M&E protocol for the adaptation outcome
Human Health & Security (Human-Wildlife Conflicts)

Overview

Human Wildlife Conflict (HWC) occurs when the needs and behavior of wildlife impact humans negatively or when humans negatively affect the needs of wildlife. While the causes of HWC range from land use changes toward agricultural expansion, the expansion of human settlements, harassment of wildlife and the increase of wildlife populations in human landscapes, the main drivers for HWC are climate change and population growth. Climate change, specifically through more frequent and intense droughts and flooding cycles, and the spread of zoonotic diseases to cattle, has led to the rise of cases of HWC in wildlife areas. Over the years, climate change has been a silent threat to wildlife, evidenced by changing weather patterns that trigger shifts in habitat composition, forage availability, and limited access to water. The result is that wildlife is left with limited natural spaces, forcing them to move to densely populated human areas, hence creating instances of HWC. Ecosystem based adaptation (EbA) includes strategies can help reduce the effects of climate change and can indirectly reduce HWC. The following protocol is used to monitor and evaluate the ability of improved management of grasslands to minimize HWC caused by more intense and frequent droughts and flooding cycles.

Table 1. M&E table overview

Indicator definition/unit	Data collection methods	Data sources/origin	Policies alignment
Human Wildlife Conflict (HWC) Incidences	Rangers counts/reporting	MMWCA 16 Member conservancies	SDG 16.1.2

1. Case study: KENYA

Kenya is experiencing rapid population growth and the associated demands for increased space for settlements, agriculture and development projects. Additionally, tourism is a vital source of revenue for Kenya's economy and is based mostly on watching wildlife through game drives and safaris. Because wildlife tourism contributes significantly to Kenya's economy, wildlife conservation is given a high priority by the Kenyan Government. The Kenya Wildlife Service (KWS), created in 1989, has the aim of overseeing wildlife conservation in all protected and non-protected areas in Kenya, including wildlife parks, reserves, sanctuaries, and community conservancies.

Maasai Mara Ecosystem is home to the greatest wildebeest migration and mammals in Africa, as well as the Maasai indigenous peoples, the natural conservationist tribe of Kenya, who earn a living keeping livestock. The ecosystem hosts more than 95 species of mammals and over 550 species of birds, generally containing 30% of Kenya's wildlife (Ogutu et al.2005). Land tenure includes both private and public land: Maasai Mara National reserve is a public land managed by the county government of Narok on behalf of the national government of Kenya, while the adjacent land to the national reserve is comprised of private ranges owned by the Maasai peoples in individual ownership. However, despite the private ownership, the neighboring communities have unanimously agreed to lease land for conservation, creating community conservancies. This provides the community with an opportunity to invest their land and gain economic value, promote biodiversity through sustaining range lands, and preserve the Maasai culture for physical and economic values. The total area under conservation is approximated at 6000km^2 including the national reserve and 20 community conservancies under the Maasai Mara Wildlife Conservancies Association umbrella. (MMWCA).
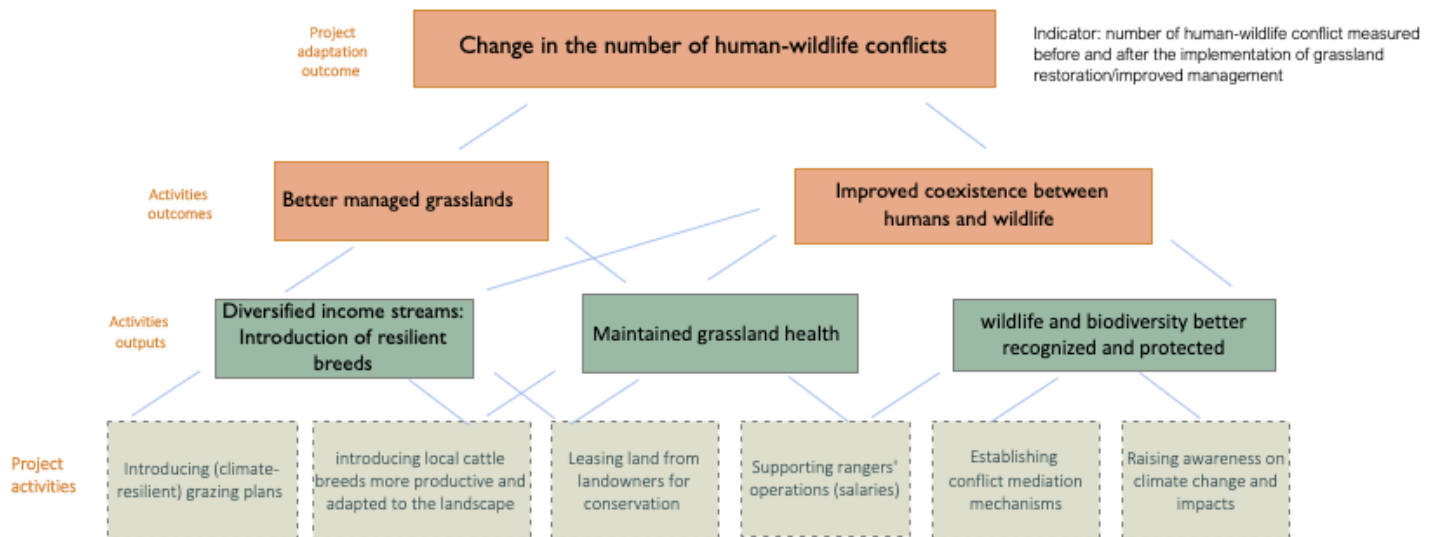
Wildlife in Kenya face many threats including poaching, habitat loss, competition for water and food with livestock and HWC, all of which are exacerbated by climate change. Wildlife habitat must be protected to ensure that species have space and food without needing to enter human settlements. As human population increases and the demand for resources grow, the frequency and intensity of HWC conflicts increases. This can be manifested by increasing encroachment to wildlife habitats. As a result, the populations of those species which are unable to adapt to altered habitats may invade marginal habitats or decline in number.

Climate change is impacting Kenya at an alarming scale and intensity. Climate change intensifies natural disasters and alters the functions and structure of terrestrial ecosystems, thus making human wildlife conflicts inevitable. In order to minimize the impacts of climate change, grasslands must be better managed to ensure a peaceful coexistence among humans and wildlife. HWC mitigation measures should aim to reduce the influence of rainfall seasonality on wildlife and local communities through the provision of water (to homesteads and wildlife) from restored and protected grasslands and other enabling interventions that minimize resource competition. Effective strategies and methods are needed to counteract the harmful impacts of HWC on wildlife and human communities. Ideally, such methods should take

account of distinctions in HWC incidence types and frequencies across regions, seasons, predominant land use types and wildlife species.

2. Theory of Change

THEORY OF CHANGE

Project adaptation outcome	**Change in the number of human-wildlife conflicts**	Indicator: number of human-wildlife conflict measured before and after the implementation of grassland restoration/improved management

Activities outcomes	**Better managed grasslands**	**Improved coexistence between humans and wildlife**

Activities outputs	**Diversified income streams: Introduction of resilient breeds**	**Maintained grassland health**	**wildlife and biodiversity better recognized and protected**

Project activities	Introducing (climate-resilient) grazing plans	introducing local cattle breeds more productive and adapted to the landscape	Leasing land from landowners for conservation	Supporting rangers' operations (salaries)	Establishing conflict mediation mechanisms	Raising awareness on climate change and impacts

3. Indicator's rationale and definitions

To assess the role of improved grassland management on HWC under climate change, the chosen indicator is "changes in the number of incidences of human wildlife conflict reported". There are five main HWC types 1) attacks on humans, 2) wildlife attack, 3) livestock attacks, 4) crop raiding and 5) property damage. Attacks on humans refer to those conflicts through which a wild animal is involved in an encounter with humans resulting in human death, human injury, a threat to humans, obstruction to school-going children or general public insecurity. Livestock attacks include incidences through which livestock are killed or injured, which is recorded as livestock depredation. Wildlife attacks are measured by the wildlife that have been attacked by human beings either through snares, poaching, retaliation or physical hunting. Crop raiding incidents include those through which crops are either destroyed or eaten by wildlife or farms are invaded or raided. Property damage includes incidents through which damage to property such as water pipes, grain stores, and houses occurs. Because climate change plays such an important role in the decline of space for wildlife, which fuels HWC, monitoring the changes in HWC serves as an appropriate proxy indicator to track the contribution of improved grassland management on minimizing HWC and therefore human security.

3.1. Linkages with national policies and priorities related to adaptation

The adaptation outcome indicator chosen related to human health and wildlife conflict is indirectly connected to the Sustainable Development Goal 16.1.2 on reduction of conflict-related deaths. At the national level, it is directly aligned with the National Adaptation Plan (NAP 2015-2030), which acknowledges the threat of increasing conflict over resources and calls for sustainable rangeland management as a response. The plan calls for the design and development of a strategy that allows wildlife and livestock to co-exist harmoniously. The NAP emphasizes the selection of adaptation indicators as part of a monitoring and evaluation process. The National Climate Change Action Plan (NCCAP 2018-2022) explicitly calls for ecosystem restoration and preservation, the conservation of land areas for wildlife, rangeland rehabilitation, and the improved productivity of the livestock sector to reduce climate-related risks. Specifically, the policy states that at least 20% of terrestrial lands must be conserved, and that human wildlife conflict must be reduced by 50% as compared to the 2018 baseline. The policy states that this should be achieved in part by ecosystem-based adaptation. Kenya's First Nationally Determined Contribution (NDC 2020) states that adaptation is Kenya's highest priority, and calls for the strengthening of adaptation monitoring, evaluation, and learning, including the use of appropriate indicators.

3.2. Definitions

Conservancy - According to the Kenya Wildlife Conservancies Association, A conservancy is land managed by an individual landowner, a body or corporate, a group of owners or a community for purposes of wildlife conservation and other compatible land uses to improve livelihoods (WCMA, 2013).

Conservation area - a tract of land, lake or sea with notable environmental or natural features, biological diversity, cultural heritage, or historical importance that is protected by law against undesirable changes (WCMA, 2013)

Dispersal areas - areas adjacent to or surrounding protected wildlife conservancies and sanctuaries into which wild animals move during some periods of the year (WCMA, 2013)

Ecosystem - a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit (WCMA, 2013)

Grassland - lands dominated by grasses rather than large shrubs or trees
- Savanna - grasslands with scattered individual trees
- Temperate Grasslands - grasslands which have grasses as the dominant vegetation. Trees and large shrubs are absent. Temperatures vary more from summer to winter, and the amount of rainfall is less in temperate grasslands than in savannas.

Human Wildlife Conflict
Wildlife often interacts with humans in different ways. However, when such interactions adversely affect or are perceived to affect the lives and livelihoods of people, conflicts occur

(Woodroffe, Thirgood, & Rabinowitz, 2005). These negative interactions result in human-wildlife conflicts (HWC), the most common of which include crop raiding, livestock depredation and attacks on humans (Thouless, 1994; Woodroffe et al., 2005). Human Wildlife conflict incidences include:

- o Human attack – This includes any harm to humans leading to injury or death
- o Wildlife attacks – This includes the wildlife that have been attacked by human beings either through snares, poaching, retaliation or physical hunting.
- o Livestock attack - This includes any harm to livestock leading to injury or death
- o Crop raiding – Destruction of crops either by eating or trampling
- o Property damage – Destruction of property by wildlife

Habitat - a place or site where wildlife naturally occurs and which provides food, cover and water on which wildlife depend directly or indirectly (WCMA, 2013)

National park - an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, managed through legal or other effective means (WCMA, 2013)

National reserve - an area of community land declared to be a national reserve under this Act or under any other applicable written law (WCMA, 2013)

Poaching - illegal hunting, illegal capturing and illegal harvesting of any wildlife. Does not include the control of species widely and commonly regarded as pests or vermin (WCMA, 2013)

Problem animal - any wildlife which has caused or is causing damage to or harm to human life or property (WCMA, 2013)

Protected area - a clearly defined geographical space, recognized, dedicated and managed through legal or other effective means, to achieve long-term conservation of nature with associated ecosystem services and cultural values (WCMA, 2013)

Ranger - a member of the Service in the uniformed and disciplined cadre. Includes corporal, sergeant, senior sergeant and sergeant major (WCMA, 2013)

Wildlife - any wild and indigenous animal, plant or microorganism or parts thereof within its constituent habitat or ecosystem on land or in water, as well as species that have been introduced into or established in Kenya (WCMA, 2013)

Wildlife conservancy - land set aside by an individual landowner, body corporate, group of owners or a community for purposes of wildlife conservation (WCMA, 2013)

Wildlife conservation area - a tract of land, lake or sea that is protected by law for purposes of wildlife and biological diversity conservation and may include a national park, national reserve, game reserve or sanctuary (WCMA, 2013)

4. Methodology

4.1. Data sources and frequency

The data to assess Human Health and Security is obtained through ranger operations. Conservancy rangers normally collect data during daily patrols. The patrols can be conducted by foot, motorcycle or vehicle. Rangers use the online applications under appendix 1 for data collection. Currently, there is no preferred application because different conservancies use various applications. However, the majority of conservancies use a combination of CYBERTRACKER, SMART and EARTHRANGER. The applications are used to record incidences of HW+WC, distances covered by rangers in patrols and animal sightings, though they vary in specificity depending on the application. When there are no online applications, physical logs are used. Once the data is collected by the rangers, their respective conservancy managers clean and compile the data to provide feedback. Conservancy managers provide information to regional and national associations on their conservancy status ranging from composition, membership, expenditure and HWC data. Status reports on conservancies are produced on a quarterly basis by conservancies and every five years by national bodies like the Kenya Wildlife Conservancies Association.

4.2. Data measurements/collection

Human Health and Security is measured through incidences of human wildlife conflict that are aggregated by conservancy and calculated per area (# incidences per square kilometer) and that can occur in five forms: human attack, wildlife attack, livestock attack, crop raiding and property damage. Specific questions under each category can be found under annex 2.

4.3. Data analysis

The following are descriptions of the five different forms of HWC and considered in this protocol.

4.3.1. Livestock Attacks

Livestock attacks are measured by the number of livestock injured or killed by a wild animal. Community members normally contact the nearest ranger unit to their location who assesses the extent of damage. The livestock owner then fills a form indicating the type of attack as described under annex 2. Most of the time, injured animals do not survive and are usually slaughtered by the owners or buried. Livestock attacks aren't compensated at the national level, but individual conservancies have mechanisms and guidelines to offer compensation in form of consolation payments.

4.3.2. Wildlife Attacks

Wildlife attacks are measured by the wildlife that have been attacked by human beings either through snares, poaching, retaliation or physical hunting. Information can also be gathered and reported quarterly through observing animal carcasses which can indicate the cause of death.

4.3.3. Human Death/Injury

Human death/injury, though rare, occurs when a wild animal attacks a human being either by retaliation or defense. The type and severity of conflicts vary among species. The African elephant is the leading conflict species the Mara ecosystem. The next four most notorious conflict animals, in decreasing order, are nonhuman primates, African buffalo, lion and spotted hyena. The Kenyan law under the Wildlife Conservation and Management Act, 2013 provides provision for compensation under certain clauses for human death/injury by wildlife.

4.3.4. Crop raiding

Crop raiding is also considered a HWC type. The type of crop destroyed depends on the foraging habit of the wildlife species involved. Crops damaged range from Cereals, Tubers, Legumes or Fruits. Crop raiding normally peaks in the late wet season. Grazers and mixed feeders predominate HWC involving raiding of cereals, browsers predominate HWC involving raiding of legumes and nonhuman primates predominate HWC involving roots and tubers (Thouless and Sakwa, 1995; Hill, 2000; Conover, 2001; Mackenzie and Ahabyona, 2012; Meinecke et al., 2018).
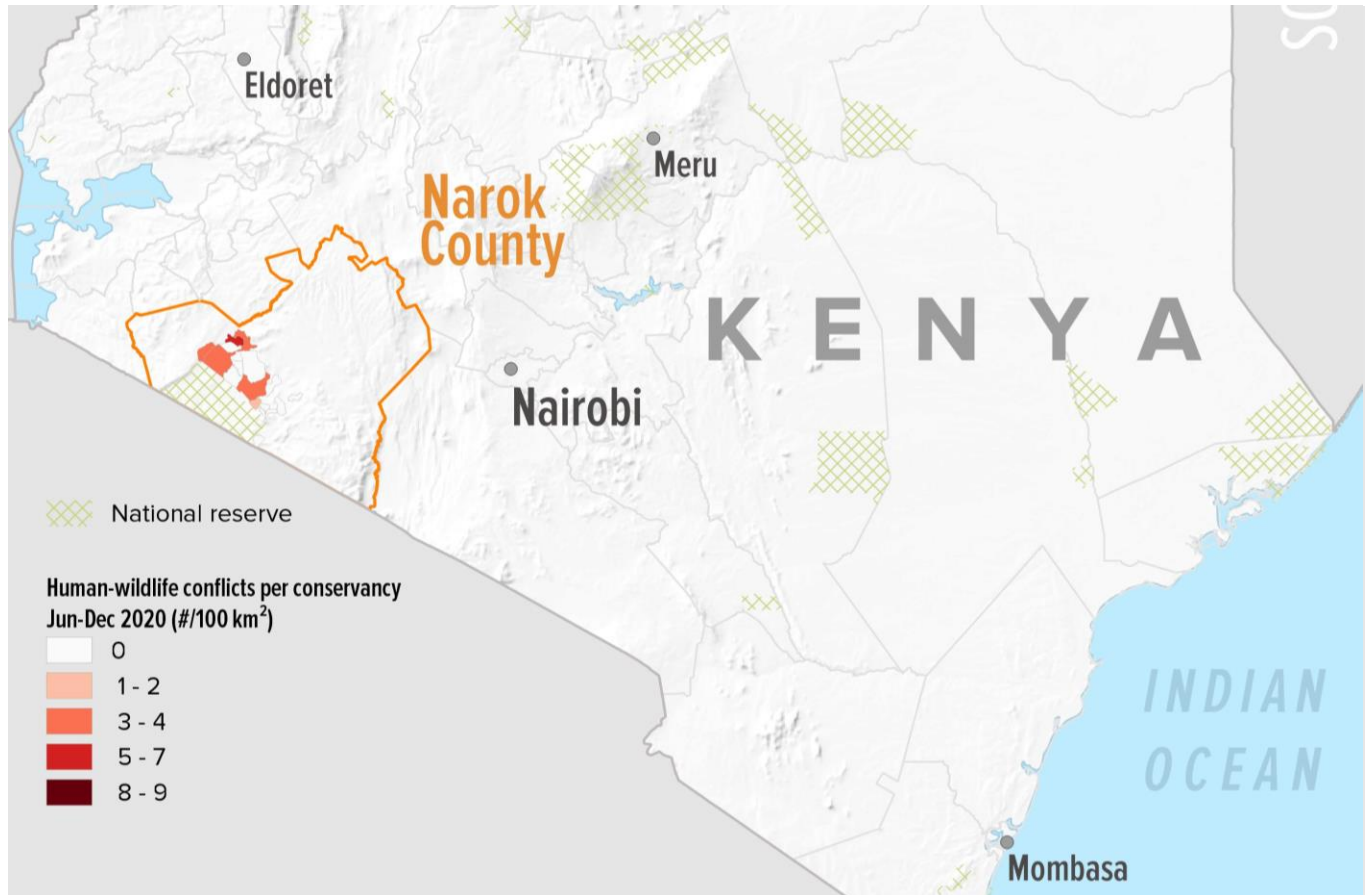
4.3.5. Property Damage

Property damage is destruction of physical infrastructure by wildlife. The most commonly damaged properties included water structures (e.g., dams, waterpipes, boreholes, and water tanks), houses, grain stores, fences (wire and electric fences), livestock pens and chicken cages. Elephant, buffalo, baboons, and hippopotamus cause most property damage.

All 5 types of conflicts are combined in a composite indicator for HWC by summing the occurrences in a given area during a given time. Different areas are then compared based on this composite indicator and tracked through time to track changes before and after the implementation of project activities implemented to reduce HWC.

4.4. Interpreting your results

We expect that the number of HWC per conservancy to decrease with the implementation of project activities. Our baseline shows that the number of HWC per conservancy in the project area varied from 0-9 from June -December of 2020, and we expect the number to reach zero in all conservancies targeted by the project after the implementation of activities.

4.5. Data reporting, quality, and limitations

Rangers collect raw data from the field during patrols using online applications as indicated under annex 1. Conservancies that lack those applications use physical logs as an alternative. Once the data is collected, the conservancy manager cleans the data and uses the data to report on the status of the conservancy. Afterwards, data is shared to regional associations and later forwarded to national associations.

4.6. Data repository and management

HWC incidence data is stored in excel databases with different security levels at the conservancy, regional and national level. Data from digital forms are transferred into excel

databases. Once forms are entered into the excel spreadsheet and verified, the spreadsheet is saved onto a secure server as well as backup cloud storage if possible. To ensure backup of primary data (forms) if possible, all forms are to be scanned and saved in server or cloud storage. The Excel spreadsheet should be separated according to villages and settlements and consolidated into one file for ease of references.

5. Literature

Distefano, E. (2005). Human-Wildlife Conflict worldwide: collection of case studies, analysis of management strategies and good practices. Food and Agricultural Organization of the United Nations (FAO), Sustainable Agriculture and Rural Development Initiative (SARDI), Rome, Italy. Retrieved from https://www.tnrf.org/files/E-INFO-Human-Wildlife_Conflict_worldwide_case_studies_by_Elisa_Distefano_no_date.pdf

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The Wildlife Conservation and Management Act (WCMA), Kenya 2013

http://extwprlegs1.fao.org/docs/pdf/ken134375.pdf

Annexes

Annex 1: Data Collection Applications

Tool	Description	Use	Source

SMART (Spatial Monitoring and Reporting Tool)	SMART (Spatial Monitoring and Reporting Tool) is a ground-breaking and innovative management tool designed to assist rangers on the ground to stop poachers in their tracks and curb the illegal trade of wildlife. SMART consists of a software application that enables you to collect, store, communicate, and evaluate ranger-based data on: patrol efforts, patrol results, and threat levels. The SMART approach covers three areas: software, capacity building, and site-based protection standards. The SMART Tool is open source, non-proprietary, and freely available. The Approach is supported long-term by a collaboration and is based on a set of common principles for improved site-based conservation effectiveness, to enable future development and adaptations to meet the evolving needs of users.	MMWCA Member Conservancies	https://smartconservationtools.org/
WILD (Wildlife Information and Landscape Database)	The Wildlife Information and Landscape Database (WILD) App that will strengthen existing wildlife anti-poaching and human wildlife conflict (HWC) deterrent efforts. the U.S. The mobile phone data collection application and cloud-based database is designed to improve collection, sharing, management and analysis of biodiversity information and data of endangered wildlife i.e., Elephants and Rhinos in East Africa which are facing extinction due to the increased poaching activities. The WILD application tracks a patrol unit's movement using global-positioning software (GPS) using the smart-phone. While on patrol, game scouts can record information on incidences that occur, such as poaching, animal mortality, human wildlife conflict, illegal human activity, community service, wildlife sightings, climate data and others. The information captured in WILD is stored in a secure online database that allows administrators to access and analyze information collected by their scouts, and use this information to support evidence-based management decisions, such as re-organizing patrol routes to cover areas with higher incidents of poaching or HWC. WILD can also be used to track the progress and outcomes of counter wildlife trafficking legal cases that the organization is supporting.	MMWCA Member Conservancies - Naboisho, Olkinyei, Mara North, Olchorro, Olare Motorogi	https://ilabafricastrathmore.wordpress.com/2016/09/20/the-wild-app-helping-conserve-our-wild-animals/
CYBER TRACKER	CyberTracker Conservation is a non-profit Public Benefit Organization that promotes the vision of a worldwide environmental monitoring network. Since 1997 CyberTracker has developed and distributed free software for smart phones and PDAs for data gathering and visualization. They also provide Tracker Certification to preserve indigenous tracking skills and to improve observer reliability in biodiversity research and conservation. CyberTracker is based in Cape Town, South Africa.CyberTracker is being used worldwide by indigenous communities, in protected areas, scientific research, citizen science, environmental education, forestry, farming, social surveys and crime prevention.	MMWCA Member Conservancies - Siana, Oloisukut	https://www.cybertracker.org/background/the-cybertrac

EARTH RANGER	Earth Ranger is an easy-to-use online software solution developed by Vulcan Inc. to help protected area managers, ecologists, and wildlife biologists stay informed and make operational decisions for wildlife conservation. Earth Ranger collects, integrates, and displays all historical and available remote sensing data available and combines it with reports from the field to provide one unified view of collared wildlife, rangers, enforcement assets, and infrastructure within a protected area. Earth ranger is very effective at monitoring and studying wildlife movement across ecosystems, ranging from very specific areas to continent-wide migrations	MMWCA Member Conservancies - Enonkishu	https://earthranger.com/

Annex 2: Data Collection Form for Conservancies Human Wildlife Conflict Data

Name of Conservancy	
Date	
Reporting period (month)	
Region/Province/District	
Village	
GPS coordinate (if any)	

1. Livestock Attacks
Number of Incident Reported?

	Livestock attacked	Number	Wild animal responsible	Action taken /compensation **	GPS location/place
1.					
2.					
3.					
4.					

2. Wildlife Attacks

2.1 Poaching or any wildlife crimes Incidents? (Number of Incidents and Wildlife affected)

	Wildlife species attacked/killed	Number	Type of attack (spear, arrow, poison)	Action taken /compensation **	GPS location/place
1.					
2.					
3.					
4.					

2.2 Snaring (Number of snares and wildlife affected)?

	Wildlife species affected	Number	Type of trap	Action taken /compensation **	GPS location/place
1.					
2.					
3.					
4.					

3. Human injuries/death

	Type of injury	Number	Wild animal responsible	Action taken /compensation **	GPS location/place
1.					
2.					
3.					
4.					

4. Wildlife ridings
4.1 Crop riding

	crops damaged*	Area (m2)	Wild animal responsible	Action taken /compensation **	GPS location/place
1.					
2.					
3.					
4.					

4.2 Infrastructure damages

	Infrastructure damaged*	Number	Wild animal responsible	Action taken /compensation **	GPS location/place
1.					
2.					
3.					
4.					

* (water structures (e.g., dams, waterpipes, boreholes, and water tanks), houses, food stores, fences (wire and electric fences), livestock pens and chicken cages.

5. Number of arrests made? Fined? Convicted?

Annex 3: Compensation forms

Human Compensation

http://www.kws.go.ke/file/2220/download?token=_vZkJPuG