and anthropogenic drivers, pressures and impact around HWC require a holistic and integrated HWCMS (Gross 2019). HWC will not be solved by solely implementing technical methods and means. It requires much more than merely stopping an animal from moving into a farm. Multiple strategies are needed to fully understand the complexity of HWC and address its challenges on various levels (Figure 10). The core of a holistic HWCMS are social strategies that bring stakeholders together and ensure exchange and enable engagement. HWC management is about sharing experiences, of building relationships, and trust, and it has to be mainstreamed into all sectors of conservation and development. Any HWCMS needs to be based on a strong and supportive foundation of legal frameworks guiding its actions and a spatial planning with ecological and socio-economic overview and foresight. Technical strategies bear powerful tools to create safe space for people and wildlife. Financial strategies balance the costs of living with wildlife and support fair shares of benefits. On top of all this, a holistic and integrated HWCMS builds upon data based evidence provided by continuous monitoring and evaluation. In short, an effective HWCMS decreases the negative impact of wildlife on safety and livelihoods, while simultaneously decreasing negative impacts on wildlife and natural resources and maintaining or strengthening positive impacts.

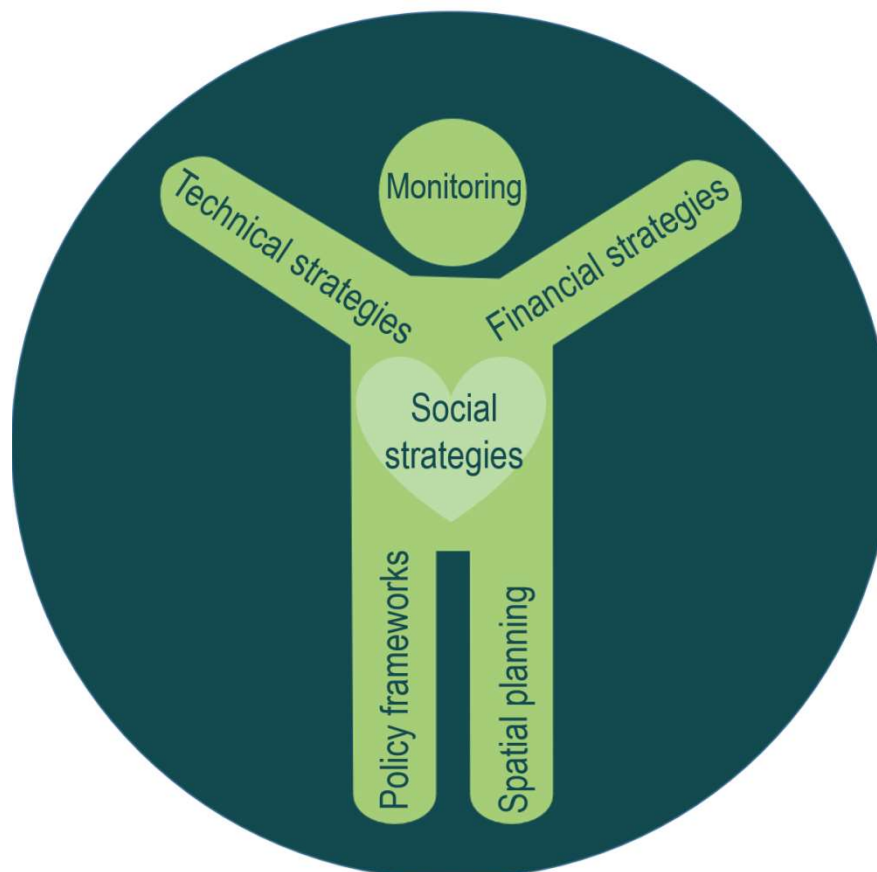


Figure 10 Framework of a holistic HWCMS, considering legal framework, monitoring, spatial planning, social, financial and technical strategies (adapted from Gross 2019).



6.1 Legal framework for HWC management and coexistence

Various international framework agreements and national policies affect the management of HWC and the development of coexistence strategies in Malawi.

The development and implementation of a HWCMS needs to be conducted against the background of these legal frameworks. This is particularly important, as HWC management is a cross-sectoral theme, touching not only upon wildlife conservation, but upon agricultural development, forestry, water, veterinary issues, safety etc.. To foster mainstreaming of HWC management and coexistence strategies into multiple sectors, it needs to be understood how current legal frameworks directly or indirectly affect HWC and its management. Here, we are providing a rough overview of the most important legal frameworks touching upon HWC management and coexistence strategies for VMWR and NNP and recommend further actions.

National Environmental Policy

The Government of Malawi adopted a National Environmental Policy (NEP) in 1996 to provide guidance and set standards for development of sector policies in environment and natural resources. It provided an overall framework against which relevant sectoral environmental policies were revised and adopted to ensure that these are consistent with the principles of sustainable development. More specifically, the National Environmental Policy sought to:

- promote the efficient utilization and management of Malawi's natural resources;
- facilitate the rehabilitation and management of essential ecosystems and ecological processes;
- enhance public awareness of the importance of sound environmental management; and
- promote cooperation between Government, local communities, and women groups, non-governmental organizations and the private sector in the management and sustainable utilization of the natural resources and the environment.

Among other matters, the Revised National Environmental Policy (June 2004) recognized the importance of creating an enabling policy and legal framework for cross sector coordination, participation of non-state sectors, strengthening the enforcement machinery and decentralizing natural resources and environmental management and governance. It is worth highlighting that amongst some of its specific Policy Goals, the NEP seeks to meet the following goals:

- Integrate sustainable environment and natural resources management into the decentralized governance systems and ensure that the institutional framework for the management of the environment and natural resources supports environmental governance in local government authorities.
- Promote local community, Non-Governmental Organizations (NGO) and private sector participation in environment and natural resources management.
- Facilitate development of mechanisms for management of conflicts in the environment and natural resources sector.

These goals are extremely important aspects when considered in the elaboration and development of integrated HWCMS and human-wildlife coexistence strategies. The NEP advocates the encouragement of community-based management and revenue sharing from the sustainable utilization of natural resources on customary and public lands. These are part of the overall design and endeavour to ensure that citizens benefit from sustainable use of natural resources in general and in minimizing conflict. The policy also highlights the point that local

communities whose livelihoods depend on natural resources shall take a leading role in identifying, planning and implementation of community based natural resources management (CBNRM) activities and appropriate legal and institutional frameworks shall be facilitated to ensure that local communities take responsibility for and benefit from sustainable management of natural resources. It is sought to return a significant portion of the benefits from sustainable utilization of natural resources on public and customary lands to the local communities whose collaboration is needed to conserve the resources and integrate local representatives into the decision-making process in order to empower local communities in the management of natural resources. As such, the NEP lays the foundation for a decentralised, community-based HWC management and on coexistence strategies, building on the principles of sustainable development.

Malawi Wildlife Policy

Conservation of biodiversity both within and outside protected areas is critical to environmental sustainability together with other policies such as land use and sustainable agriculture policies. The Malawi National Wildlife Policy aspires for a more inclusive approach to wildlife management (DNPW 2018). The Wildlife Policy puts much emphasis on building constructive relationships between government and local communities in the management of wildlife. At community level DNPW implements activities through community-based organizations, the NRCs. The Malawi Wildlife Policy and the National Parks and Wildlife Act Chapter 66:07 were instituted with the objective to manage and conserve wildlife resources in National Parks, Wildlife Reserves and those outside protected areas in such a way as to ensure their protection, sustainable utilization, and reduction of people/wildlife conflicts (Government of Malawi 2004). Amongst some of the Guiding Principles are that:

- Local communities within and adjacent to National Parks and Wildlife Reserves shall participate in their planning and management.
- There shall be a fair distribution of the benefits and revenue from sustainable utilization of wildlife resources between central government, local authorities and local communities.
- Provide benefits to local communities from National Parks and Wildlife Reserves by facilitating their planning, management and administration, and by returning a certain percentage of revenues to local communities.
- Train local communities in law enforcement including management of problem animals in National Parks and Wildlife Reserves.
- Design and implement mechanisms for managing conflicts between wildlife and the local communities around National Parks and Wildlife Reserves.
- Establish a Wildlife Fund for sustainable management of wildlife.

While the reduction of HWC is seen as an important objective of DNPW, the Wildlife Legislation of Malawi does not mention anything about the compensation of losses/damage caused by wildlife. However, financial tools mentioned are the distribution of benefits and revenues from sustainable utilization of wildlife resources, pointing at a political environment that favours equitable benefit share and performance schemes to offsetting damage.

Hunting and lethal control

Hunting is permitted in Malawi, but is restricted to two species: Baboon (*Papio ursinus*), and bush pig (*Potamochoerus porcus*), and to a limited number of subsistence hunting permits for duiker (*Sylvicapra grimmia*), warthog (*Phacochoerus aethiopicus*) and bushbuck (*Tragelaphus scriptus*) (Halle and Burgess 2006). The hunting licences are available for a nominal fee from local Wildlife Offices within Malawi. Baboon and bush pig are common in Malawi, particularly around natural forests, reserves and forested hills. They are considered as vermin due to the damage they cause in croplands. The low density of animals in customary land stimulates poaching in the protected areas including national parks and wild life reserves.

The National Parks and Wildlife Act also regulates the killing of protected species in defence of a person, property, crop or domestic animals (§74 National Parks and Wildlife Act). Killing is allowed to any person, who is threatened, who is the owner, the servant of the owner or acting on his behalf in safeguarding the property (§74 National Parks and Wildlife Act), if immediately and absolutely necessary. Otherwise threats may be reported to an officer, who would then take any necessary action he considers fit in the circumstances (§77.2 National Parks and Wildlife Act). Killing of animals is defined as a last resort (§77.3 2 National Parks and Wildlife Act) and shall only be done if the survival of the species is not put at risk. With this formulation, the National Parks and Wildlife Act generally supports killing of animals, also endangered species, if deemed as problematic. It furthermore leaves a wide scope for interpretation of the appropriateness of lethal measures to the officers. This calls for further guidance and support mechanisms, i.e. standard operation procedures (SOP) for lethal control.

Another ambiguity related to the subject of lethal control is the question who would receive revenues from meat sale of the animal. While the Wildlife Act deems the transfer of ownership of a killed animal (§76) and supports the handover of the carcass to the officer (§78), generally local communities do not benefit from the meat or its sale. This creates a sense of injustice (EI 10), particularly against the background of benefit and revenue share policies explained above. Therefore, the current regulations of lethal control of problematic animals do not be sufficient to prevent abuse and injustice.

Constitution and land tenure

The Malawi Constitution mentions that the State shall actively promote the welfare and development of the people of Malawi by progressively adopting and implementing policies and legislation. The constitution calls for managing the environment responsibly in order to:

- a) prevent the degradation of the environment;
- b) provide a healthy living and working environment for the people of Malawi;
- c) accord full recognition to the rights of future generations by means of environmental protection and the sustainable development of natural resources; and
- d) conserve and enhance the biological diversity of Malawi.

The Land Tenure and Land Use Policy also seeks to empower local communities to manage common property resources in an environmentally sustainable manner, to develop and implement local programmes to rehabilitate highly degraded land within the border zone. It calls for improved cultivation practices, promotion of local land use planning and holistic approaches concerning NRM, in addition to promoting alternative income generation in rural areas using multiple resources (permaculture systems) for sustainable natural resource use, agriculture combined with economics, management and financial training. As part of efforts to

harmonize land use practices, The Land Tenure and Use Policy calls for environmentally sustainable agricultural development by ensuring sustainable crop and livestock production through ecologically appropriate production and management systems, and appropriate legal and institutional framework for sustainable environmental management. Fragile and marginal areas should be protected from environmental degradation and promotion of proper animal husbandry practices to curb overgrazing and environmental degradation. As such, border zone communities to PAs need to further consider drivers of HWC as a risk to their agricultural practices. Integrating the special importance of agricultural practice as potential factors to increase or decrease HWC would support the development of appropriate and sustainable agriculture in border zones to PAs.

Land use policies

There is growing conflict between agriculture and protected areas especially in view of increased agriculture expansion and growing human population. The decline in soil fertility because of over-use or improper agricultural techniques has encouraged encroachment on conservation areas, watershed, wildlife and national parks. Ignorance about land carrying capacity and agro-ecological zoning makes it difficult to educate and enforce proper land management practices. The National Land Use Policy recommends that agro-ecological zoning studies need to be undertaken to determine land potentials and capabilities. It adds that there is need to introduce buffer zones in areas where agriculture conflicts with protected areas. Where possible, multiple land uses such and agro-forestry should be encouraged.

Forest clearing for agriculture, fuel wood and for tobacco curing is a major problem and a leading cause of degradation and conflict between local communities living adjacent to protected areas. The need for more land for cultivation, as cultivable land becomes scarce forces farmers to encroach into reserves and national parks. Limited availability and the loss of forest products on customary land forces local residents to enter protected areas as they depend on them for income and subsistence. The Malawi Land Use Policy recognizes that in some rural areas, collecting, processing and selling forest products are the only way by which rural households obtain income. To this effect, it recommends that local/village communities should be encouraged to manage forest products locally and be watchdogs to protect community forests and woodlands. Community and village development organizations should be encouraged to practice agroforestry. Most importantly, in order to manage conflicting interests amongst stakeholders, the Land Use Policy calls for Environmental impact assessment (EIA) studies before any major land development project is carried out. Some technical HWC management tools, such as fences, may require EIA prior to implementation.

Perhaps the most important land sector agency whose policies impact lands resources the most is the Ministry of Agriculture and Irrigation. Agricultural development policy in Malawi has always been, and is still dualistic, emphasizing food self-sufficiency in small-holder areas, and capital intensive export production in the large-scale (estate) sector. Food self-sufficiency in this context is synonymous with self-sufficiency in maize production. Unfortunately, maize production adjacent to protected areas is the biggest trigger of human-wildlife conflict.

National Forest Policy

Currently, demand for forest resources is higher than supply, and this creates conflict between protected areas and forest users. The Malawi Forest Policy seeks to promote the participation of local communities, civil society and private sector in forest conservation and management.

It seeks to promote appropriate incentives for the participation of local communities in the management of forest resources in the country.

Human-wildlife conflict in international policy frameworks

Reducing conflicts over the use of natural resources, including wildlife and PAs, is given high priority on international level. The Convention on Biological Diversity's 2050 Vision of "Living in harmony with nature" envisages a world in which environmental conflicts are much reduced and "humanity lives in harmony with nature and in which wildlife and other living species are protected" (HWCTF 2021).

The Post-2020 Global Biodiversity Framework draft currently includes the reduction of HWC as a target, the details on language and indicators is still under discussion.

Furthermore, the HWC Task Force of the IUCN is about to develop IUCN Guidelines on the Management of Human-Wildlife Conflict.

Recommendations for improving legal frameworks for HWCMS

Objective: Legal frameworks are harmonized and effectively enable holistic and integrated HWC management and coexistence strategies.

Activities*:

- Strategic assessment and evaluation of policies regarding the interface of subjects of development-environment nexus and conservation/biodiversity utilization paradigms
- Add guidance to lethal control of problematic animals
- Add guidance to Land tenure and Land use policies in PA border zone areas considering HWC, its drivers and management
- Assessment and revision of HWCMS with regard to IUCN Guidelines, once they are published
- Adoption/extension of the HWCMS to the whole TFCA also considering Zambian legislation

* Details elaborated in Action Plan HWCMS Manual



6.2 Technical strategies

Multiple technical strategies have been developed worldwide, to improve income through wildlife tolerant businesses, prevent damage by wildlife species, deter wildlife in case damage could not be prevented, and to mitigate negative effects of damage by wildlife. In VMWR and NNP several methods have been used, such as the support of sustainable livelihood strategies, the use of fire-crackers to scare elephants, support by DNPW scouts to drive wildlife back into the PAs, and the erection and maintenance of game proof fences along the PAs boundary.

To increase the effectiveness and sustainability of such measures, the need to be implemented in a coordinated and integrated way and negative side effects of one measures on the other need to be considered. The HWC situation analysis revealed that only the use of fire crackers has been ranked as an effective measure by DNPW Extension Workers and community representatives alike. Particularly the fences of the past have been vandalized and converted into snares. To ensure that technical measures show the desired effects, they need to be planned in strong collaboration with local communities, the provision of sufficient funds needs to be ensured, and monitoring and evaluation of effects needs to be in place. Therefore, the implementation of any technical strategy needs to be coupled with social and financial strategies as well as spatial planning and monitoring.

Maintaining HWC prevention measures

Most technical HEC measures strongly depend on adequate maintenance. This maintenance generally is to be conducted by specific members of the farming community. In many HWC management programmes in Africa, Asia and Europe the issue of a maintenance breakdown is observed. This maintenance breakdown is characterized by initial high motivation for the implementation of the measure and the commitment for maintenance, and a drastic decline in maintenance efforts over some time. The problematic point seems to be that only if the benefit of maintaining a measure is visible, high input by community members or individuals is given. However, when the measure shows success the damage ultimately declines and with that seemingly the stimulus to remain active. The benefit is not visible anymore (e.g. because wildlife stops coming) and maintenance input goes down. If then damage happens because of low maintenance, it is claimed the measure was not working. Besides this many technical HEC measures require strong labour input. In case of relatively low expected benefits (e.g. the regular harvest of a staple crop), motivation for extra work might be low. Here a need has been identified for the development of approaches to maintain the motivation for the continuation of successful measures. Keeping the personal connection to users, constantly monitoring their activities and success and regular communication about challenges and perspectives seems to be one option to achieve this goal (Gross 2019). Incentive payments for good maintenance efforts and deducting penalties in case of bad performance may be another tool to enforce good maintenance efforts.

6.2.1 Sustainable livelihood development – reducing dependency on natural resources of PAs

Sustainable development considers ecologic, social and economic factors and aims at balancing economic growth with ecologic carrying capacity and social equity. In landscapes which are shared by wildlife and people, the ecologic component is strongly influenced by wildlife and needs to be factored into all development activities, as a challenge or opportunity.

Market-based strategies benefitting individuals, while not harming wildlife, are an important tool in the set of HWC management strategies. The general idea behind it is, to reduce livelihood practices which may trigger HWC (e.g. farming of attractive crops, production of livestock attractive to carnivores) and at the same time are low in value, by businesses which are more suitable to wildlife rich areas and generate higher income. This can be achieved through the farming of cash crops which are less attractive or even unpalatable to some herbivores and adding value to traditionally grown crops for sale. Also, the production of handicraft products, honey or fish can decrease the vulnerability of farmers to damage by wildlife. An important factor for success, is market access. Building up “wildlife friendly” businesses implies building up capacity for small business management and bears a viable economic potential which fosters sustainable business instead of aid.

Also skill-transfer partnerships formalised through social contracts between private companies and local communities could be established to enforce the development of sustainable livelihoods, whereby communities are accompanied to gradually provide economically viable services (e.g. production of a specific product or crop for a specific buyer). Such business-like partnerships, with an economic rationale, can function as powerful incentives – if appropriately accompanied throughout.

As the high vulnerability of people increases the significance of losses to wildlife, decreasing farmer’s vulnerability through livelihood development is an important human-wildlife coexistence strategy and bears the potential to create synergies between development and conservation. Ultimately, wellbeing and safety is achieved for communities, while biodiversity and wildlife are protected and ecosystem functions are maintained.

Farming strategies

As crop damage is the most important negative impact of wildlife on people’s livelihoods in VMWR and NNP (Shaba and Gross 2021), adjusting and improving farming practices on customary land is key to achieve coexistence of wildlife and people in the long term.

Elephants are the most challenging species for farmers, but also hippos, baboons and wild boars must not be neglected, as they can cause chronic crop damage and are difficult to deter from farms. The feeding preference of elephants on staple crops (i.e. maize or sorghum) or other readily available food on farmland and villages will persist, even if they are protected through barriers or deterrents (see below in this chapter). Once elephants experience the high nutrient intake by consuming such food they will be lured to crop fields or villages. Decreasing the attractiveness of farms and villages for wild herbivores, therefore, is seen as a constructive strategy to decrease the invasion of elephants and other wild herbivores into human dominated landscapes.

The ecological suitability as well as market value of the grown crop has to be taken into consideration when making the crop choice for farming. High value crops generate income and may reduce incentives to illegal activities (EI 06). Crop choice of high value crops, which are

unattractive to wildlife could create double benefits: increasing farmer's income and decreasing attractiveness of farmlands to herbivores.

Adjacent to Liwonde NP birds-eye chilli is produced in a 30 ha pilot project plot. The chilli farms are located directly at the fence line, 50 meters in width and 6 km in length and are drip-irrigated. The project is run by African Parks, under leadership of TLC and funded by a Dutch company (EI 05). The projects has just started and is achieving promising result, however, data analysis and evaluation will be available in 2023.

Similar projects have been implemented in South Luangwa/Zambia, where lemon grass, achieved high income as an alternative cash crop, followed by ginger and turmeric (Gross et al. 2016). Revenues can be strongly increased through value adding processes (e.g. polishing) or following standards of good agricultural practice (Booker et al. 2016).

Which crops are naturally avoided by elephants?

There are some crops, which are not consumed by elephants in large numbers. These crops are defended against feeding by herbivores through plant secondary metabolites. Field experiments have shown that elephants would not consume crops containing antifeedants like capsaicin (Parker and Osborn 2006) or so-called medicinal and aromatic plants (Gross et al. 2016, Gross et al. 2017). Although elephants are able to neutralize tannins with their salivary proteins (Clausen et al. 2005, Schmitt et al. 2016) other plant secondary metabolites seem to be avoided as detoxification is energetically expensive. Such an avoidance has been demonstrated for African elephants for lemon grass, ginger, and garlic (Gross et al. 2016) and for basil, citronella, chamomile, coriander, lemon grass, mint, and turmeric in Asian elephants. The identification of such less attractive or even unpalatable crop types most probably is transmitted by olfactory cues. It has recently been shown that elephants rely on olfaction to locate food and distinguish between preferred and avoided forage (Plotnik et al. 2014, Schmitt 2016). Which odours or odour cues finally determine the decision of elephants to forage on a specific crop type or not, is still unknown. In order to develop new crop protection strategies based on odours, more research in this area is needed (Santiapillai and Read 2010).

With well-connected markets, well-organised producer groups and good product stocking systems joint marketing can achieve good prices for farmers. The development of producer and marketing corporations to command prices is one of the key strategies for TLC in the VMWR/NNP landscape (EI05). Therefore, they start with leadership trainings for producer groups and the development of skills on good governance, which is needed to achieve self-sustenance. Then, technical trainings can commence, because producer groups can organise themselves. Success has been achieved for the production of groundnuts and soya, whereby market has been created through increased production, good structures and purchase guarantees (EI05). As groundnut and leguminous plants, such as soya, are frequently damaged by wildlife (Gross et al. 2019), plantation close to herbivore habitat should be avoided.

For subsistence farmers agricultural practices are more than a livelihood. They are deep rooted traditions and the basis of a family's continued existence since decades and strongly linked to cultural identity. Therefore, changes in agricultural practices take time and need to be handled with great sensitivity. Moving away from farming a staple crop that has fed a family through decades and to replace it e.g. by a cash crop that requires a reliable market and some economic skills, may be associated with losing autonomy and feeling exposed to starvation. Enhanced

training, skills and knowledge support farmers in developing a holistic understanding of agriculture, ecology and economy. Integrating the subject HWC drivers and the role of farmers in human-wildlife coexistence in leadership training programmes could be a first step support sustainable farming practices against the background of shared landscapes.

Livestock production

Livestock production in wildlife rich areas needs to be handled with specific care. Even though livestock predation in the border zone of VMWR and NNP seems lower compared to crop damage by herbivores, it may not be neglected. The installation of a game proof fence may further impact the situation of livestock predation on communal lands. Large carnivores, such as hyena and leopard and smaller carnivores, such as civets or honey badgers can make their living in agricultural landscapes, escape the PA by creeping under the fence or move in from other areas. The game proof fence along VMWR and south of NNP, therefore must not necessarily decrease the number of carnivores in the adjacent communities, but may in contrary, even increase in the presence of certain predators (EI 11). Such unintended consequences need to be considered in HWC management planning.

Small livestock, such as ducks and chicken are important for the protein supply of families. Keeping goats is promoted by TLC through a “Livestock-pass-on system”, whereby goats can be acquired at low cost. Goats do not serve the daily protein intake of families, as small livestock does, but are kept for special occasions (e.g. funeral, wedding) and as economic asset. Important impacts of this programme are the added value to farmer’s assets and the connected climate change risk reduction as well as an increase resilience through diversification. However, goats are attractive prey species for larger carnivores and need to be kept in safe pens at night and need to be guarded during daytime, in case they e.g. enter community forest. Furthermore, any livestock production programme needs to be backed by a vaccination programme to reduce disease transmission, specifically at wildlife-livestock interfaces. Upscaling livestock production in the border zones of VMWR and NNP in the first place means upscaling livestock husbandry and livestock safety.

Fish farming

The demand for fish as source of protein and for income generation is high in the border zones of VMWR and NNP. Fishing in the rivers, however, increases exposure towards crocodile and hippo and may further overexploit fish resources, which also may increase croc attacks on livestock and people.

Fish farming has been implemented successfully in many places with similar ecological setting (GIZ 2020) and should be explored as an option to increase food security and income for people living in the border zones of VMWR and NNP and at the same time to reduce exposure towards wildlife. Collaborations with successful projects, such as the GIZ led project “Sustainable Aquaculture Malawi” which aims at improving the organisation of farmers, creating operational economic groups and enabling members to receive services and inputs (GIZ 2020), may open up new opportunities. The project is also operating in Mzuzu, Rumphi district.

Sustainable use of natural resources

Communities living on the fringes of VMWR and NNP are in essence natural resource dependent communities. They have some key historical economic and socio-cultural links to the two PAs and at least half of households in the border zone area access natural resources in VMWR and NNP, notably Non-Timber Forest Products (NTFPs), mainly mushroom, thatch

grass, medicinal plants and edible insects. Therefore, NTFP play an important role in the local economies, sustaining livelihoods and as a source of income.

Within a 5-km belt inside the PAs border zone community members are allowed to collect NTFPs, after having obtained a permit by the NRC. The collection of thatch grass, one of the most frequently collected resources, can even be combined with an efficient fire management, when well organised (EI 14, EI 15). Furthermore, other sustainably collected resources, such as mushroom, can be processed to increase value and sold to increase income. Any usage that exceeds traditional and cultural forms of use need to be well planned, organised and monitored, to meet sustainability criteria. As the regulations on the use of natural resources (DNPW 2018) seem not to be perfectly well understood by users and is prone to misuse (Shaba and Gross 2021), redesign to increase user friendliness and detailed information on the permit system, as well as improved control mechanisms are required.

Reforestation and Agroforestry

The border zone communities of VMWR and NNP are still highly dependent on wood as the most important source of energy for cooking. Naturally died trees and branches (deadwood) cannot sufficiently meet the needs of people for fuelwood. The illegal harvest of trees inside the PAs and the illegal production of charcoal causes wild habitat degradation and therefore is another important driver of HWC. Stopping the unsustainable use of wood in VMWR and NNP is a priority to maintain viable habitats for wildlife and to maintain the important ecological functions of the PAs (watershed and carbon storage). Reducing firewood consumption and fostering wood production outside of the PAs are strategies currently implemented by TLC in the border zone communities.

Firewood consumption is reduced by the introduction of energy saving stoves (rocket stoves), which consume 65% less fuelwood than traditional open fires. Less fuelwood consumption also means less time spent for fuelwood collection (mainly by women), less exposure to wildlife and more time available for other livelihoods. Furthermore, energy saving stoves generally produce less smoke and are, thus, less harmful to the health of the cook. To achieve significant effects on the overall fuelwood consumption of local communities' energy saving stoves need to be introduced and used at scale. Therefore, multiple types of stoves (e.g. LPG, solar cookers, and chimney stoves) may be used. Co-designing of energy saving stoves by users and engineers have gained successful outcomes in other places (DeWan et al. 2013).

Regeneration of the Miombo woodlands on degraded hills outside of the PAs is another activity TLC is involved in, to enable sustainable use of forest resources. Good governance structures are required to manage these areas sustainably. By-laws are created by community representations (see also chapter 5.2 and 6.1) community-based conservation of the forests and to obtain forest products sustainably. Benefits of such community managed forests can be obtained at individual (e.g. fire wood collection) and community level (carbon finance/REDD+) and generally do not collide with farming activities.

Tree-planting can further be fostered on household and community level, on fallow land, and adjacent to farms and gardens. The combination of trees and crops may further have a positive impact on the soil fertility, reduce erosion, provide fertilizer and tree products, such as wood and fruits. If developed and maintained skilfully agroforestry is an ideal concept to foster human-wildlife coexistence adjacent to PAs.

Beekeeping

The production and sale of high quality honey can greatly increase the household economy of people living in rural landscapes. Wild African honey bees easily colonize beehives, which can be produced on site. In case of sufficient availability of flowering plants (e.g. trees and shrubs) honey production can be plentiful and of good quality. Many projects are promoting this form of business, which fits well to biodiverse areas and is not conflicting with conservation and can be tailored into organic farming practices. Members of the border zone communities of VMWR and NNP are allowed to hang beehives for the colonization by wild bees and for the harvest of honey within the 5 km belt inside the PA.

Most important for upscaling honey production, harvest and sale are skills and resources to be able to produce organic honey professionally and market access. Community members living adjacent to Majete NP produced 2.5 tons of honey in 2021, which is sold through Honey with Heart and achieves a total revenue of 7,500,000 MWK (9135 US\$) (MWR 2021).

Recommendations for sustainable livelihood development

Objective: Securing livelihoods of border zone communities in such a way that negative impact by wildlife is outweighed by sustainable and wildlife conscious income generation

Activities*:

- Identification of suitable and viable livelihood options, improved farming practices, and businesses, which are sustainable and do not drive HWC
- Implementation of wildlife conscious farming and livelihood strategies through integration into rural development programmes
- Improve sustainability of natural resource use considering HWC drivers
- Decrease unsustainable use of natural resources with focus of reducing drivers of HWC in PAs and on customary land
- Enable and support innovation

* Details elaborated in Action Plan HWCMS Manual

6.2.2 Strategic water supply

The lack of water in some communities adjacent to VMWR and NNP a serious issue for the concerned households. As long ways to fetch water puts people at risk of accidentally running into wildlife, water supply ideally should be available within villages. Furthermore, fetching water, washing and bathing in rivers puts women and children at risk of crocodile attacks. In VMWR and south-western NNP the construction of game proof fences will further restrict access to water sources (i.e. Rukuri River).

Combined with macro and micro level spatial planning, the construction of boreholes for safe drinking water supply can be used strategically in HWC management. Providing water, where people have safe space to develop their livelihoods creates incentives to settle in these areas and stay at those places. The construction of water points moreover can be used as an entry point into community collaboration as well as partnerships with development and/or humanitarian aid organisations. A water point development plan based on groundwater

availability and geology, as well as wildlife movement and community development plans is the basis for using water supply strategically in HWC management.

Recommendations for safe and strategic water supply
Objective: Safe water access outside of the PA is available to all border zone communities of VMWR and NNP Activities*: ➤ Secure safe water access to communities cut off to their water sources by PA fence ➤ Develop safe water access for all villages in the border zone and beyond * Details elaborated in Action Plan HWCMS Manual

6.2.3 Separating wildlife from people and their assets through electric fencing

Human-wildlife coexistence means people and wildlife sharing land at landscape level. Preventing crop and livestock damage and securing safety of peoples life is part of coexistence strategies and fine spatial scales. Separation of people and wildlife is one of the methods used to create safe space for people and for wildlife (Gross et al. 2019; 2021). The selection of technical measures to separate people and their assets from wildlife needs to be based on ecological, social and economic criteria. The behaviour of wildlife species, the geographic and geomorphological characteristics of an area, the traditions and habits of people, to only mention a few, determine the suitability of separation strategies.

In the past, fences have been used for this purpose on the Malawian side of the TFCA. In VMWR parts of the boundary has been fenced with bonnox or electric fences in the past. Unfortunately, the fences had been vandalized by people seeking illegal access to the WR. NNP is unfenced to date, however, a sanctuary fence had been put up inside the VMWR for the translocation of 34 elephants in 2017 (Milulu 2017). Plans to completely fence VMWR from the Malawian side and to fence 30 km of the southwestern NNP boundary were formulated in management plans of the MAZA TFCA (Shaba and Gross 2021).

Various electric and game proof fence types are available on the market, specified for various wildlife species (e.g. predator proof, hippo fences, buffalo fences or elephant fences). However, only few institutions have developed standards or guidelines for fencing, to set minimum criteria for the construction of fences and enclosures for wild animals (CapeNature 2014, Fernando 2020).

Bonnox fences are equally spaced horizontal line wire hinge joint fence without electrification. They are frequently used across the African continent to ensure smaller species are kept inside a game area and are used to support electric fencing. While the mash of bonnox fences looks sturdy at first glance and may be unpassable for some species, others may dig under the fence (e.g. hyena, bushpig, and porcupine) (Pekor et al. 2019). Another disadvantage of bonnox fences is the difficult handling for repairs. If broken or cut, the hinge joint fence needs to be rewoven with wire or new bonnox parts. Alternatively, a number of vertical wires can be installed, which is easier to fix when damaged (EI 14).

To be elephant proof electric fences need a minimum height of 2.4 m. Generally, outliers or offset brackets are recommended, to stop animals before they reach the fence. These outliers or offset brackets can be shorter (e.g. 25 cm) in the lower parts and longer in the middle (e.g. 45 cm) and longest on top (e.g. 75 cm). Offset brackets are electrified with live wires and negative (grounded) wires, to produce an electric shock (for elephants not below 6 kV) when touched by wildlife. However, elephants can learn to take down wire from offset brackets by the use of their tusks (EI 15). Currently, the most elephant safe fences, that were trialled on the African continent are the Armstrong fence of Addo and the so called Kenya fence. The Armstrong fence is not electrified but consists of 60 mm strong steel wire and railway ties, fixed firmly in the ground. The Kenya fence is made of up to 100 cm long electrified outliers, which are attached to a low (approx. 80 cm high electric fence). The fence runs on high voltage (9 kV) and touching an outlier delivers a strong electric shock. The Kenya fence is currently used in various locations to upgrade fences, which are repeatedly damaged by elephants (EI 14).

While low trip wires are installed against carnivores (e.g. a negative wire at 25 cm height and a live wire at 35 cm), any wire below 40 cm can be a fatal trap for pangolins (Pietersen et al. 2011). Hyenas manage to surpass even low electric fences, due to their thick fur (EI 14).

Generally, robust steel poles hold various advantages for permanent electric fencing on the African continent compared to wooden poles. Firstly, steel poles are not prone to termite invasions, which easily can erode wooden poles within a few weeks' time. Timber insecticide treatment can expand the lifetime of wooden poles but does not completely solve the problem. Furthermore, wooden poles are more prone to theft by people, as they can be cut from the outside of the fence, in case the fence is not additionally secured from the outside. Therefore, steel poles are recommended over wooden poles by various experts for permanent game proof fencing along PA boundaries (EI 13, EI 14, EI 16).

An important technical aspect for the longevity of the fence is the maintenance of road access to the fence for maintenance. Where fence parts are difficult to access they are easily left unattended and unpatrolled, so that wildlife and illegal actions remain unseen in case of fence damage (Fernando 2020).



Figure 11 Heavy duty Armstrong fence of Addo NP 1985, RSA Photo: E. Gross. Photo: J. Bothma



Figure 12 Electric "Kenya fence" with long outliers keeps elephants in Meru NP, Kenya Photo: E. Gross

The most important learning from more than 15 years of human-elephant conflict management is that fences need to be set up properly right from the start, to not allow elephants to learn breaking out (Slotow 2012, Gross 2019). The moment individual elephants figure out how to

overcome a fence and succeed in feeding on attractive crops, they will put even more effort in breaking through on the next occasion.

To ensure long durability and effectiveness of the fences for the sake of both, people and wildlife, not only technical standards have to be met. As fences enforce access restriction, may impact on land tenure, may shift human-wildlife interface to other areas, and require close monitoring and high maintenance, their installation process requires strong community involvement and buy-in and their maintenance requires sustainable financing. Thus, an integration of social and financial strategies, spatial planning and monitoring are required as well.

Permanently installed electric fencing - VMWR

In October 2021, the installation of a game-proof fence along 72 km of the southern and western boundary of VMWR commenced. The construction is undertaken by Far Distribution Company of South Africa in collaboration with Maclin Power Fencing. The fence starts at the southwestern Zambia-Malawi border and ends at the northern Zambia-Malawi border. The steel poles of the fence are 2.7 meters long and are planted 800mm into the ground with a dovetailed base bringing the fence height 1880mm. Live wires are installed at the inside on offset brackets (10 m intervals) on the top and an outside offset bracket (Internal: 4 x live wires and 3 x earth. Top of fence: 1 x live wire. External: 2 live wires and 1 x earth). The four internal live wires take the power out to the end of the section of fence, the power is returned via the top wire and the external live wires. A top live wire is installed 20 cm above the top fence line, at 1.9 meters height. To ensure effective grounding, four to seven cold wires are alternated into the fence. Fence posts are not separately secured by guard wire, as they are secured by the top live wire. The external bottom live wire is installed approximately 350-400mm off the ground (depending on the undulation of the ground). The two live wires are 30 cm apart with an earth wire in between them. The internal bottom live wire is approximately 25-30 cm above ground and is specifically installed at this height in order to protect pangolins and tortoises coming into contact with the bottom electric wire (EI 19).

Live wires are electrified through energizers installed every 4 km. The voltage at the energizer will be 9.9 kV and shall maintain 8.5 kV at its lowest point. All energiser equipment is installed into a free standing steel medium game shock box with backing board, converter, battery, key switch, lock and an adjustable lightening diverter with choke. Every energizer is powered independently by two solar panels, to maintain permanent electrification. Each Station consists of two 160 watt solar panels which charge three 100 amp solar batteries via a 30 amp regulator during day. Once fully charged, the energiser will run for between 4 - 6 days depending on the load (e.g. vegetation) on the fence. A total of 18 energizer stations will be installed along the fence line.

Additionally, a bonnox fence is installed with straining posts at 20 meter intervals, Y-standards spaced at 10 meter intervals and droppers at 2 m intervals.

Pedestrian gates are provided at strategic locations at a preferable interval of max. 5 kilometres to allow resource users access resources under the resource use program. However, the installation of gates causes a decrease in voltage. A number of 14 L-shaped entrances without gate are constructed for pedestrians, additionally to 13 (management) gates, plus two main gates at Kazuni and Kawiya Camps. To ensure high voltage through the fence, ideally gates are installed where energizers are located. However, these locations do not always match with the

requirements of the communities to enter the reserve (e.g. to fetch water or collect resources). Therefore, the number and placement of gates needs to be carefully planned together with community representatives and fence engineers.

At river crossing and flood prone areas steel poles are dug deep into the river bed and are supported with concrete stairs, to prevent breakage in case of flooding. Bonnox wire is attached to the poles to prevent hippos to cross the fence. Alternatively, soft wire is attached to the poles, which will break in case of flooding and is replaced after floods. Flood gate controllers are installed at minor river crossings to ensure continuation of power during wet cycles.

As tall trees can be pushed by elephants and felled over the fence easily, any tree within 4 m inside of the fence and 3 m outside of the fence is removed by the fence contractor. However, tall trees further away from the fence may still cause risk to the fence, in case they are pushed or in case baboons or vervet monkeys use them to jump over the fence.

The starting point of the fence is located at Bambabda-Zaro, at the Zambian border, without any further connection to another fence or barrier. Game ranger houses are located in that area. As it is very likely that wildlife species may circumvent the fence at its starting point, patrols will be required to prevent wildlife entering Malawi in the southern part.

Fence installation process Vwaza fence

Fence construction has started in October 2021 in the flood prone area from the Kasuni main gate westwards. Ideally, all flood prone and marsh areas will be finalized before the onset of rains. If possible, fence construction will be continued in hilly areas throughout the rains.

The fence is installed with strong involvement of local communities. The zone chairs recommend people to be involved, who are then trained on the job by the fence contractor. For the clearing of the fence line with hoes and axes an average of 30 people are engaged per zone. The daily wage is 2000 MKW/day (approx. 2 Euro). In total about 350 people will be engaged for fence line clearing throughout the fence construction.

While for fence line clearing community members are engaged per zone, the team for fence construction needs more intensive training. Three weeks of training is required, to be well set for installing the wire, fixing brackets and bobbins etc. Community fence construction workers (male and female) are recommended by the zone chairpersons and DNPW representatives. Generally, no particular qualification is required to be chosen, but high motivation to learn and perform well on duties is required. Those workers, who perform well, will be kept in the team, while individuals with low performance will be replaced by new candidates from other zones and will be trained on the job. As such, a team of fence experts will be built up along the fence lines, qualified for long-term fence maintenance. Efforts have been made by DNPW to have at least one local representative per zone trained on fence construction and maintenance.

As fence construction takes part during day time, generally wildlife remains inside of the reserve. However, wildlife may be fenced out, in case habitats are found outside (e.g. hyenas, leopards, elephants).

Fence installation process Nyika fence

A new fence line is planned along the south-western boundary of NNP, to prevent crop damage by wildlife species. While the level of crop damage in the adjacent communities generally seems lower than in most Vwaza communities, elephants have learned to feed on crops on the

farms and fields, particularly in Thazima zone. About 60 elephants are resident in the area and another 40 elephants will join the population, which are currently enclosed in a sanctuary.

Initial plans had foreseen a fence construction of 35 km (Chisimuka and Thazima zones). Adjusted plans foresee the installation of a new 35 km fence plus another roughly 35 km fence by the use of the dismantled sanctuary fence.

Due to the changed plans, open questions and coming rains the fence construction has been postponed to 2022, starting with a more profound community consultation process.

Community-based fence management

Electric fences mainly are psychological, not physical, barriers for wildlife. Thus, maintaining their high voltage needs to be maintained throughout the whole fence line and throughout the year. Particularly elephants are able to learn quickly. In case an elephant touches a malfunctioning fence with low voltage, it will learn that a fence can be overcome and will try to challenge it, even if the voltage is back. Therefore, the fence must be monitored every morning and very evening (see 6.6 Fence monitoring) by adequately trained and equipped fence attendants, using a voltmeter. In case of low voltage simple maintenance work will be conducted directly by the fence attendant.

To ensure quick repairs, materials required for maintenance work need to be stocked in every zone. Materials include sand, cement, poles, wire, brackets, droppers etc. The fence attendants need to be equipped with fence voltage testers, pliers, cutters, fence strainers and a roll of galvanized wire. They need to wear protective clothing (rubber boots and gloves), carry their fence monitoring tools as well as a mobile phone or radio handset. Depending on the extent of their dedicated fence line, bicycles will be required for fence attendants. The fence attendants will also be in charge in washing the solar panel in case of need.

Every Zone with its respective NRCs will be in charge of maintaining the fence line adjacent to it. As the fence segments of 4 km will not directly begin or end at the boundary of Zones, and some zones have longer fence lines than others, responsibilities need to be agreed upon between the Zones. Each Zone will be responsible for one or two fence segments. As such, every Zone needs to plan a budget for fence repairs and maintenance, also considering the replacement of the battery (every 5 years), energizer (approx. every 5 years), solar panel (every 25 years), and other electronic parts, for which lifetime depends on the weather situation, pressure by wildlife or hazards.

One fence attendant will be responsible for monitoring and maintaining one or max. two fence segment(s) of 4 km (8 km for two segments) including its energizer station(s). Decision needs to be taken if a rotation system for fence attendants can be installed, to decrease the risk of elite capture (EI 16). Furthermore, minimum standards for fence attendants need to be defined, to guide their selection, profile development, and monitoring.

The energizer boxes are the most vulnerable parts of the fence. Therefore, it is highly recommended that fence attendants man them at night. In case solar panels get damaged, the power supply will be down within three days, as batteries will be drained. Solar panels can get destroyed, e.g. by throwing stones on the panel.

Furthermore, areas where no habitations are close by the fence and areas that are abandoned at night are prone to damage. Here, elephants have time to check fence out and learn how to overcome it. Similarly people seeking illegal access have time to operate undetected.

In case the fence attendant observes any leakage or damage, i.e. broken wires, broken insulators, disconnected or intertwined live wires or grounding repairs are done immediately. Fence attendants will also be skilled to replace or fix posts, in case of need. Any damage and repair is indicated on the monitoring and maintenance forms. Fence attendants will also observe the cause of damage (e.g. by person or by wildlife species), by checking tracks or other signs (see Fence Monitoring form HWCMS Manual). In case larger repairs are needed, the Cx Committee and Cx Unit (which includes DNPW) are informed and take immediate measures (see Fence Attendant Decision support HWCMS Manual).

Besides the daily fence monitoring and maintenance fence attendants inform NRCs when there is a need for clearing fire breaks and the buffer zone to the fence. It is very important to prevent plant growth under the fence as well as cutting of branches over fence and solar panel. Clearing of vegetation is to be done periodically, depending on growth rate. A group of community members will be selected by the NRC to clear the buffer zone. For this paid duty an objective and fair selection system shall be developed and implemented (e.g. rotating system or selection based on criteria the community defines).

Response to large fence damage

In case the fence gets massively damaged and the repair of damage will exceed the skills and ability of a fence attendant, a fence repair team needs to be called on site. Skilled and well equipped teams can repair or put up new fence parts within a few hours.

Therefore, preferably two Rapid HWC Response Teams shall be trained within DNPW, one to cover the northern section and one to cover the southern section. Response teams are informed directly by fence attendants (see Fence Attendant Decision support HWCMS Manual). While fence attendants investigate the site of damage (e.g. tracks of wildlife or people) and collect evidence for wildlife having broken out of the PA and its current location (back to PA or in farmland, village etc.) or people broken into PA, Cx teams load all required equipment for safety on site and for fence repair. In addition to immediate fence repairs, the Rapid HWC Response Teams will respond to any breakouts from the PA in close collaboration with the community (see chapter below).

Safe shelters for livestock

Livestock predation by medium sized and small carnivores, i.e. hyenas and honey badgers are reported particularly from the northern VMWR Zones and the Nyika Zones. With the construction of a game proof fence predation by large bodies carnivores may be reduced to some extent. Small carnivores, however may reside within the border zone. As the fence will reduce presence of large carnivores in the border zone, some competing species may find good habitat in communal land (i.e. hyena). If the presence of lion in a specific area is reduced, resident or immigrating hyena populations may grow quickly (EI 11). Similarly, the absence of predators can cause a rapid increase in baboon populations (Taylor et al. 2016).

While livestock keeping has been assessed as an important and viable livelihood option for subsistence farmers in the border zone, corralling of all livestock needs to be considered. Predator proof corrals or pens are built of bricks, woven bamboo and chicken wire. With such pens it is possible to protect livestock from carnivores. Protection from baboons and eagles is more difficult, unless completely enclosed corral or hutches are built.

Assisting livestock keepers in building effective livestock shelters is an important requirement for any livestock support programme. Setting up model pens and corrals that can be learned

from and copied, has been a successful tool in other areas (NCP 2020). Such model predator safe livestock keeping programmes can be further coupled with livestock health and husbandry programmes (see also 6.2 “sustainable livelihoods”).

Safe crop storage

The risk of elephants damaging grain stores or searching for food in houses will be greatly reduced by the installation of the fences in VMWR and NNP. Safe crop storage may therefore be regarded as less relevant, however, not only elephants can cause massive damage to harvested and stored crops. Also baboons or rodents can damage harvest massively, as well as weevils or other pest insects. In Malawi 5-12% of farmer’s harvest is lost due to inappropriate crop storage (Ambler et al. 2018). The safe storage of harvest should therefore be addressed by any agriculture based livelihood development activity (see also chapter 6.2 “sustainable livelihoods”).

Recommendations for separating wildlife from people and their assets

Objective: Long-term effective electric fences along VMWR and NNP keep wildlife inside the PAs and livestock is protected against predators.

Activities*:

- Conduct profound community consultation process prior to fence construction (NNP)
- Assess fence specifics to comply with general and current standards on specie’s and people’s safety and sustainability criteria (NNP)
- Identify and implement further measures to increase effectiveness of fence.
- Install effective and transparent fence maintenance scheme
- Prepare for HWC management measures for species fenced out (i.e. hyenas) or not stopped by the fence (i.e. baboons)

* Details elaborated in Action Plan HWCMS Manual

6.2.4 Response to wildlife outside the PA

If, despite the electric game proof fence, wildlife species manage to enter farmland or villages, a quick, effective and professional response is needed. Furthermore, some species may reside within the border zone so that communities require support to adequately respond to their presence. Given the extension of the reserve boundaries, the inaccessibility during certain times of the year and the high number of people around the reserve, a decentralised Rapid HWC Response structure with strong involvement of communities and DNPW extension officers, seems to be the way forward. Rapid Response needs to be well organised with a uniform system all over VMWR and NNP, with clear and comprehensive protocols (see HWCMS Manual) and sufficient capacity building and equipment.

These teams often will be the first to be notified, by the fence attendants or by community members in distress. Therefore, they need to be skilled in communication and crowd control, to boil down emotions and take the most important measures to minimize any further risks for people and wildlife (see HWCMS Manual). The speed of the response, the conduct of the Rapid HWC Response Teams, the thoroughness of the investigation, and the appropriateness of follow-up are all critical to maintaining community trust and tolerance or losing them altogether (Barlow and Brooks 2019).

Definition Response Team:

A group of people with a specific role to either deal with HWC while it is taking place, assess the damage done by HWC incidents for the purposes of providing financial relief to those affected, or prepare affected communities to more effectively deal with future HWC incidents (Barlow and Brooks 2019).

Community-based and DNPW-based Rapid HWC Response Teams

Response Teams can be set up by wildlife authorities, communities or in mixed forms. With regard to a strong wish of the communities in VMWR and NNP to be involved in HWC management, a tandem of community-based and DNPW-based Response Teams seems viable. While the trained and equipped community-based Rapid HWC Response Teams respond to the presence and damage of smaller, less dangerous species, the DNPW-based Rapid HWC Response Teams are called in case of presence of large and potentially dangerous species. Members of all Rapid HWC Response Teams bring very experienced and nuanced knowledge to HWC and problem animals, to be able to respond to a range of HWC types. Both, community-based and DNPW-based teams work hand-in-hand and support each other. The functions of both teams are clearly defined and guided by protocols. Building well-functioning community-based HWC response structures is highly important. Hereby, performance monitoring and supervision needs to play an important role, to make sure these teams operate effectively (see also 6.6 Monitoring).

Responsibilities/duties of the Rapid HWC Response Teams

A functional Rapid HWC Response Team is critical to appropriately manage HWC and needs to be on call 24/7. The duties of the both, community-based and DNPW-based Rapid HWC Response Teams for VMWR and NNP encompass (adjusted from Barlow and Brooks 2019):

- **Crowd management:** In case of large wildlife species causing disturbance in the border zone or beyond Rapid HWC Response Teams serve to manage crowds and also actively participate in village trainings and meetings around HWC.
- **First aid:** As the first on the scene following an incident, Rapid HWC Response Teams could save human life and reduce unnecessary suffering by administering emergency First Aid, as well as raising the alarm for others to stay away from the danger.
- **Investigate and verify:** Through their response to incidents, Rapid HWC Response Teams systematically investigate and report on each site and conflict. This helps to ensure accurate documentation and reduce false reporting, and can add veracity to any insurance claims that may arise.
- **Support communities in guarding and deterring wildlife:** Rapid HWC Response Teams are well set to provide pertinent advice to farmers, land owners, livestock keepers, and local communities in the most effective strategies to prevent future damage.
- **Monitoring and reporting:** Rapid HWC Response Teams play an important role in monitoring, not only of incidents, but of wildlife overall. If animals are hazed out of an area, the RTs may monitor their movements (using radio collaring, or local informant networks) to track if they return or become a problem animal. Furthermore, the data recorded from each incident can be collated and periodically evaluated to guide adaptive management and the enhancement of prevention and mitigation strategies
- **Follow-up with community:** After an operation Rapid HWC Response Teams follow up with the respective people involved and affected community, to understand if tensions have been reduced and if further needs persist.
- **Community education:** The better all community members are aware of the options every individual in the community has to prevent and reduce HWC and the better they understand their roles, the more effectively will the Rapid HWC Response Teams be able to operate. Informing community about HWC management and coexistence strategies is an important investment of the operational success of Rapid HWC Response Teams.
- **Allaying fear:** the ability of the RT to reduce the perceived risk may be its most important contribution to minimizing wildlife mortality following HWC incident. In some places, just the presence of the RT conducting an investigation can give confidence to communities to continue their daily activities.

The DNPW-based Rapid HWC Response Team further takes on the following activities:

- **Trapping/capture of wildlife species:** Rapid HWC Response Teams need to remove wildlife individuals from areas, in case of need.
- **Fence repair:** In case of fence damage, which fence attendants cannot handle alone, Rapid HWC Response Teams provide manpower, technical skills and equipment for fence repair.

- **Maintaining fence maintenance depots:** The Rapid HWC Response Teams ensure that all relevant equipment and materials are available in their depots (registration and safe storage).

Operation of the Rapid HWC Response Teams

In VMWR and NNP Rapid HWC Response Teams will operate on community and private land and deal with wildlife species, which are under the protection of the government. This requires an official, documented mandate (considering location and species) from the community and from DNPW to legitimize the activities of the Rapid HWC Response Teams with respect to key stakeholders and to reduce the risk that the Rapid HWC Response Teams gets into legal difficulties in case anything goes wrong during the operation.

The Rapid HWC Response Team for VMWR and NNP must follow a documented protocol for carrying out their activities in response to the different types of HWC incidents. HWC incidents mostly happen without warning, are within a short period of time, and can result in serious harm to the people or wildlife involved. A clear protocol or decision-tree on how to manage different HWC incident types, enables the Rapid HWC Response Team to quickly make the best decision possible in any given situation (see HWCMS Manual). Moreover, using a well thought out protocol reduces the risk of Rapid HWC Response Team members and others being harmed during HWC incidents. The SOPs and operational decision trees need to be developed with the input of key stakeholders and need to be validated on district and community level.

Each Rapid HWC Response Team for VMWR and NNP needs to comprise 5-8 members to effectively respond to HWC incidents, especially during periods of high conflict. As the frequency of HWC incidents fluctuates due to season, crop availability, and the behaviour of individual animals or people Rapid HWC Response Team may take up other tasks during periods low HWC, e.g. road repair, community education, wildlife monitoring. During peak HWC activity the Rapid HWC Response Team may be supported by part-time team members.

The Rapid HWC Response Team for VMWR and NNP need to have means of transportation that enables them to reach HWC incidents in time for them to effectively carry out their functions. They, furthermore need to have sufficient skills to be effective at carrying out their duties, either full time, part time or on voluntary basis. A curriculum draft is found in the HWC management Manual and needs fine-tuning based on feedback of stakeholders. The Rapid HWC Response Teams need to be equipped to carry out their functions effectively, e.g. mobile phones, megaphones, flash lights, wildlife deterrents, and heavy weather clothing.

Another important aspect is to plan the swift opening of the electric fence to push wildlife back into the PA, in case of fence breaches, through options to drop the fence line at specific locations.

In certain situation community-based and DNPW based Rapid HWC Response Teams will reach their limits. In those cases further support needs to be planned, organised and budgeted. Expert teams for tranquilising and translocation or the use of a helicopter to push back elephant herds when they strongly pressure the fence, need to be factored in response plans.

To measure and improve the effectiveness of their functions the Rapid HWC Response Teams have a regular monitoring process in place (see also 6.6.3 Monitoring of Rapid HWC Response).

HWC hotline

The installation of a HWC hotline has been suggested by multiple community representatives in the Phase I of this study (Shaba and Gross 2021). Single, official contact number for people to report conflict incidents have achieved good results in various HWC management settings, particularly if coupled with Rapid HWC Response Teams (Barlow and Brooks 2019). A hotline ensures a quick, standardized way to contact Rapid HWC Response Teams to report and/or get support for managing a HWC incident. The person receiving the call is trained on a standardized protocol of how to document and respond to the information provided (see HWCMS Manual). Ideally the HWC hotline operates on a toll-free number. Sponsorships of such numbers by mobile phone providers have been reported from other places, such as Nkhotakota WR.

By informing the HWC hotline about an active HWC, Rapid HWC Response Teams are activated. Furthermore, alert WhatsApp groups or alarm SMS may warn any registered member of an alarm group about the presence of wildlife in their region.

Furthermore, the hotline may also be used to inform on illegal activities, e.g. when rifle shots are heard in PA or if illegal activities referring to the PA have been observed.

Recommendations for response to wildlife outside the PA

Objective: Effective operation of decentralised Rapid HWC Response Teams across VMWR and NNP border zones

Activities*:

- Development of a decentralized Rapid HWC Response structure
- Operationalize community-based and DNPW based Rapid HWC Response Teams
- HWC disaster management is scaled up
- Implementation of a HWC hotline

* Details elaborated in Action Plan HWCMS Manual

6.2.5 Wildlife deterrents

A long list of deterrents has been developed to repel wildlife before entering farmland or to drive it away, when it has entered. The objective of effective deterrents is to increase the risks (biological costs) of crop damage to wildlife to a level greater than the nutritional benefit (Hoare 1999, Hoare 2012). Aim of any deterrent strategy should be to prevent wildlife entering fields, to avoid positive enforcement of crop damage behaviour through feeding success. Obviously it is also more difficult to chase away any species from attractive food sources, when it has already started to feed. When wildlife is detected too late, driving the species away can be difficult. Particularly if a herd or larger group is present, driving wildlife away can become risky.

When properly maintained, the fence will strongly decrease the number of wildlife in community lands. Some species, however might still be able to escape, so deterring them from fields and villages is necessary. Furthermore, some deterrent measures can be used to improve the barrier effect, in areas where wildlife regularly tries to challenge the fence.

However, deterrents need to be adjusted to the presence of the fence to not cause even higher damage, when large bodied species, i.e. hippos, buffaloes or elephants are driven along the fence line and do not manage to find they escaped the PA (Gross et al. 2019).

Early warning system

The idea behind elephant early warning systems is the detection of wildlife in specific areas to warn guards, scouts, or Rapid HWC Response Teams about their presence. Once detected, safety measures can be taken and deterrents can be prepared, before wildlife has damaged the fence and reached crops or habitations. The simplest early warning systems are watchtowers with guarding farmers or trip wires, more sophisticated is satellite tracking.

Satellite real-time tracking of collared elephants can facilitate early warning of potentially problematic elephant individuals and herds (Venkataraman et al. 2005). Such systems are conceivable in case individual elephants were identified for causing a majority of losses or being convinced in challenging the fence. By the installation of so-called geofences, spatial shapefiles which are programmed into the collars of elephants, an alert will be sent, if collared elephants are crossing the geofence. The alert will be sent to a central point, where response will be coordinated. The first geofence was erected in Ol Pejeta conservancy, Kenya, in 2006 to respond to notorious fence breaking elephant individuals (STE 2019) and has been further developed in the Kenyan Mara (MEP 2019). The response to alerts needs to be well organised and mostly conducted from within the PA (EI 17), to drive elephants away from the fence, ideally, before they reach it (see also sub-chapter “Response to Wildlife outside of PA”).

Also community vigilance and hotlines can be effectively used for early warning on potential fence damage. The sooner elephant spoor and presence of elephants observed close to the fence are reported to a hotline, the sooner response teams can react in driving away elephants (and other wildlife) from the fence, either from the inside, or by support from community-based Rapid HWC Response Teams.

Scaring wildlife

Using acoustic (yelling, hitting metal objects), and visual signals (burning fire and lighting torches) in combination with scaring elephants (or other wildlife species, i.e. hippos and buffaloes) by through throwing stones, burning objects and even fire crackers, currently are the most common deterrence methods used in VMWR and NNP. Such common practices of driving wildlife has to be re-considered, when a fence has been set up, as they can cause massive damage to farms and to the fence when trying to escape into the reserve. Clear strategies on how to scare away various wildlife species need to be developed, based on experience in VMWR, NNP, and elsewhere and comprehensively communicated to the farming population (see also sub-chapter “Response to Wildlife outside of PA”).

Drones, unmanned aerial vehicles, have been trialled to deter elephants from farms in various African and Asian countries. As crop damage generally takes place at night the drones have to be equipped with strong flashlights (2,200 lumen). Elephants show flight response quickly and elephant groups react by grouping together quickly and fleeing rapidly (Hahn et al. 2016). Game scouts in Tanzania were able to control the movement of the elephants through herding tactics, positioning drones on either flank of the herd with a distance of 50 to 100 meters from the elephants. The drones also help in giving a very good overview of the area, so that it is easy to determine the direction the elephants should be guided to. Drones have also been successfully tested in driving away zebra or wildebeest from fields. However, care should be taken to

understand the physiological and stress responses of each species before responsibly deploying drones to reduce HWC (Hahn et al. 2016).

Drones underlie national policies and are a tool which can only be handled by trained and skilled personnel. So far drones have only been used by wildlife authority staff members to prevent or mitigate crop damage. In specific locations, where elephants continuously try to damage the fence, drones could be considered as an option to “train” elephants to refrain from challenging the fence. Detailed investigation and scientific monitoring needs to be guaranteed.

Similar to the use of drones, helicopters are in use to either drive elephants away from the fence and to guide them back into the reserve, in case of breakouts.

Whether or not aerial vehicles are available, strategic driving elephants (and other species) back to the reserve needs detailed operational planning (see also sub-chapter “Response to Wildlife outside of PA”), to decrease the risk of further damage, stressing the animals and thereby causing safety risks to people. In case animals have managed to move far away from the PA, tranquilizing and translocating the animal might be the only safe option. Such an operation has to be conducted by specialized and professional teams.

Bees

Playback methods conducted with elephants in Samburu/Kenya have revealed that elephants will run from the sound of disturbed honey bees (King et al. 2007). Additionally, when they run away, the elephants emit a unique low frequency “bee alarm rumble” vocalization, which warns neighbouring elephants to retreat as well (King et al. 2010). This knowledge was the basis for a new multi deterrent fence, invented by Dr. Lucy King and Save the Elephants in 2009 (King 2009). Since then, bees have gained a lot of attention as elephant repellent and beehive fences and have spread rapidly.

Challenges to beehive fences are the high initial installation costs, high labour intensity for maintenance and apiary work, the need for specific training in beekeeping and the reliance on natural occupation rates by bees. The positive aspects are the low likelihood of habituation of elephants to bees and that it is the only fence that creates direct revenues (see also sub-chapter “Sustainable livelihoods”).

In the VMWR/NNP context beehive fencing could be an option, where electric fencing ends (e.g. eastern NNP or in the area south of Bambanda-Zaro) or as fence substitutes, where elephants frequently try to break through the electric fence (EI 15).

Chilli measures

Chilli-based olfactory repellents to deter elephants from entering crop fields or human habitation have been explored and used since more than 20 years (Hoare 2012). Capsaicin, the active ingredient of the chilli causes pain on the sensitive nasal mucosa of the elephant trunk. Experiments with concentrated capsaicin aerosols (pepper spray) had proven difficult for handling, as the chilli gas cloud is wind dependent and thus directional control is difficult (Osborn 2002).

Capsaicin from chilli is fully soluble only in oils, thus oil-based media are used to deploy the deterrent. On chilli fences i.e. chilli powder is mixed with grease and displayed on cloth dispensers. While such fences have been found to be effective in many areas, they have been found ineffective in others. As for many crop damage prevention and mitigation tools used

against elephants, proper maintenance of the measure is highly important and success may vary, depending on the habituation level of individual elephants or groups.

Also the chilli bomber deploys oil-based capsaicin, which is projected against elephants. The chilli bomber is a simple device to shoot ping-pong balls filled with a chilli-oil extract against elephants. The ping-pong balls need to be fired with strong force, so that it will reach the elephant and then break when hitting its skin. The chilli bomber was initially designed by Mike La Grange in Zimbabwe, based on the function of a potato gun (Le Bel et al. 2010, Le Bel et al. 2013). The chilli bomber has been refurbished in a project in South Luangwa, Zambia, to function reliably with a piezo igniter, to make it independent from electrical charging. The use of the chilli bomber requires specific training and exercise and can be effectively used against elephants, but also buffaloes (Gross 2021). As the chilli bomber combined acoustic, physic and olfactory deterrence effects of habituation of elephants should be decreased.

Another method to use chilli as elephant deterrent are so called chilli crackers (Honeyguide 2018). Chilli crackers are produced locally from chilli powder, which is mixed with sand and filled into a condom. Then, a firecracker is tied tightly into the pack. For use the crackers are lit and thrown above the heads of elephants, taking the wind direction into account. Honeyguide advises throwing multiple chilli crackers in succession.

Also chilli smoke through burning of chilli is used as elephant deterrent (e.g. chilli bombs, chilli cake, chilli torch). However, their effectiveness has not been proven scientifically and strong dependence on wind makes handling difficult.

Flashing lights

Light can be effectively used as wildlife deterrent, particularly against carnivores (Miller et al. 2016). In 2011 the young Maasai Richard Turere experimented with flashing LED lights to ward off lions from cattle corrals (boma) and developed the first carnivore light deterrent on the African continent (Dasgupta and Levine 2015). Since then, flashing lights have proven to ward off predators, particularly at night (Lesilau et al. 2018). An effective, though not inexpensive, are so called fox lights (niteguard.com), solar predator deterrent lights that have been successfully trialled by in Niassa Special Reserve, Mozambique in various settings (NCP 2019). The strategic use of fox lights and close monitoring of eventual habituation effects may be considered in the HWCMS for VMWR and NNP, in case livestock predation by carnivores may rise.

Recommendations for wildlife deterrents

Objective: Establishment of an efficient, suitable and species specific wildlife deterrent system

Activities*:

- Adjust deterrent strategies to new fence situation
- Improve early warning systems for elephant damage
- Assess further deterrents

**Details in HWCMS Manual*



6.3 Social strategies

Social strategies for HWC management include participatory and inclusive approaches, community outreach and education. As conflicts can only be resolved by the inclusion of all parties taking a role in that very conflict, the participation of stakeholders plays a vital role in HWC management. When working towards long-term solutions to HWC, it has to be understood that HWC is a conflict of people over wildlife and over the use of natural resources. Building up good working relationships and a basis of trust requires transparent governance and communication (Gross 2019). Involving communities and their representatives, district administration, tourism companies, agricultural institutions, forestry, conservation NGOs and other stakeholders into an open dialogue with shared information is highly important. In general, meaningful local participation with clearly defined roles and strong community ownership of the process will lead to higher acceptance and tolerance of the conservation work.

Communities have played an important role in VMWR and NNP since the establishment of the PAs. NNP was declared a protected area in 1965 and in 1978 the park was expanded to its present size of 3,134 km² from 940 km² by inclusion of the plateau's northern and southern foothills. Expansion of the park required the resettlement of about 5,000 people. The evictions were undertaken over a protracted period between 1975 and 1978, largely by district government officials. In VMWR, two boundary realignments were done in 1985 and 1994 in response to local pressure for access to land and water. Approximately 9 km² of the reserve were excised. The new boundary has neither been surveyed nor the changes gazetted (VMWR 2004). Protection of the area as a group reserve began in 1941 with the proclamation of Lake Kazuni Game Reserve. This included all land and water within a 5-mile distance of the centre of Lake Kazuni. The evictions and translocations from both PAs were not carried out in a coordinated and participatory manner, and people mainly settled at the boundary of the PA, where they still were able to find land. These areas today comprise the border zone along VMWR and NNP. To develop a community representation, NVA was formed and negotiations with DNPW achieved a documented right of use for natural resources (DNPW 2017). The NRCs were set up in the late 1990s, with the objective of building community representation to secure accesses to natural resources and benefit share for those communities directly affected by conservation activities. Another important objective of the NRCs is the community sensitization and mobilization regarding natural resource related subjects.

A social assessment was undertaken as part of the safeguard activities during project preparation (TMU 2021). In addition, a baseline assessment of the socio-economic situation in the Rumphu district in Malawi was carried out (TLC 2019). The results are reflected in safeguard documents of the MAZA TFCA project, such as the MAZA TFCA, Process Framework, which guides engaging People Affected by the TFCA.

6.3.1 Stakeholder involvement

Besides the community representatives in form of NRCs, NVA, and the governmental institution DNPW various other governmental and private stakeholders are involved in VMWR and NNP with regard to HWC management (see chapter 5.1). Furthermore, it has to be understood that the community as such is not a homogenous stakeholder group. Farmers, livestock keepers, honey collectors, fishermen, civil servants, mothers, teachers, pupils all are interest groups affected by HWC in various ways and their varying interests need to be considered adequately. While the NRCs act as representatives of all these groups, they may not always be well suited and able to consider all interests. The current process of stakeholder involvement therefore may need adjustment to ensure maximum inclusiveness.

Stakeholder involvement for HWC management needs to be well structured and professionally facilitated (Grossmann et al. 2020). Ideally, before introducing any measures, a systematic stakeholder identification process including expert interviews needs to take place (Phase 1, Figure 13), which has been conducted through this assignment on the development of a HWCMS. With the implementation of core actions further details on the specific interest groups need to be assessed, to understand how they can be best bound into the management scheme, which roles they can take on, and how a long-term support of the scheme can be maintained (Phase 2, Figure 13). Assessing and understanding perceptions on individual level will finally support the process of tailoring actions to all segments of the community and key stakeholders (Phase 3, Figure 13).

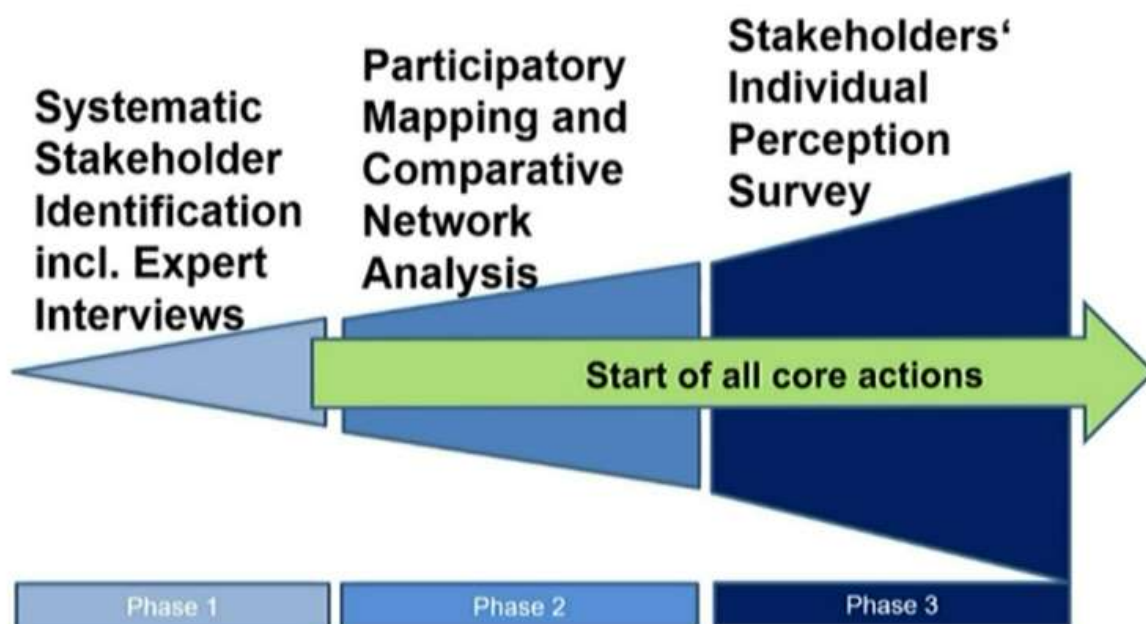


Figure 13 Stakeholder engagement throughout the life cycle of a programme on human carnivore coexistence in Europe, Adapted from Grossmann et al. 2020

The introduction of a step-wise professional networking and stakeholder engagement is highly relevant for a large scale programme relying on strong community involvement, such as the MAZA TFCA. Strong investment need to be made to ensure a trustful communication with all relevant interest groups and key individuals to ensure continuous improvement of relationships between the stakeholders. The systematic detection of common interest to overcome challenges is a proven strategy in conflict resolution, which can be widely used in the context of HWC management.

To engage and encourage all relevant actors to share their views and address conflicts openly and constructively to achieve co-existence with wildlife, regular stakeholder exchange on the topic of HWC management and coexistence strategies local and regional forums or dialogue platforms have been successfully trialled in the past (EuroLargeCarnivores 2019, Grossmann et al. 2020). It is highly recommended that the facilitation of any platform or forum is carefully designed by a professional facilitator, as power imbalances may lead to dominance of some individuals or personal agendas, at the expense of others, who are not heard, making them feel marginalised, and potentially leading to or exacerbating conflict (Durham et al. 2014).

The stakeholder engagement process that has been started in VMWR and NNP needs to be professionalised and widened with the goal to achieve enhanced cooperation between stakeholders across local, regional, and national borders.

Local, regional and international dialogue platforms/forums are ideal for drawing about and feeding back learning among the stakeholder groups. While best-practice can be generated from platform dialogues, similarly, outcomes from monitoring and evaluation (see chapter 6.2) is shared and discussed within platforms.

Communication and engagement outline

Based on the stakeholder mapping (sub-chapter 5.1) interest groups are engaged in various ways. Here, engagement means the active involvement and participation of groups and individuals in some aspect of the HWCMS. Different levels of stakeholder engagement can be identified, depending on the ultimate aims of engagement activities and the project (Durham et al. 2014). At highest level, fully active engagement is undertaken, where stakeholders are effectively partners for the HWCMS, driving the management direction, and/or contributing resources and perspective. This type of involvement can be best defined as ‘collaboration’. At the lowest level, communication with more-passive stakeholders might be designed to simply share information about the HWCMS or deliver the outcomes to those whom it may affect (defined as ‘inform’). Informing is typically a one-way flow of information, but is included as a form of engagement because it still requires implementers to communicate in a way that suits the stakeholder. The middle levels of engagement are designed to meet the needs of stakeholders who are ‘consulted’ (e.g. they are asked for opinions or information); and those with whom ‘involvement’ occurs (e.g. they are more fully engaged, and may also provide resources or data).

The communication and engagement outline for the HWCMS of VMWR and NNP engages stakeholders at more than one level. As described in chapter 5, four main groups of stakeholders were defined by stakeholder mapping. Based on this, communication and engagement strategies have been summarized and suitable methods listed (Table 5).

Group A with a high interest in and high influence on HWC management are essential stakeholders for the management of HWC and must be fully engaged with (**collaboration**).

With all stakeholders of this group (Traditional leaders and Chiefs, Community Police, Zone committees, DNPW extension workers, ward councillors, NRCs, ADCs, VDCs, TMU, livestock keepers and subsistence farmers) partnerships need to be created and their support for the implementation of the HWCMS needs to be galvanized. The satisfaction of this group about the HWCMS operations will be most relevant for moving towards human-wildlife coexistence. The communication and engagement strategy for this group is based on regular meetings, and listening to their needs, observations and suggestions. The involvement in local and regional dialogue platforms informs decision making processes. Best practices can be shared on national and international level. Workshops, trainings and handing over of responsibilities for specific tasks of the HWCMS are important to implement key HWC management activities.

Group B with a high interest in but low influence on HWC management are important groups to consider in HWC management, as they hold high motivation for HWC management but need capacity to be involved (**consultation**). In VMWR and NNP this group includes a wide range of marginalised people, with high dependency on natural resources, and landless people as well as institutions, which are not directly affected by HWC, such as agricultural office, extension planning officers, VNRMCS, Civil protection committees, fishery and forestry offices as well as tourism operators. These stakeholders need to be provided with enough information and interaction to keep them updated and to address their concerns.

The consultation strategy with this group is based on obtaining feedback from and provide adequate information to the stakeholders on aspects of the HWCMS which are relevant for their activities/scope of work. Their attitudes and needs are assessed through surveys and FGDs, and they are involved on specific topics in workshops and local dialogue forums. Care should be taken not to overwhelm stakeholders with information outside of their area of interest.

Group C has a comparably low interest in HWC management and low influence on the subject, such as people with a cultural/spiritual connection to VMWR&NNP, unemployed youth, fishermen and honey collectors, as well as radio channels, such as Mzimba Community Radio and Voice of Livingstonia. Even though they may play a less active role in HWC management, they are important opinion leaders in the communities. The need to be informed by adequately updating them with balanced and objective information to assist them in understanding the problem, identifying alternatives, recognising opportunities and discovering potential solutions (**information**). Information must be tailored to stakeholder needs. Regular meetings with media inform about processes and decision on HWC management, airtime on the radio featuring human-wildlife coexistence subjects, and information visits of coexistence outreach teams to stakeholder meetings are good ways to maintain information flow.

Group D with a comparably low interest but high influence regarding HWC management encompasses regional and national politicians, donor agencies and institutions as well as agricultural companies, such as Tobacco estates and Tropha Ltd. Working directly with these interested third parties throughout all projects phases ensure that their concerns and aspirations are understood and that holistic and integrated HWC management is incorporated into their decision making processes (**involvement**). This requires close contact and substantial investment in targeted involvement through one-to-one meetings, expert discussion and on national/international dialogue platforms, to create an understanding for the necessity of integrating HWC management into their agendas.

Table 5 Communication and engagement methods, adapted from Durham et al. 2014

	Inform	Consult	Involve	Collaborate
Website	XX	XX	X	X
Social media	XX	XX	X	X
Radio advertisement	XX	X	X	X
Airtime on radio/radio show	XX	XX	X	XX
Drama shows	XX	XX		XX
Movie show and discussion	XX	XX		XX
One-to-one meetings		X	XX	X
Expert discussions		X	XX	XX
Workshops		XX	XX	XX
Trainings		X		XX
Questionnaires/survey		XX	X	X
Focus group discussions		XX	X	XX
Open community meeting	XX	XX		X
Practical demonstrations		XX	X	XX
Local dialogue platform/forum		XX		XX
Regional dialogue platform/forum		X	X	XX
National dialogue platform/forum		X	XX	XX
International dialogue platform/forum			XX	XX
Steering group			X	XX

XX most appropriate level of engagement for a particular method.

X other levels for which the method is also relevant.

Community outreach

Developing and maintaining a good relationship with the local community and involving local people into conservation activities is an important objective of DNPW, for which extension workers are based within the border zones. Currently 8 extension workers are located along VMWR and 13 along NNP. Each extension worker takes care of 1-3 zones (3-12 NRCs).

DNPW Extension Officers are charged with responsibilities to maintain regular contacts/liaison with assigned border zone communities. They are monitoring adherence to resource harvesting quotas and supervise extension activities on resource harvesting and recording quantities of resources harvested. Furthermore, they support the communication between the PA management and the communities, which also encompasses receiving queries and complaints from communities.

To continuously strive towards a situation of sustainable coexistence between wildlife and people in shared landscapes, community outreach is an important key activity. Community outreach encompasses professional stakeholder communication, capacity building/training/education and relationship/trust building. All community-based stakeholders and local interest groups are target audience for community outreach programmes. Therefore, community outreach personnel need to be highly skilled in communication strategies and sufficiently trained on core areas, such as conflict solving, crowd management, and all aspects of HWC management. DNPW extension workers are charged with various tasks and are responsible for large areas. Therefore, the decentralisation of community outreach on subjects of human-wildlife coexistence is recommended. With the designation of a Cx in-charge on NRC level, and the Cx-committee at Zone level (chapter 5.2), community information and outreach

is implemented at community level. A capacity building outline for Coexistence outreach personnel (Cx in-charges, Cx-committee and DNPW extension workers) is found in the HWCMS Manual.

The involvement of every community member in HWC safe behaviours, the role of community-based rapid response teams in HWC management and support by institutionalized rapid response needs to be comprehensively communicated. Therefore, the education form most suitable for the respective target group needs to be selected (e.g. drama campaign, songs, radio show, writing contests).

Community outreach for coexistence may also be fostered through collaborative events, which aim at building trust and good relationships. Monthly, joint clean-up campaigns, in which all conservation management staff gets active together with community members to tidy up communal land, supports the sense of community and togetherness (EI15). Teambuilding and collaboration can also be fostered through sports events, during which multiple stakeholders take part and meet in an informal setting (CLZ 2019, CSL 2020).

Besides DNPW and other governmental sectors (i.e. dept. of forestry, agriculture, irrigation and fishery), other conservation, development and humanitarian organisations (i.e. LWT, TLC, YIELD) target communities with their respective programmes.

While HW coexistence touches upon conservation, development and health issues at the same time, the subject of HW coexistence could be mainstreamed into the outreach activities of multiple organisations, with varying focus. As examples, veterinary programmes would emphasise on good livestock husbandry, including predator-safe corralling, human welfare organisations would support and promote safe water sources, agricultural programmes emphasize crop selection and crop protection in accordance to wildlife factors and educational programmes would take up the topic of safety on the way to school. To create a thorough understanding of HWC management and HW coexistence within non-conservation organisations and institutions, coordinated action to develop capacity on the subject is needed. Jointly developed strategies for complementary activities and well defined key-messages lay the basis for developing synergies for coexistence among various actors.

Education for coexistence

Primary and secondary schools in the border zone may play a vital role in laying a basis for a holistic understanding on the opportunities and challenges of sharing the same landscape with wildlife. Due to its various connections to biodiversity, health, development, tradition, economy etc. human-wildlife conflict management and coexistence suits well into school curricula of various grades. Ideally, the subject is coupled with the general curricula, based on teacher's recommendations. Specifically developed educational materials and teacher guides, approved by the education department strongly support teachers in integrating the topic of coexistence into their subjects. Specifically designed teacher's trainings improve teachers understanding on human wildlife coexistence and knowledge about state of the art HWC management and inspire for more interactive learning.

Besides learning about HWC management and coexistence in class, an improved education in the border zones will have multiple positive effects for the area. A good basic education is the basis for development of alternatives to unsustainable use of natural resources and land conversion. Especially higher education for girls will open new development options and

reduce dependency on primary natural. Furthermore, increasing education levels of girls is the only ethically unassailable way to balance human population growth (Lutz et al. 2019).

Collaboration with education organisations and institutions will improve the education situation in the border zone and regionally. Offering scholarships to students, who are interested in sustainable development and conservation (e.g. coexistence scholarships) has been successfully trialled adjacent to other PAs in Malawi (EI16) and elsewhere (Chipembele 2020).

Recommendations for stakeholder involvement

Objective: Establishment of an equal and fair participatory process through professional stakeholder involvement

Activities*:

- Introduce step-wise professional networking and stakeholder engagement
- Institutionalize communication and engagement within permanent structures/platforms
- Tailor communication and engagement strategy to stakeholder mapping
- Mainstream HW coexistence into programmes of conservation, development and humanitarian organisations
- Build collaboration with education organisations and institutions to integrate Cx related topics into existing educational formats

*Details in HWCMS Manual

6.3.2 Building strong community representation

Communities of the border zone around VMWR and NNP are key stakeholders and active partners in HWC management. Coexistence strategies need to be based on strong community involvement, or even needs to be driven by the community itself. The level of community engagement and ownership is influenced by the conservation management concept and national/regional frameworks for community engagement. With a shift from hierarchical to alternative approaches seeking the involvement of the community actors and the private sector, suitable governance models need to be developed and community governance needs to be strengthened. Good governance principles for protected areas (Lockwood 2010) can also be applied for social-ecological systems (Iannuzzi et al. 2020), such as community representations in the border zone of VMWR and NNP (Table 6).

Table 6 Good governance principles for social and ecological fit of social-ecological systems, Lockwood 2010 & Iannuzzi et al. 2020

	Principle	Content
Social Fit	Legitimacy	Acceptance of the community representation and the perceptions of the integrity and responsibility with which it exerts power: - Input legitimacy: conferred by democratic mandate and the processes through which institutions and governing actors are legitimised - Output legitimacy: effectiveness and responsiveness, problem-solving logics, ability to build consensus
	Transparency	Availability of relevant and accurate information and its accessibility and visibility and clarity of policymaking processes - Data reporting - Decision making processes
	Accountability	Clear and agreed allocation of roles and responsibilities - Downward accountability: Answerability to community members/constituencies - Upward accountability: Answerability to higher governance bodies (Zone NRCs, NVA)
	Inclusiveness	Opportunities that actors have to participate and influence decision making; use of diverse formal processes and informal interaction - Participation from early stages - Promotion of engagement of marginalized actors
	Fairness	Equitable distribution of costs and benefits; recognition of stakeholders' cultural values, views and identities; recognition of the intrinsic value of nature
	Connectivity	Connections and coordination between and across all institutional levels and combination of policy instruments for nature conservation and other public policies (e.g. agriculture and tourism)
	Resilience	Capacity of a governance system to cope with changes, threats and risks - Capacity to manage complex cross-scale relationships between the social and the ecological systems (Adaptive governance) - Inclusive dialogue, supported by formal and informal social networks, for information sharing and improving response diversity
Ecological Fit	Spatial dimension	Congruence between the geographical extent of the ecological problem and the territorial scope of the institution
	Temporal dimension	Match of the activation of institutional responses to an environmental problem
	Functional dimension	Management of interlinked ecological system constituents

If community representation in the border zones of VMWR and NNP are enabled and capacitated to meet these principles, they will be able to act responsibly in the interest of people and wildlife and achieve effective outcomes.

Capacity building for CBOs, corporations and NRCs in the border zone, which is based on these principles produces operational structures integrating social and ecological systems and are, therefore, suitable to deal with the complex issue of creating sustainable human-wildlife coexistence. The community-based structures under the HWCMS described below are also outlined in chapter 5.2 on institutional frameworks.

Natural Resource committees

NRCs are the grassroots-level structures for communal governance and decision making in the border zones. NRC representatives have indicated their willingness to contribute to the monitoring and maintenance of the fence and need to be enabled to fulfil their role in the HWCMS. Furthermore, NRCs play an important role in the selection of beneficiaries for livelihood development programmes as well as the selection of fence attendants. Clear guidance and criteria for the selection of beneficiaries, and an increased level of awareness regarding elite capture and bribery will ensure fair implementation and prevent abuse.

To secure effective and professional operation the NRCs need to:

- fully understand their roles and responsibilities,
- be enabled to fulfil these roles,
- collaborate with similar structures, e.g. VNRMCS,
- collaboration with higher level institutions (VDCs, ADCs, Community Police) also considering minorities and vulnerable groups
- improve finance literacy and financial management
- develop / strengthen leadership and other group dynamics

The NRCs will elect 2-3 Coexistence in-charges (Cx in-charge) based on defined criteria, who are then trained on the HWCMS, including fence maintenance requirements, crowd control, rapid response and community sensitization. The Cx in-charges represent their NRC in the Cx committee on Zone level and will collect HWC related data on NRC level.

Coexistence committee

The Coexistence committee (Cx committee) deals with all HWC management and coexistence related issues on communal level. A close collaboration of the Cx committee, with the Cx Unit, and with DNPW extension workers is maintained and at least monthly meetings are held to coordinate activities between DNPW, Cx committees, Cx Unit, NRCs, and district administration.

The Cx committee is responsible for but not limited to:

- Supervision of fence attendants
- Determining fence maintenance procedure and schedule
- Collecting and administering funds for fence maintenance
- Financing fence repairs by the fence attendant
- Mobilization of community for fence clearing, clearing of fire breaks, road maintenance, maintenance of river crossings
- Exchange/coordination with adjacent Cx committees

Coexistence Unit (Cx Unit)

It was proposed by stakeholders to establish a Cx Unit. Its composition will have representatives from DNPW, NVA, NGOs (development and conservation), and District Council. This will be a Special team charged with general oversight over fence operations and monitoring of activities and financial resources.

The Cx Unit will be in-charge of planning, budgeting, implementation, and reporting. It will be responsible for general financial prudence regarding funds that will be channelled directly to zones in support of activities carried out and implemented by NRCs. The Cx Unit will monitor plans submitted by Zones and approve budgets and release of funds in support of fence operations and other development activities. The Cx Unit will ensure proper follow-ups on distribution of funds by zones and proper follow-up on fence maintenance and negotiate release of funds from donor(s). The Cx Unit will have adequate systems and safeguards in place to ensure transparency and accountability in management of funds and resources. It will institute regular and periodic auditing of funds released to zones in line with internationally recognized accounting standards and procedures.

Guidelines shall be established for awarding of grants to successful applicants. TMU will agree on the SOP's and codes of conduct. A contract shall be drafted clearly specifying the expected deliverables upon which the guarantees performance shall be assessed.

The Cx Unit is responsible for but not limited to:

- Planning of community-based HWC management activities and Cx strategies
- Channelling of funds to Cx committees (Zone NRCs)
- Release funds under Fence Maintenance Performance Scheme
- Employment of fence attendants
- Monitoring of plans and activities delivered by Cx committees (Zone NRCs)
- Ensure accountability and transparency
- Transparent reporting

Grievance redress mechanisms

A grievance mechanism enables community members or other stakeholders to register concerns, either real or perceived, with the aim of resolving challenges before they escalate. This helps to demonstrate genuine concern and support, promotes 'buy-in' and reinforces a respectful relationship based upon communication and trust. Typically, a grievance mechanism is a formal, legal or non-legal complaint process that can be used by individuals, workers, communities and/or civil society organizations that are being negatively affected by certain business activities and operations. Grievance mechanisms are sometimes called 'complaints', 'redress', or 'accountability' mechanisms.

The manner in which grievance mechanisms deal with complaints varies widely. For instance, some are designed to resolve problems through dialogue, problem-solving methods like mediation. Others conduct investigations or fact-finding that lead to recommendations or statements. As a general rule, grievance mechanisms accept complaints from affected individuals, groups and/or their representatives – provided the complaint falls within the scope of the mechanism.

A Grievance Redress Mechanism (GRM) generally addresses any complaints and grievances arising during the course of implementing a project. Local communities within the Border Zone

of VMWR and NNP Members of the public may perceive risks to themselves or their property, or have concerns about social or even environmental performance of the project such as construction of the game proof electric fence.

To improve the traditional Grievance system of the local communities during the fence construction process, in September/October 2021 a new Grievance mechanism has been set up. On Zone level Grievance Redress Committees were installed, comprising ten members per Zone. Each committee has a total number of ten members

Each committee is comprised of one member from the ADC, two members from community, one member from religious groups, two members from the zone, three chiefs and one extension officer. In these committees about one third are women. The ten members competed for the positions in the committee regardless of who they are in the society. This gave equal opportunity the most trusted members to be take leading positions in the committee.

In case of any concerns related to HWC management measures (i.e. fence construction) or coexistence strategies, a grievance system must be in place, to address concerns adequately. Criteria/standards for the installation and operation of grievance redress committees need to be developed to ensure that credibility, practicability, effectiveness, and efficacy. The objective of the grievance redress committee is to work towards common solutions. If this cannot be achieved on local level, grievances have to be communicated to a higher level, where they need to be followed up seriously. As women, vulnerable groups, and minorities are more prone to be more often harassed and the target of unfair actions, they need to be adequately represented in the grievance committees. Furthermore members of the grievance committees need to understand the legal basis they are acting upon, need to be trained on their roles and functions, and need to be skilled in conflict mediation and management.

Recommendations for building strong community representation

Objective: Community governance is strengthened through improved structures and capacity to enable the effective implementation of the HWCMS and holistic coexistence strategies

Activities*:

- Establish a full participatory process for the establishment of the HWC/Cx management structure
- Build capacity for HWC/Cx management structure



6.4 Financial strategies

The main negative impact by wildlife on peoples livelihoods in the border communities of VMWR and NNP encompass direct losses caused by wild herbivores through feeding on crops and carnivores through killing livestock. Indirect costs are associated with high labour investments for guarding or the maintenance of crop protection measures and detrimental effects through guarding at night, exposure to malaria, absence from school for guarding etc. Although the majority of crop losses caused by elephants, hippos and buffaloes are small to medium sized damage, they can also cause very high damage, up to the destruction of a complete harvest (Shaba and Gross 2021). Even small and medium size losses by wildlife add up to general losses, due to pest insects, rodents and draught, and can play an important role in food insecurity.

When the costs of living with wildlife outweigh the benefits of sharing the same landscape, the call by farmers for compensation or at least an offset of losses is comprehensible. In Malawi, compensation or ex-gratia payments for losses incurred due to wildlife are not covered by the government or any other sources, but revenues from PAs are shared with local communities.

In various parts of Africa and Asia, multiple financial strategies have been developed to contribute to the management HWCs. Coupling payments to conservation or HWC management performance have proven to be highly effective, in case of strategic and comprehensive implementation.

Furthermore, the development and implementation of this integrated and holistic HWCMS requires substantial funding over a long period of time. With the involvement of multiple sectors, a network of various partners, donors and income streams need to be identified and involved. Thus, a detailed financing plan to fund the HWCMS including fence maintenance needs to be developed.

6.4.1 Revenue sharing scheme (RSS)

Communities in the border zones of VMWR and NNP benefit from 25% of the income generated through entry fees to the WR and NP. The revenue share is paid by DNPW to NVA, which further distributes funds to NRCs.

In line with the wildlife policy and Act of 1992, the Nyika-Vwaza Association signed a resource sharing agreement with the DNPW which stipulated that the association will receive 50% (currently revised to 25%) of the gate or entrance fees and 20% from the concession agreements that the department signed with tourist operators and other resource users. The main objectives of the association are to conserve natural resources in and around the PAs as well as facilitate development projects within the boundary communities from the proceeds realized from the resource sharing arrangement with the government. Community facilities such as primary schools, roads and health centres have been constructed or rehabilitated in the villages around the two PAs via the shared revenue from the association. Surrounding communities are now aware of the benefits of VMWR and NNP and are able to access various NTFPs plus carry out activities such as beekeeping inside the protected areas.

The general idea behind the RSS is to offset missed economic opportunities and cost incurred by living with wildlife. A RSS actually bears the potential of a strong financial conservation and coexistence tool, however, its potential needs to be fully exploited. Income through the

RSS needs to be sufficiently high, to not dissolve due to a “trickle-down” effect, if a rather small sum is divided by many NRCs/community members. Upscaling income of the PAs, therefore would directly benefit the border zone communities. In the past the RSS in VMWR and NNP was used to finance a few single projects, which raised a feeling of injustice within those NRCs, which were not (yet) benefitting. Many question on the process remain unclear and currently those people suffering most from the presence of wildlife, e.g. bearing the highest costs of crop damage, or losing a family member, are not the ones benefitting from the funds. Clarifying and re-designing the payment modalities and processes into a transparent, comprehensible and equitable scheme is an important task for the future. Therefore, a fair revenue share, high transparency in decision making for the use of funds, and transparent communication on money needs to be highest priority for all involved organisations.

Sustainable harvest of wildlife and hunting

The business plan for VMWR originally proposed to promote hunting of all species, especially buffalo and other plains game to generate an income for the reserve. Communities could benefit from this utilization. In the long-term income from hunting could contribute to financing the HWCMS including fence maintenance. Options for the development of sustainable wildlife harvest and development of hunting tourism and its connection to the HWCMS should be explored.

Recommendations for Revenue sharing scheme (RSS)
Objective: Significant benefit achieved from the RSS in a fair and equitable way for the border zone communities Activities*: ➤ Development of a detailed financing plan to fund the HWCMS including fence maintenance. ➤ Evaluation of current RSS practices to understand deficits, challenges, benefits, and opportunities ➤ Improvement of the RSS processes according to good governance criteria of socio-ecological systems ➤ Scaling up on income generated by RSS, once the system is running effectively

6.4.2 Payment schemes to foster coexistence

When it comes to HWC mitigation, the compensation of losses is a matter to be discussed. The idea behind compensation is that a) people who suffer damage through no fault of their own receive some support to cope with the loss, and b) those responsible for the damage pay. The HWC scenario in VMWR and NNP is complex, due to various players and jurisdictions. First of all, VMWR and NNP are national PAs, managed by DNPW as governmental authority. Communities receive 25% from the benefits generated through fees (see above) and are allowed to use natural resources in a sustainable manner within a 5 km belt inside the PA (see sub-chapter 3.1). The RSS is not used to offset damage by wildlife, but to foster development activities.

A compensation of losses due to wildlife is not foreseen by the government of Malawi (see also sub-chapter 6.1). Although it is surely recognized that people feel they deserve to be

compensated for damage or death, difficulties are seen in the high administrative efforts for the monitoring of damage, fair determination of losses, and the difficult process of payment. Besides the logistical challenges compensation schemes may be prone to abuse and corruption (EI 01, 02). Besides this, compensation schemes generally target the market price for victims' losses without recognition of opportunity costs of conflict management and transaction costs of getting compensation, or the hidden costs of declined psychosocial and social well-being (Hoare 2000, Ogra and Badola 2008). Furthermore, placing economic value on, and providing adequate compensation for humans injured or killed by wildlife is another difficulty to deal with.

To overcome these challenges there are two schemes that have been installed with some success in the African context: a) insurance schemes and b) coexistence performance payments.

While insurance schemes pay offset losses of killed livestock and damaged crops, coexistence performance payments incentivise living with wildlife.

Insurance schemes

Insurance schemes have been widely used as a tool to mitigate the direct negative impacts of wildlife damage. Payments are tied to damage incidents and are funded at least partially through premium/membership payments. Policyholders pay premiums to an insurer before incidents occur with the agreement that specified damages, should they occur, will be paid for.

Insurance schemes have been developed for several events (e.g. weather-related damage, theft, etc.). Increasing numbers of innovative schemes are being launched with a focus on providing enhanced protection for climate-related weather impacts to smallholders across the African continent, as well as in Asia. Insurance schemes for HWC related incidents have been limited in scope, with insuring for livestock predation or crop damage conducted at a small scale in several places worldwide with varying levels of success (Leslie et al. 2019). To be successful, the implementation of insurance schemes must be bound into holistic and integrated HWC management schemes, be closely linked with preventive measures; take into consideration the social and ecological context, be site specific, and build upon stakeholder trust and effective monitoring of success. The main challenges of such schemes are related to timely and accurate verification of damage, clear rules and guidelines, prompt and fair payment, and sufficient sustainable funds.

Integrating a community-based insurance scheme for wildlife damage into the holistic HWCMS in VMWR and NNP could increase tolerance towards wildlife on community land and offset most serious losses. However, for the integration of such scheme well-functioning and transparently operating community institutions have to be set up, community-based monitoring needs to be established and clear rules and regulations for compensation payments and premiums need to be agreed upon on communal level. Once installed payments in case of damage needs to be paid rapidly and adequately.

The main challenge for HWC insurance schemes is the sustainability of funds. Schemes can only be implemented if income for premiums is secured for a long period of time and is regularly filled by i.e. income through RSS or private sources (e.g. tourism operators).

Performance payments

Conservation performance payments are gaining momentum on the African continent. The idea behind is to reward communities for compliance to conservation and for tolerating wildlife in

their neighbourhood. In Namibia, the Wildlife Credit scheme rewards community conservancies for the presence of specific species on their land (NACSO 2019). In the Mariri concession of Niassa Special Reserve, Mozambique, performance payments are paid to the community according to criteria, which were defined in community meetings. Positive conservation/coexistence performance increases payment, negative performance decreases payment. For instance, money is paid for number of months no elephant is killed, money is taken off for elephants, lions, hyenas killed or snared, money is paid for children finishing schools etc. (NCP 2019). In Tanzania, the Ruaha Carnivore Project /Lion Landscapes links direct benefits to the active conservation of wildlife by local communities through the Community Camera Trapping programme. Villagers place camera-traps on their village land, and receive points for each wild animal photographed. Every quarter, each village receives some benefits (e.g. veterinary support, education, health care) worth up to 2000 US\$. This highlights that the benefits don't come from the project itself, but from the actual wildlife that is on village land, increasing direct tolerance for these species.

These schemes have proven to result in reduced illegal killing and an increase in wildlife populations. A strength of the performance payments is the direct and transparent link of conservation to a benefit. Coupling performance payments with offsetting losses by a community-led insurance scheme might be a viable options for community-based human-wildlife coexistence strategies.

REDD+

A different type of performance payment is the scheme to Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (REDD+), which is implemented for VMWR&NNP. In various places, REDD+ schemes have already been combined with HWC management, such as in Nepal, Kenya, Zambia and Cambodia. This bears the potential for another income stream to foster coexistence between people and wildlife.

Fence maintenance performance scheme (saving book account)

The success or failure of a fence is determined by its maintenance. While maintenance efforts are high, the effects of decreased crop damage are less visible to the adjacent community, and access restriction is felt at various levels. These effects combined with low professionalism and inadequate resources for fence management, have led to massive failures of fences in the past. To maintain proper fence management in long-term, incentives for good maintenance performance could be a factor to success. Therefore, adequate amounts of money are transferred to saving book accounts of preferably Zone NRCs. The amount of money needs to be sufficient to pay and equip fence attendants, maintenance materials and community rewards for the pilot duration of three years. To maintain full transparency, every saving book needs to be dedicated to a specific fence segment (approx. 5 km fence with one energizer station).

The NRCs and Zone NRCs agree on a set of criteria to measure fence success and reward good conservation performance (e.g. low fence vandalism, low wildlife killing rates, high fence voltage, low break-out by elephant, low crop/livestock damage and timely clearing/slashing of fence). They set up their fence maintenance scheme, provide at least two fence attendants per fence segment, and form a Cx committee with representatives from each NRC (Cx in-charge). The Cx Unit guides and facilitates the process and employs the fence attendants. After capacity training and signing of a fence maintenance agreement/contract the Cx Unit decides on the first release of funds to the Cx committee, to equip the fence attendants and initiate the process.

Every quarter the fence maintenance group/committee reports monitoring efforts to the Cx Unit, which allows further disbursement of funds. The Cx Committee signs an MoU with the bank regulating that withdrawal every quarter is only possible if the Cx Unit has approved clearance according to the criteria. In addition to the long-term commitment of the project, an interest rate may be used to incentivise improved performance. The Cx committee rewards communities for good maintenance according to defined criteria and rates. Regularly, an independent audit is conducted, to ensure that funds are released as agreed.

Tree saving book of Vietnam

The fence maintenance performance scheme is inspired by the “Tree Saving Book” programme, an innovative and highly successful program developed and financed by KfW. Funded by the German KfW, a Vietnamese partner bank hands out credits on saving books to farmers or land owners, for every hectare planted with trees for sustainable use. The system is based on a very simple principle: reforestation and forest management are attractive enough for the local population from an economic point of view, since Vietnam is a rapidly growing economy in which construction timber is scarce. However, the trees first need to grow for a number of years before the wood can be harvested and sold. In the past, only very few small-scale farmers were able to bridge this long gap with their own reserves, which is why they did not reforest themselves. However, the tree savings book has changed this calculation: for each hectare of successfully reforested land, farmers are given a savings account balance at the start of the project, which is paid out successively over a period of six to nine years to bridge the first years without income (KfW 2010), until the plantation is producing direct benefits.

Recommendations for payment schemes to foster coexistence

Objective: Coexistence performance payments are explored and a fence maintenance performance scheme is piloted

Activities*:

- Explore concepts for coexistence performance payments coupled with local, community-based insurance schemes
- Develop structure, processes and capacity for fence maintenance performance scheme
- Pilot fence maintenance performance scheme for 3 years
- Initiate process for further financial coexistence schemes

*Details in HWCMS Manual

6.4.3 Cash-for-work

Cash-for-work are programmes in which participants provide community service and are paid for it. From their wages, participants are able to support their families, and the local economy and communities are supported. Furthermore, participants are empowered by enabling them to provide income for their family and play an important role for their community. Women in particular can benefit greatly from the programmes and specific groups can be integrated through defining specific and transparently communicated selection criteria. Cash-for-work can provide direct benefits from conservation activities, e.g. fence maintenance, slashing and clearing of the fence line, or the fight against invasive species.

However, there is the possibility of misuse of salaries and security risks in the distribution of wages. The effects on the local economy and society need to be monitored. Traditional ways of gainful employment may be negatively affected, for example by neglecting traditional crafts or services, and people may inadvertently become dependent on cash-for-work programmes. Which types of work related to HWC management will fall under cash-for-work programmes need to be carefully discussed and decided together with stakeholders.

Recommendations for cash for work schemes

Objective: Cash for work programmes provide income for community service in a fair and equitable way

Activities*:

- Development of fair cash for work criteria
- Implementation and monitoring of equitable cash for work schemes

*Details in HWCMS Manual



6.5 Spatial planning for human-wildlife coexistence

A fundamental requirement for coexistence landscapes are safe space for people and safe space for wildlife. Thus, the spatial organisation of a landscape on macro and micro level is essential for HWC management and for developing long-term perspectives for both, people and wildlife. Spatial planning allows defining zones for specific actions and utilization of natural resources, based on scientific evidence considering wildlife needs and behaviour, population dynamics, HWC drivers, and people's needs and aspirations.

While VMWR and NNP are both part of the MAZA TFCA, VMWR shares its western boundary with the Zambian Musalangu GMA and is part of a contiguous wildlife habitat. VMWR and NNP are disconnected by human dominated landscape on the Malawian side, while NNP is still connected to a small part of the Zambian Nyika National Park.

Inside the PAs community members from the border zone communities are allowed to collect natural resources within a 5 km belt in a regulated way. The PAs are managed by DNPW. The protected area is bordered by customary land, cultivated mainly by subsistence farmers and a couple of estates and is managed by the traditional authorities. In most areas the boundary is characterized by a hard border with forest or bushland on the PAs side and agricultural farms on the other side. Multi-use zones are not found on the Malawian side of the TFCA.

A 5 km belt around VMWR and NNP on the Malawian has been declared as “border zone”, benefitting from the RSS and the resource use utilisation programme (see also sub-chapters 3.1 and 6.4).

6.5.1 Macro-level planning

The maintenance of connectivity for various species within the TFCA is of utmost priority to decrease HWC in the future. With the objective of rising wildlife populations, the future dispersal and movement patterns, particularly of key species such as elephants, buffaloes and large carnivores needs to be considered.

The connectivity between VMWR and NNP is blocked for most large mammals by dense human population and agricultural activity, and will be further disconnected by the installation of game proof fences along the PAs on the Malawian side. The population dynamics of VMWR need to be observed against the background of connectivity to other populations. In the VMWR wildlife is able to disperse westwards into the Zambian part of the TFCA and Zambian wildlife populations can profit from water availability in the Vwaza marsh during the dry season. However, the potential of a contiguous habitat of VMWR towards the west depends on development and management activities on the Zambian side. Road constructions, increased poaching or habitat destruction influence movement behaviour of wildlife. Studies of the past years have shown a rather low movement from VMWR into Musalangu GMA by elephants. The situation may change with the construction of the game proof fence and less anthropogenic browse availability for elephants in the southern VMWR.

Data collected on elephant and other species movements via satellite collars are helpful for understanding movement patterns and habitat selection of elephants. Such data give a highly valuable insight into areas that may be prone to crop or livestock damage and allows analysis of changes in movement patterns over time and with changing ecological and anthropological factors. A stronger collaboration and exchange between research on elephant movement and

other conflict prone species and HWC management agencies needs to be fostered to enhance synergism between these fields. Also the regulated use of natural resources within the PAs needs to be informed by research and ecologic effects need to be monitored.

With a rising human population and increasing needs for resources, land-use planning outside of the PAs on the Malawian side needs to consider decreasing the anthropogenic pressure on the PA and limiting drivers of HWC. This involves crop choice and farming practices adjacent to the PA boundary and the production of wood and other forest resources on customary land (see sub-chapter 6.2).

Carnivores, particularly hyenas, are seen across Malawi on community land and livestock predation is an issue in all those regions. With the construction of a game-proof fence it is very likely that hyenas remain in the forest patches between Nyika and Vwaza and continue to create livestock damage. Population growth may even be fostered through the fence construction, if other competitors are fenced off (see also sub-chapter 6.2).

Landscape approaches to conservation also acknowledge the need for connectivity between actors to increase information sharing, trust building and to address shared problems (Brondizio et al. 2009). Joint planning and sharing of information between the international partners should be the basis in a TFCA and needs to be strengthened in the future.

Elephant dispersal and movement in VMWR & NNP

Data on the population dynamics and movement patterns of large mammals and other conflict prone species is an important baseline for macro level spatial planning. As most species, such as elephants, are density dependant dispersers, the currently low wildlife densities in VMWR and NNP result in a low dispersal rate. With rising numbers of elephants, dynamics will change. Movement restriction by the fence will influence elephant dispersal and may shift crop damage to other areas. Dispersal and movement of elephants between VMWR and Musalangu GMA in Zambia will also determine if this population shall be managed as a connected or isolated population.

The elephant population from Nyika is rather isolated. While there is evidence that elephants do use grassland in higher elevations, it needs to be further observed if elephants are able to utilize the higher elevation ecosystems as habitats, as suitable browse is available only in small parts of the PA. A rising elephant population in Nyika may become problematic because of their restricted movement options and an increasing on the fence and smaller diverse ecotopes, which elephants can damage beyond repair.

Recommendations for macro-level planning

Objective: Landscape level plans define safe space for people, safe space for wildlife and maintains/enables connectivity for key species of the TFCA

Activities*:

- Landscape level conservation and development planning considers HWC drivers
- Anticipate shifting of HWC from VMWR/NNP to other areas
- Coordination of research activities and exchange

*Details in HWCMS Manual

6.5.2 Micro-level planning

The goal of micro-level planning is to encourage and increase sustainable development within the community areas and to discourage unsustainable practices and drivers of HWC. Especially the development of water access, reforestation or agriculture extension has to be well planned and implemented on micro level in accordance with macro-level plans. HWC management infrastructure needs to consider macro level plans and prevent unintended negative side-effects.

Outside of the PAs community members cultivate farms on customary land. Local chiefs have authority over the land and its use, land-use plans are not available. The location and extent of Estates is confirmed by the TAs.

In accordance with the Malawi National Land Use Policy of 2002, the following are guidelines for Village Land Use Planning (Government of Malawi 2002):

- (a) Land use planning will be done as a dual process in which the community participates fully by offering local knowledge of their environment and existing land use patterns.
- (b) Land use plans will contain policy guidelines for better use and management of individual and community land resources in accordance with agreed boundaries and degree of planning flexibility. This will be enforceable by law.
- (c) Rural land use plans will involve multi-disciplinary teams of experts in spatial planning, soil management, crop and animal husbandry, forestry and others and should provide a basis for guiding extension services including land management techniques.
- (d) Rural land use planning should be unbiased by urban planning concepts and should be enacted into law by legislation suitably designed for the purpose.

The concept of village land use planning is not new to TAs. However, most rural populations view formal planning and the enforcement of physical planning requirements with some apprehension. To remove this fear and to assure rural community input at all stages of the planning process, the above stated principles should be employed for planning at the village level.

With growing a growing population and increased need for resources planning of land-use becomes increasingly important, to be able to meet the needs of all. Such planning also needs to mainstream HWC management, particularly the prevention of HWC through limiting drivers of HWC in the border zones. The provision of water independent from the PAs, the sustainable use of natural resources inside the PA, reducing crops attractive to wildlife close to the PA boundary, and fostering forest development on customary land are key considerations. An

integration of these issues into guideline c) for Village land-use planning should be considered in border zone communities of PAs.

Micro-level planning needs to be based on community needs and requirements, respecting the presence of wildlife in the neighbourhood. Decisions on micro-level planning, such as pilot village planning with identification of appropriate land uses (rain fed agriculture, irrigation, regeneration etc.), can only be taken by the TAs and community themselves and involves a highly participatory approach.

As many organisations are active in the border zone communities their activities need to be coordinated, so that they can fully unfold their positive potential, reduce negative side effects and consider development towards a sustainable human-wildlife coexistence.

Recommendations for micro-level planning

Objective: Land-use strategies within community areas are based on sustainability and coexistence

Activities*:

- Assessment of appropriate land-use/livelihood strategies for VMWR/NNP border zones
- Planning and implementation of village/NRC level land-use planning considering HWC drivers

**Details in HWCMS Manual*



6.6 Monitoring of HWC and the HWCMS

A standardized monitoring of HWC and the impact of prevention, deterrence and mitigation strategies is the basis for evidence-based decision making in HWC management. However, no uniform HWC assessment scheme is used in Malawi or across the MAZA TFCA. With scaling up collection of law enforcement related data in the PAs and conducting a series of baseline studies on the socio-economic situation in the border zones of VMWR and NNP, new options and approaches for monitoring and evaluation may develop. The implementation of an integrated HWCMS also need to consider an integrated monitoring system, collecting reliable data in a standardized way, using multiple sources (e.g. wildlife collaring data, HWC data from extension workers, damage data from community, fence maintenance data and rapid response teams data, data on threats, ecological data).

Monitoring data feeds into the HWCMS to inform decision making on multiple levels:

- On community level monitoring of fence maintenance, rapid response, damage by wildlife and killing of wildlife provides information to the NRCs, Cx committee, and Cx Unit on how their HWCMS performs, and whether and where adjustments are required.
- Fence maintenance and wildlife damage data will inform Cx Unit on performance payments
- Monitoring data on community level is also used to increase transparency on efforts, success and challenges in HWC management and evidence-based communication increases objectivity in an emotional topic.
- On landscape level monitoring data related to HWC and its management provides the basis for micro and macro level planning. The planning of rural development actions in wildlife landscapes needs to factor in the presence of wildlife, by considering its potential risks and opportunities.
- For wildlife management monitoring data on HWC management and damage caused by wildlife informs short-term management decisions, related to rapid response and PAC
- HWC related data combined with population and ecologic data inform long-term population management and planning.
- Anti-poaching operations make use of HWC and HWC management related data to further define profiles of communities, areas and individuals.

Thus, monitoring data on HWC and its management informs both, short-term action/response/control and planning. HWC related data further feeds into the evaluation of project progress and impact.

Working towards human-wildlife coexistence means decreasing the direct and indirect costs of living with wildlife while simultaneously increasing the benefits of living with wildlife. Ideally, benefits of living with wildlife outweigh the associated costs. Costs and benefits in this sense involve tangible and intangible parameters.

6.6.1 HWC monitoring

In the communities along VMWR and NNP crop damage impact assessment has been carried out by DNPW in the past years. Extension workers had collected data on the damaged crop types, location and area/extent. However, the detailed data collection had to be stopped, as it had raised hopes and expectation for some sort of compensation. Therefore, HWC data

collected in the past years mainly comprised reports that community members had passed on to Extension workers by phone. Extension workers summarized the HWC situation as a narrative text in their monthly reports without any specific standards (EI 02, EI 03). Data collection, therefore, was flawed, patchy, and incomplete.

However, data on the damage caused by wildlife and data on wildlife being killed in conflict, is seen as very important by DNPW representatives as baseline data, for planning of HWC management measures, channelling resources most effectively, and for the justification of land-use. Therefore, a standardized HWC data collection tool was developed, which is outlined in the HWCMS Manual. It comprises of an excel table, and is set for data collection on accidents with people, crop damage, livestock predation, property damage and wildlife killed due to HWC. The forms (see HWCMS Manual) contain information regarding: location, species causing damage, number of animals causing damage, extent of damage (no. of affected farmers/farms/individuals), details on damage (main crop type, livestock, property or injury/fatality), estimate of damage (total area/quantities), distance to fence, response by community, and response by DNPW,

It is recommended to introduce and upscale the HWC monitoring scheme in several phases:

Phase 1: Use of paper forms (e.g. Kobo toolbox on smartphone) by DNPW extension workers to collect HWC data and regular feeding of data into excel table. Simple reports can be produced monthly, quarterly, annually. Database to be unified at VMWR and NNP headquarters and shared with TMU.

Phase 2: Introduction of HWC monitoring on community level, simple paper forms on breakouts and damage on communities assets, copy by Extension worker, or transfer to Extension worker by phone.

Phase 3: Introduce SMART (or any other digital management data interface/platform used) HWC monitoring for DNPW extension workers, based on excel database. Develop plug-in for community-owned data. Matching of HWC data with wildlife monitoring/LE data and PAC data.

Phase 4: Plug-in elephant movement data from collared elephants into SMART (or any other digital management data interface/platform used) and foster development of early warning of potential elephant fence breaches.

Recommendations for HWC Monitoring

Objective: Standardized and reliable monitoring data HWC informs management and decision making

Activities*:

- HWC Monitoring tools and database are validated and tested
- Capacity building for HWC monitoring conducted
- Implementation and upscaling of HWC monitoring

*Details in HWCMS Manual

6.6.2 Fence monitoring

Daily monitoring of the fence is the basis for proper fence maintenance and thereby ensuring the fence to operate effectively. Fence monitoring is also important to understand the effectiveness of a fence over time and identify weak parts that eventually need upgrading. Fence monitoring is conducted by well trained, equipped and employed fence attendants.

The moment one section of the fence is finalized and electrified, monitoring has to start. Every morning and every evening the fence line has to be examined, starting from one energizer to the other (roughly 4 km). Thereby, the functions of the energizer have to be checked and any alarm or failure has to be tracked. The voltage of the fence is checked in intervals of 100 meters. Any leakage or damage that can be fixed easily, needs to be addressed immediately.

All observations and repairs are taken down on a fence monitoring form (see HWCMS Manual).

The morning patrols of the fence examine if any damage has occurred throughout the night (e.g. by wildlife). Any damage is taken down in the fence monitoring form and the cause of damage is indicated. Therefore tracks and spoor are observed, to understand whether the damage was caused by wildlife or by people. If possible, species causing the damage are identified by tracks inside or outside of fence). In case tracks are observed outside the fence it is important for the fence attendant to figure out if the animal still remains outside of the fence or whether it has moved back to the PA. For decisions on which actions to take, a decision tree needs to be developed in accordance with the Cx Unit and Rapid HWC Response Teams (see HWCMS Manual).

Evening patrols examine if any damage has occurred throughout the day, most probably by people. In case people have damaged the fence, repair is immediately carried out and the fence committee is informed.

Recommendations for Fence Monitoring

Objective: Standardized and reliable fence monitoring data inform management decisions

Activities*:

- Fence monitoring tools and database are validated and tested
- Capacity building for fence monitoring conducted
- Implementation of fence monitoring

*Details in HWCMS Manual

6.6.3 Monitoring of Rapid HWC Response

In case of HWC occurring in the border zone or beyond, Rapid HWC Response Teams will be active to manage the crowd, and take management measures to reduce the risk posed by wildlife. Every operation by the Rapid HWC Response Team will be documented (see HWCMS Manual).

Indicators of effectiveness include:

- time taken to respond,
- type of interventions used,
- level of community support,
- proportion of HWC incidents managed that lead to positive outcomes.

The Rapid HWC Response for VMWR and NNP will encompass community-based and DNPW-based teams, operating hand-in-hand. Monitoring needs to be implemented on both levels (community and DNPW) and analysis needs to target the operational impact and success of each team/level as well as their interplay.

Recommendations for Rapid HWC Response Monitoring

Objective: Standardized and reliable monitoring data on rapid HWC response informs management and decision making

Activities*:

- Validation and testing of Rapid HWC Response monitoring tools
- Capacity building for Rapid HWC Response monitoring
- Implementation of Rapid HWC Response monitoring

*Details in HWCMS Manual

6.6.4 Monitoring of problematic species

Multiple species are involved in HWC at various levels. While some species can cause catastrophic damage, which is characterised by a high damage during a short period of time (e.g. elephant, hippo, hyena), others may cause chronic damage, which is continuous small damage over a longer period of time. While some damage by wildlife occurs randomly, others may follow a temporal or spatial pattern. In some cases individual animals have specialised in crop damage or livestock predation behaviour or in overcoming HWC prevention techniques.

Monitoring data from damage caused by wildlife (see above) may point at such specific patterns, which can be verified and specified by further research. Collaring individuals, analysing tracks, droppings, and other signs of presence or long-term population monitoring can be used, to gain further insights on the causes of damage behaviour and its prediction.

The development of the most appropriate monitoring system for problematic species and individuals needs to be based on primary population and HWC data, which currently is lacking. At this stage it can only be assumed that problem animal monitoring may include:

- Collaring of specific elephants prone to crop damage (e.g. individuals frequently observed outside of PA, dominant individuals released from sanctuary etc.)
- Mapping of elephant tracks/droppings/signs near fence, mapping of other spoor near fence
- Population monitoring of baboons, hyena, bush pig – data needs to be present to inform decision making for management

Data/information needs to be shared with Rapid HWC Response Team and the Cx Unit, to inform decision making and short and long term management actions. Especially collaring data may inform Rapid HWC Response, when individuals are observed to move close to fence/border (see also sub-chapter 6.2 early warning).

Recommendations for monitoring of problematic species

Objective: Species involved in catastrophic or chronic damage are monitored and problematic individuals are closely monitored to inform HWC management and PAC.

Activities*:

- Development of an effective monitoring system for problematic species and individuals
- Implementation of an effective monitoring system for problematic species and individuals
- Development of a decision support system/SOPs for population management and PAC

*Details in HWCMS Manual

6.6.5 Monitoring of socio-economic parameters

Holistic and integrated HWC management also targets the socio-economic wellbeing of people sharing the same landscape with wildlife. Increasing the resilience of farmers against crop and livestock damage by improving and diversifying livelihoods, adjusting farming strategies and enhancing marketing options are important measures to take in the border zones of VMWR and NNP. The progress and impact of such measures needs constant monitoring, to adaptively adjust management and development activities targeting at human-wildlife coexistence.

As interactions by people and wildlife cannot be decreased to zero, human-wildlife coexistence will always require a level of tolerance by people. While tolerance is influenced by costs and benefits of living with wildlife, perceptions are also shaped by culture, tradition and the relationship with agencies involved in wildlife management. Observing the attitudes towards wildlife agencies and perceptions towards their actions as well as the relationships maintained is necessary to understand underlying causes of conflict and identify early warning signs for emerging conflict.

Currently, the monitoring of socio-economic factors in VMWR and NNP is conducted by TLC serving their key impact indicators and involves:

- household and food security
- household income
- impact items for household economy per beneficiary/participant
- individual income monitoring of “reformed poachers”

With the development of an integrated HWCMS socio-economic monitoring data needs to be combined with HWC data and HWC management data, to provide a holistic understanding of the effects and impact of the system on its way towards coexistence.

Recommendations for monitoring of socio-economic parameters

Objective: Monitoring of socio-economic parameters informs management decisions and analysis supports holistic understanding of process and impact.

Activities*:

- Development of an effective monitoring system for socio-economic parameters
- Implementation of an effective monitoring system for socio-economic parameters

*Details in HWCMS Manual

6.6.6 Monitoring – Evaluation - Learning

HWC management is a complex task, involving various stakeholders and various strategies. Ideally, HWC management is mainstreamed into planning and into political frameworks, considered in land-use and livelihood strategies and implemented through technical strategies on various communal and institutional levels. Monitoring the effects, identifying gaps and challenges and drawing learning from processes and projects is highly important to adjust mechanisms in an adaptive way. Therefore a monitoring, evaluation and learning system is proposed to be developed, targeting all institutions involved and all strategies used – directly or indirectly.

The installation of local, regional and international platforms on human-wildlife coexistence (see 6.3 social strategies) can be an important step to facilitate such learnings and communicate best-practice back to the stakeholders involved. National platforms would involve multiple players involved in HWC management to share experiences (e.g. Liwonde NP and its chilli project, honey with heart, fencing standards) and discuss what works well and why (conditions/basic parameters). Well functional and professionally facilitated dialogue platforms may further serve as participatory mechanisms for regular review and amendment of the HWCMS.

Recommendations for monitoring, evaluation and learning

Objective: Learning about Cx strategies is scaled up through transparently sharing information, best practices and learning on local, regional and international levels.

Activities*:

- Development of an integrated monitoring, evaluation and learning system within TFCA
- Sharing of best practice and learning on local, regional and international stakeholder platforms

*Details in HWCMS Manual

7. References

- Ambler, K., A. de Brauw, and S. Godlonton. 2018. Measuring postharvest losses at the farm level in Malawi. *Australian Journal of Agricultural and Resource Economics* **62**:139-160.
- Barlow, A., and A. Brooks. 2019. Human Wildlife Conflict - Response Teams: Global lessons in design, operation, monitoring and sustainability. . WWF Tigers Alive.
- Booker, A., D. Johnston, and M. Heinrich. 2016. The Welfare Effects of Trade in Phytomedicines: A Multi-Disciplinary Analysis of Turmeric Production. *World Development* **77**:221-230.
- Brondizio, E. S., E. Ostrom, and O. R. Young. 2009. Connectivity and the Governance of Multilevel Social-Ecological Systems: The Role of Social Capital. *Annual Review of Environment and Resources* **34**:253-278.
- CapeNature. 2014. Policy on Fencing and Enclosure of Game, Predators and Dangerous Animals in the Western Cape Province. Biodiversity Support Services, Stellenbosch. South Africa.
- Chipembele. 2020. Annual Report 2020. Chipembele Wildlife Education Trust, Mfuwe, Zambia.
- Clauss, M., J. Gehrke, J. M. Hatt, E. S. Dierenfeld, E. J. Flach, R. Hermes, J. Castell, W. J. Streich, and J. Fickel. 2005. Tannin-binding salivary proteins in three captive rhinoceros species. *Comparative Biochemistry and Physiology* **140**:67-72.
- CLZ. 2019. Annual Report 2019. Conservation Lower Zambezi, Lusaka, Zambia.
- CSL. 2020. Annual Report 2019. Conservation South Luangwa, Mfuwe, Zambia.
- Dasgupta, P., and A. Levine. 2015. What is scientific thinking? Two cases of problem-solving by some newcomers in science. *Current Science* **108**:165-166.
- DeWan, A., K. Green, L. Xiaohong, and D. Hayden. 2013. Using social marketing tools to increase fuel-efficient stove adoption for conservation of the golden snub-nosed monkey, Gansu Province, China. *Conservation Evidence* **10**:32-36.
- DNPW. 2017. Collaborative Management Agreement between the Government of the Republic of Malawi acting through DNPW and Nyika-Vwaza Association for Natural Resources and Rural Development. Page 14 in D. o. N. P. a. Wildlife, editor. Department of National Parks and Wildlife, Lilongwe, Malawi.
- DNPW. 2018. Vwaza Marsh Wildlife Reserve. Resource Utilisation Programme Guidelines. Page 94 in D. o. N. P. a. Wildlife, editor. Department of National Parks and Wildlife, Lilongwe, Malawi.
- DNPW. 2018. National Wildlife Policy. Department of National Parks and Wildlife, Malawi. 39pp
- Dowsett-Lemaire, F. 1983. Ecological and territorial requirements of montane forest birds on the Nyika plateau, south central Africa. *Gerfau* **73**:345-378.
- Durham, E., H. Baker, M. Smith, E. Moore, and V. Morgan. 2014. The BiodivERsA Stakeholder Engagement Handbook. BiodivERsA, Paris, France.
- EuroLargeCarnivores. 2019. European Perspectives on Coexistence with Large Carnivores. A Summary of Regional Stakeholder Perspectives on Managing Human Large Carnivore Conflicts: Challenges and Solutions., WWF Germany, Berlin, Germany.
- Fernando, P. 2020. Guide for Implementing Community-Based Electric Fences for the Effective Mitigation of Human-Elephant Conflict. The World Bank.
- GIZ. 2020. Sustainable Aquaculture in Malawi. Global Programme Sustainable Fisheries and Aquaculture. Deutsche Gesellschaft fpr Internationale Zusammenarbeit. <https://www.giz.de/de/downloads/giz2020-en-malawi-fischerei-sv.pdf>
- Government of Malawi. 2004. National Environmental Policy. Environmental Affairs Department. Ministry of Natural Resources and Environmental Affairs, Malawi

- Gross, E. M. 2019. Tackling routes to coexistence. Human-elephant conflict in sub-Saharan Africa., GIZ Partnership against Poaching and Illegal Wildlife Trade, Eschborn, Germany.
- Gross, E. M. 2021. HWC management Niassa: Status quo and recommendations for a way forward. WCS Mozambique, Mbatamilam, Mozambique.
- Gross, E. M., N. Drouet-Hoguet, N. Subedi, and J. Gross. 2017. The potential of medicinal and aromatic plants (MAPs) to reduce crop damages by Asian Elephants (*Elephas maximus*). Crop Protection **100**:29-37.
- Gross, E. M., B. P. Lahkar, N. Subedi, V. R. Nyirenda, L. L. Lichtenfeld, and O. Jakoby. 2019. Does traditional and advanced guarding reduce crop losses due to wildlife? A comparative analysis from Africa and Asia. Journal for Nature Conservation **50**:125712.
- Gross, E. M., R. McRobb, and J. Gross. 2016. Cultivating alternative crops reduces crop losses due to African elephants. Journal of Pest Science **89**:497-506.
- Grossmann, C. M., L. Patkó, D. Ortseifen, E. Kimmig, E.-M. Cattoen, and U. Schraml. 2020. Human-Large Carnivores Co-existence in Europe – A Comparative Stakeholder Network Analysis. Frontiers in Ecology and Evolution **8**.
- Government of Malawi. 2002. Malawi National Land Policy. Ministry of Lands and Housing.
- Hahn, N., A. Mwakatobe, J. Konuche, N. de Souza, J. Keyyu, M. Goss, A. Chang'a, S. Palminteri, E. Dinerstein, and D. Olson. 2016. Unmanned aerial vehicles mitigate human–elephant conflict on the borders of Tanzanian Parks: a case study. Oryx:1-4.
- Halle, B., Burgess, J. 2006. Country Environmental Profile for Malawi (Draft Report). Commission of the European Communities. EC Framework Contract EuropeAid/119860/C/SV/multi, Lot 6: Environment.
- Harwood, A. C., E. Stone, K. Shevlin, and M. Hammer. 2019. Expedition report: From elephants to cats to butterflies: Monitoring biodiversity of Vwaza Marsh Wildlife Reserve, Malawi (September - October 2018). Biosphere Expeditions.
- Hoare, R. 2000. African elephants and humans in conflict: the outlook for co-existence. Oryx **34**:34-38.
- Hoare, R. 2012. Lessons from 15 years of human elephant conflict mitigation: Management considerations involving biological, physical and governance issues in Africa. Pachyderm **51**:60-74.
- Hoare, R. E. 1999. Determinants of human-elephant conflict in a land-use mosaic. Journal of Applied Ecology **36**:689-700.
- Honeyguide. 2018. Human-elephant conflict handbook. A guide to crop protection from elephant raiding., Honeyguide Arusha, Tanzania.
- HWCTF, I. 2021. Information document on the inclusion of a target on Human-wildlife conflict in the framework. IUCN Human-Wildlife Conflict Task Force, Gland, Switzerland.
- Iannuzzi, G., J. Mourato, and R. Santos. 2020. Towards a multidimensional framework to assess the social and ecological fit of institutional arrangements for private protected areas. Parks **26**:7-22.
- KfW. 2010. Conserving forests to protect our climate. KfW Development Bank, Frankfurt, Germany.
- King, L. E. 2009. Bees help protect crops from damage by elephants in Kenya. Pages 9-11 Bee Craft British Beekeepers' Association, Peterborough, U.K.
- King, L. E., I. Douglas-Hamilton, and F. Vollrath. 2007. African elephants run from the sound of disturbed bees. Current Biology **17**:R832-R833.
- King, L. E., J. Soltis, I. Douglas-Hamilton, A. Savage, and F. Vollrath. 2010. Bee Threat Elicits Alarm Call in African Elephants. PLoS ONE **5**:e10346.

- Le Bel, S., M. La Grange, and N. Drouet. 2013. Repelling elephants with a chilli pepper gas dispenser: field tests and practical use in Mozambique, Zambia and Zimbabwe from 2009 to 2013. *Pachyderm* **56**.
- Le Bel, S., R. Taylor, M. Lagrange, O. Ndoro, M. Barra, and H. Madzikanda. 2010. An easy-to-use capsicum delivery system for crop-raiding elephants in Zimbabwe: preliminary results of a field test in Hwange National Park. *Pachyderm* **47**:80-89.
- Lesilau, F., M. Fonck, M. Gatta, C. Musyoki, M. van 't Zelfde, G. A. Persoon, K. Musters, G. R. de Snoo, and H. H. de Iongh. 2018. Effectiveness of a LED flashlight technique in reducing livestock depredation by lions (*Panthera leo*) around Nairobi National Park, Kenya. *PLoS ONE* **13**:e0190898.
- Leslie, S., A. Brooks, N. Jayasinghe, and F. Koopmans. 2019. Human Wildlife Conflict mitigation: Lessons learned from global compensation and insurance schemes. .
- Lockwood, M. 2010. Good governance for terrestrial protected areas: A framework, principles and performance outcomes. *J Environ Manage* **91**:754-766.
- Lutz, W., G. Amran, A. Bélanger, A. Conte, N. Gailey, D. Ghio, E. Grapsa, K. Jensen, E. Loichinger, G. Marois, R. Muttarak, M. Potančoková, P. Sabourin, and M. Stonawski. 2019. Demographic Scenarios for the EU - Migration, Population and Education. 18319424, European Union, Luxembourg.
- Madden, F., and B. McQuinn. 2014. Conservations blind spot: The case for conflict transformation in wildlife conservation. *Biological Conservation* **178**:97-106.
- McShane, T. O. 1985. Vwaza Marsh Game Reserve, Malawi: A baseline ecological survey. Department of National Parks and Wildlife, Lilongwe, Malawi.
- Meadows, M. E., and H. P. Linder. 1993. A Palaeoecological Perspective on the Origin of Afromontane Grasslands. *Journal of Biogeography* **20**:345-355.
- MEP. 2019. Elephant Collaring, Monitoring and Research. Mara Elephant Project.
- Miller, J. R. B., K. J. Stoner, M. R. Cejtin, T. K. Meyer, A. D. Middleton, and O. J. Schmitz. 2016. Effectiveness of contemporary techniques for reducing livestock depredations by large carnivores. *Wildlife Society Bulletin* **40**:806-815.
- Milulu, C. 2017. 34 Elephants trans-located to Nyika National Park. MBC. Malawi Broadcasting Corporation, Blantyre, Malawi
- MWR. 2021. Report 2021. Majete Wildlife Reerve
- NACSO. 2019. How Wildlife Credits works. Namibian Association of CBNRM Support Organisations (NACSO), Windhoek, Namibia.
- NCP. 2019. Annual Report 2019. Niassa Carnivore Project, Niassa, Mozambique.
- Ndhlovo, T. 2013. The ecology of the Nyika Plateau, Malawi. University of KwaZulu-Natal, KwaZulu-Natal, South Africa
- Ogra, M., and R. Badola. 2008. Compensating Human-Wildlife Conflict in Protected Area Communities: Ground-Level Perspectives from Uttarakhand, India. *Human Ecology* **36**:717-729.
- Osborn, F. V. 2002. Capsicum Oleoresin as an elephant repellent: Field trials in the communal lands of Zimbabwe. *Journal of Wildlife Management* **66**:674-677.
- Pekor, A., J. R. B. Miller, M. V. Flyman, S. Kasiki, M. K. Kesch, S. M. Miller, K. Uiseb, V. van der Merve, and P. A. Lindsey. 2019. Fencing Africa's protected areas: Costs, benefits, and management issues. *Biological Conservation* **229**:67-75.
- Pietersen, D. W., A. E. McKechnie, and R. Jansen. 2011. A review of the anthropogenic threats faced by Temminck's ground pangolin, *Smutsia temminckii*, in southern Africa. *South African journal of wildlife research* **44**:167-178.
- Plotnik, J. M., R. C. Shaw, D. L. Brubaker, L. N. Tiller, and N. S. Clayton. 2014. Thinking with their trunks: elephants use smell but not sound to locate food and exclude nonrewarding alternatives. *Animal Behaviour* **88**:91-98.
- PPF. 2021. About Malawi-Zambia. Peace Parks Foundation, Stellenbosch, South Africa.

- Santiapillai, C., and B. Read. 2010. Would masking the smell of ripening paddy-fields help mitigate human–elephant conflict in Sri Lanka? *Oryx* **44**:509-511.
- Schmitt, M. H. 2016. The influences of plant secondary metabolites on the foraging behaviour and carrying capacities of the African elephant, *Loxodonta africana*. University of KwaZulu-Natal, Pietermaritzburg, South Africa.
- Schmitt, M. H., D. Ward, and A. M. Shrader. 2016. Incorporating secondary metabolites, tannin-binding proteins, and diet breadth into carrying-capacity models for African elephants. *Ecological Modelling* **332**:8-18.
- Shaba, T., and E. M. Gross. 2021. Situation Analysis Report and Short-Term Action Plan for Development of a Human-Wildlife Conflict Management Scheme (HWCMS) for Vwaza Marsh Wildlife Reserve, and Nyika National Park, Malawi. Transfrontier Management Unit, Mzuzu, Malawi.
- Slotow, R. 2012. Fencing for Purpose: A Case Study of Elephants in South Africa. Pages 91-104 in M. J. Somers and M. Hayward, editors. *Fencing for Conservation: Restriction of Evolutionary Potential or a Riposte to Threatening Processes?* Springer New York, New York, NY.
- STE. 2019. Geo-fencing. Save the elephants.
- Taylor, R. A., S. J. Ryan, J. S. Brashares, and L. R. Johnson. 2016. Hunting, food subsidies, and mesopredator release: the dynamics of crop-raiding baboons in a managed landscape. *Ecology* **97**:951-960.
- TLC (2019) Sustainable Management and Wildlife Law Enforcement of the Nyika-North Luangwa Component of the Malawi-Zambia Transfrontier Conservation Area, Baseline Study Report, 64 pp, Total Land Care, Malawi
- TMU (2021) Assessment of the need for a solar-powered electric fence by communities around Vwaza Wildlife Reserve, Transfrontier Management Unit, Malawi
- Venkataraman, A. B., R. Saandee, N. Baskaran, M. Roy, A. Madhivanan, and R. Sukumar. 2005. Using satellite telemetry to mitigate elephant–human conflict: An experiment in northern West Bengal, India. *Current Science* **88**:1827-1831.
- VMWR. 2004. Vwaza Marsh Wildlife Reserve Master Plan, Revised Version. DNPW, Malawi
- Willis, C. K., J. E. Burrows, L. Fish, P. S. M. Phiri, A. C. Chikuni, and J. Golding. 2001. Developing a Greater Understanding of the Flora of the Nyika. *Systematics and Geography of Plants* **71**:993-1008.
- Zimmermann, A., B. McQuinn, and D. W. Macdonald. 2020. Levels of conflict over wildlife: Understanding and addressing the right problem. *Conservation Science and Practice*.

8. APPENDIX

Appendix 1:

List of Interview partners, qualitative expert interviews by video call or face-to-face meeting

Name, first name	Institution
Adendorff, John	African Parks, Majete
Blair, Matthew	FZS, North Luangwa
Bunderson, Trent	TLC
Chikwemba, Anthony	DNPW, NNP
Gomezga, Obedi	African Parks, Nkhotakota
Jere, Zwide	TLC
Kagunya, Viva	TLC
Kamoto, Samuel	African Parks, Nkhotakota
Maclaughlin, Neil	Maclin Power Fencing
Maliro, Jephtah	TLC
Moyo, Leonard	DNPW, VMWR
N, David	African Parks, Nkhotakota
Nyirongo, Isaac	TLC
O'Connel, Donnamarie	LWT, UK
Perera, Henry	FAR Distribution
Robertson, Dave	African Parks, Liwonde
Siewert, Olivia	LWT, Rumphu
Vaughan, Jonny	LWT, Lilongwe
Wadi, Peter	DNPW

Appendix 2:

Questions and answers concerning the HWCMS from client and key partners

HWVMS for VMWR and NNP

Presentation and discussion of Phase II draft documents 17. February 2022

Question/ comment by	Content of question/comment	Reply by consultants
Institutional structure for Cx management		
Brighton Kumchedwa	How would legal set-up and alignment at district level look like and how would district council be involved?	It is important that the NRCs and Zone Committees are fully aligned to the Decentralised Structure to ensure enhanced coordination and buy-in from stakeholders. The NRCs and Zone Committees ought to function as part and parcel of the Village Development Committees and established Village Development Committees under the local governance system. The legal backing for the involvement of the district council in the proposed structure emanates from the requirements in the Decentralised Governance System. The 1998 Decentralization Policy and the Local Government Act are the main pillars of democratic decentralization in Malawi. DNPW needs to quickly liaise with the District Councils on how best the desired harmonisation of the existing NRCs can be achieved. This is a priority recommendation. The NRCs and Zone Committees need to be capacitated to function as entities under the decentralised governance system.
Arrie van Wyk/ Catherine Changa/Peter Wadi:	Why is TLC mentioned as part of Cx Unit, TLC will be gone when project ends	TLC was suggested as representative NGO from the development sector. It is recommended that technical expertise from the development sector (NGO or CBO) adds to the Cx Unit to advise on and provide backstopping to any development activities in the border zone communities. To avoid confusion, the consultants will replace "TLC" by "development NGO/CBO" in the final document.
Peter Wadi	Who will employ and supervise fence attendants?	We propose employment of fence attendants on Cx Unit level. Fence attendants' performance is crucial for the success of the fence. This requires professional supervision and thorough monitoring. The performance of the fence attendants will

		strongly influence the release of fence performance payments to the Zone/Cx committee level.
Leonard Moyo	Why will zone level manage funds? Is this the right structure?	The fence sections of 4 km correspond well with the coverage of zones. The reserve boundary and, thus, fence line varies strongly between NRCs. Some border zone NRCs do not even have any fence border. Therefore, the zones are important units for fence maintenance. While zones/Cx committees will be assigned to specific fence segments, they are well set to receive funding/performance payments for the maintenance of these very fence sections. The zones then need to handle payments of NRCs/individuals and projects. Those representatives in charge of handling funds need to be capacitated, supervised and transparently monitored to avoid mismanagement of funds.
Leonard Moyo	Currently NVA is elected newly, then NRCs will be elected, how will funds be channelled?	DNPW and TMU need to ascertain the suitability of NVA to house the Cx Unit. The proposal on funding flow in support of the HWCMS is that in the proposed structure funds under the Savings Book Approach will be channelled directly to the Zone Level under the pilot scheme.
Catherine Chunga	Need to further discuss and clarify roles and responsibilities of district council and DNPW	According to the HWCMS DNPW should be part of the Cx Unit, operate the DNPW rapid response teams, conduct Zone level HWC monitoring (in collaboration with NRCs), maintain Cx maintenance depots on zone level, conduct trainings on HWC mgmt.. etc.
Catherine Chunga	Even if structures change, the people in the community will remain the same. How is this considered in the institutional set-up of the HWCMS? To many structures should not confuse people	The institutional framework for the HWCMS builds upon the existing community structures (NRCs – Zones), to not duplicate structures or create further new structures. Representatives of NRC and Zones will be further capacitated to implement the HWCMS on their respective institutional levels. However, it needs to be considered that the same individuals should not be overloaded with duties. The development of transparent and comprehensive criteria for the selection of e.g. Cx in-charges, Cx-committee members, fence attendants etc. is highly recommended.
Catherine Chunga	What are the exact tasks of the extension workers?	The DNPW extension workers are dedicated to zone NRCs and will continue their collaboration on Zone (Cx committee) and NRC level (Cx in-charge).

		Their main role is to support the community structures in fulfilling their Cx activities (e.g. fence maintenance and rapid response) and monitor HWC in collaboration with NRC level Cx in-charges. More details are found in the HWCMS document page 28-33
General HWC management		
Arrie van Wyk	Plan gives impression that project will last forever – how to consider SPV to manage park?	The management of HWC and development of sustainable Cx strategies is a long-term goal. Within the coming two years focus needs to be set on those actions that require immediate implementation, especially the development of the institutional framework. Once this structure is installed and fully operational, it will allow taking up further tasks of the HWCMS. The Consultants are not privy to detailed content of discussion taking place between PPF and Malawi Government on the proposed SVP arrangement. We cannot therefore make reference to anything we do not have details about. In our understanding SPV would be well suited to play a major role in the coordination and facilitation of the HWCMS. All we know at this point is that SPV is under negotiation. For further recommendations of roles and requirements our knowledge about SPV is not sufficient.
Nils Mayer	Clear guidance required on which next steps to take within next 2 years and to quickly get into action (set priorities and budget)	This will be incorporated in the HWCMS final version.
Arrie van Wyk	Financing of all activities? Who will pay for all of that? Donor funding or NVA?	The HWCMS and its action plan, once finalized by the Project (budget, responsible agency, timeline) can serve as a blueprint for fundraising. Multiple sources will be required for funding the full HWCMS, as it takes an integrated and multi-sectoral approach
Arrie van Wyk	Capacity for tranquilizing and translocation of elephant is a very expensive and specialized exercise that few agencies can	Indeed, preparedness for disaster everywhere is very costly. That does not necessarily imply that efforts should NOT be made to plan and budget for such. Deliberate plans and procedures in handling

	do and is usually a private sector expertise not locally available.	extreme instances that may require translocation ought to be planned for by MAZA TFCA. The project must identify players that can be quickly called upon should need arise. In addition, provisions must be made for the financing of measures in the event of extreme events. .
Catherine Chunga	There is a high risk of mismanagement of funds. How will this be prevented?	Additional to the transparent and comprehensive design of structures and processes, those representatives in charge of handling funds need to be well capacitated and able to fulfil good governance principles, and be supervised and transparently monitored by the Cx Unit (plus regular third party audits) to avoid mismanagement of funds.
George Nxumayo	Community insurance: what is meant by that?	Community insurances should only be considered when a strong and transparent community representation has been set up and HWC management is in place. In case high damage may occur despite all measures in place, community-based or insurance schemes may be developed (further details HWCMS page 73)
George Nxumayo	Which policies have been looked into for political framework	National Environmental Policy, Malawi Wildlife Policy, National Forestry Policy, National Parks and Wildlife Act, Malawi Constitution, Land Tenure and Land Use Policy. See HWCMS pages 35-39
Arrie van Wyk	I doubt it if the savings book system will work in this scenario. Monitoring and reaction must be on a daily basis and one cannot wait for a month to make a decision if a fence attendant or NRC has done their work and if they should be compensated or not. If a fence attendant or NRC is not working immediate action and changes are needed.	The proposed structure foresees the employment of the fence attendant at Cx Unit level. This will be a proper contract-based employment and fence attendants will do their duties daily (morning and evening patrol). They are monitored by the Cx committee (and extension worker). The Zone (cx committee) will receive a define amount of money to their account (saving book). If fence maintenance meets a set of criteria (defined prior and in participatory way with NRCs), the Zone is able to withdraw a certain amount (reward). How this money can be invested is defined according to criteria (defined prior and in participatory way with NRCs).
Specific Fence management		
Arrie van Wyk	4 km segments of fence, will need to be switched off when	Specific fence segments will be attributed to specific Cx committees on zone level. They (incl. the fence attendants) will need to be capacitated to switch power

	physical work on fence conducted. Who will do that?	on and off to maintain fence. They will need the proper equipment, safety regulations and SOPs to guide their work. Role and requirements for community-based fence are further elaborated on page 50&51 of the HWCMS.
Arrie van Wyk	Who will do the training of the community members in the community-based DNPW-led, Rapid HWC Response Team?	This will be the mandate of the project to facilitate. We propose professional ToTs (Training of Trainers) conducted by experts.