**Human Wildlife Conflict**

**What is human wildlife conflict?**

**What are the contributing factors to human wildlife conflict?**

A contributing factor to HWC happens when wild animals migrate in search of food and water especially during the dry season. Humans are occupying wildlife land which sometimes happens to be the migrating route of wild animals Eg elephants. During migration, the animals come across farms and livestock. Conflict begins when elephants & predators devour on man's property and then man fights back to defend it.

Climate change: Recently there have been unexpected prolonged drought, very heavy rainfall causing floods both of which have caused damaged leading to scarcity of food and water. This is a catalyst to HWC.

Communities coexisting with wildlife get stranded on the action to take against threatening attacks from elephants. Man doesn't want to kill the animal because they will be breaking the law, at same time the animal wants to devour their property. They immediately report the matter to KWS but there's poor response time. What do they do? The conflict arises and both sides get hurt.

Animals in frequent conflict with man are Baboons, elephants, lions, Leopards and hyena.

Crops frequently devoured by wildlife are maize and tomatoes.

Livestock being attacked are cows, goats, sheep and chicken.

There's poor communication between the community and KWS. People don't know how to reach them. And when they manage, the response time is poor, KWS arrives after damaged is caused. Additionally There's long delayed compensation.

**What is KWS doing to combat HWC?**

* Educate people on effective ways to coexist harmoniously with wildlife.
* Corporate social responsibility- building resources for community. Eg, schools, dispensaries, boreholes as a way to motivate people to coexist with wildlife.
* Giving compensations to those affected.

**What has been done before to combat HWC?**

**Zonal hotline number**

Typically, information about HWC comes in different ways, including the zonal hotline

number reports to a given area's human-wildlife conflict response team (HWCRT). This

method is efficient because the residents immediately report spotted wildlife to the human-

wildlife response team. However the hotline system utilizes a reactive approach, hence the need for a cheaper and proactive approach. Reactive means the reports are made after the HWC has occurred.

**Collaring large-body wildlife**

Another way is by collaring large-body wildlife such as elephants and rhinos to monitor and track their movements to Geo-fence them. For instance, the current Ngorongoro conservation area system uses collaring of animals such as elephants for geofencing alerts. This system is installed on animals that tend to cause crop-raiding sprees.

**Downsides**

* Although it is an effective method, some animals may go astray and raid crops.
* Continuous monitoring of wildlife using collaring has proven expensive to install and operate due to its networking requirements and the initial cost of equipment, especially in remote areas with poor network coverage and low population density.
* The system tracks only collared wild animals. Therefore, it is expensive to use in

tracking all wildlife.

* It is also challenging to implement the system on large and aggressive wild animals such as elephants and carnivores such as lions and leopards. The system is not
* also suitable for small-bodied wildlife such as wild dogs or wildlife which live in water, such as crocodiles.

**Fencing**

The Maasai around Ngorongoro has enclosed fences around manyattas but sometimes wildlife breaks these fences and raids the crops.

A study of electric fences effectiveness using collar data and camera traps to determine wildlife behaviors around the fences and proved to be effective

(Branco et al., 2020). However, due to the cost of power and breakage of fences by elephants

using their tusk which does not conduct electricity (Massey et al., 2014), different strategies to

minimize cost have been used. For instance, activating power when a collared animal is near

the fence using collaring data but its’ use is limited due to the high subscription fee to transmit

data and the challenges of capturing and collaring animals.

A text from a research paper, “They assume that fences make sense to protect your property from elephants; however, what we found is that they are still breaking fences, and other animals are dying in the process. Fencing is actually worse than poaching because we are blocking animal corridors and we are losing wildebeest and giraffes every day killed by electric fences. We need a better solution and MEP is working to discover that.”

**Beehives**

The other option is erecting a barrier using beehives to scare away wild animals such as

elephants (O'Connell-Rodwell et al., 2000). This system also benefits the local community

because it provides a source of income through honey harvest. This shows that when you understand the nature of an elephant you can use nature to fight it .However, this option is

cumbersome and laborious since it needs the installation and regular repairs after becoming

operational.

**PIR sensors and motion detector to detect wildlife**

Kumar et al. (2021) developed a system using passive infrared (PIR) sensors and motion

detector to detect wildlife moving to the human habited area. The system could notify the

registered residents using the mobile app. It also included a loudspeaker system to chase the

wild animals away using loud noise.

**Crop protection system**

Giordano et al. (2018) developed a crop protection system using a PIR sensor to detect wild

animals and an ultrasonic speaker to chase away the wildlife. This system used a low-power

RIOT operating system and a tailored micro controller. As a result, the system can detect

wildlife but **cannot identify each specie**s.

**Seismic sensor to detect ground waves**

Fazil et al. (2018) designed a system that uses a seismic sensor to detect ground waves of

elephants’ feet trumping the ground and then alert people using the SMS and speakers. The

only drawback of this system was that it could only detect wildlife, generating ground

vibrations such as elephants.

**Using ultrasonic repellent** to scare away wild animals after sensing them.

**Early Warning System (EWS) based on camera traps and short message service (SMS)**

Ronoh et al. (2023) developed an EWS based on camera traps and short message service (SMS) to detect and alert park warders on wildlife escaping the Tarangire National Park and communities living adjacent to the park.

**Drawbacks**

* The system is designed to monitor wildlife in only one area facing a single direction, which means that it may not be suitable for use in more extensive or complex areas.
* The wild animals detected by the system are determined by the trained model used, which means that it may not identify other wildlife not included in the training.
* The system is also susceptible to the effects of strong winds and heavy rain, which can

damage the equipment and affect the quality of the images captured.

* how do this camera detect animals at night? Do they have flashlights?
* The accuracy of a sensor distance was just about a hundred meters within line of sight.
* The battery used for the system was a simple recharge battery that works short period of a few days.
* Uses internet (modem) and network access to transfer images to cloud and location (GPS tracker) and send sms alerts. Is this method efficient for remote areas with limited or no network access? The modem for internet requires a way to renew subscription and hence frequent checkups?
* Man has to coexist with wildlife, how does this system help pastrolists? Lets say the community gets an alert, how do they react? Do they go to the exact position as shown on the map sent? Lets say its at night, is the camera able to take a picture? Is the alert made? Is the person getting the sms able to respond in time?

**Currently, what kind of solutions do you think people need?**

From all the above solutions and research papers read. Below is what we think the new solution should have or do.

**Alert system**

The system should alert people or relevant authority before the incident happens.

**Cost effective**

The system should affordable to implement and maintain.

**Real time monitoring**

The system should be tell the location of wildlife at real time.

**Data mapping**

The system should use real time wildlife location to map out their movement patterns.

**Community engagement**

The system should offer a way to receive custom reports or feedback from the community.

**Monetary value**

The system should reward immediate community for coexisting with wildlife.

**Potential study area**

Arcgis is a software solution that utilizes geographical information system (GIS) and remote sensing to know the wildlife locations, learn their movements and understand their interactions with natural resources and even man. All this is displayed on maps.

Radio telemetry is a technique that uses radio signals to track the movement and behavior of animals.

**Do you have any idea of how to create the solution?**

* I think we can incorporate the **Random Forest algorithm** to analyze environmental variables such as proximity to wildlife corridors, water bodies and vegetation alongside GPS data to predict the movement patterns of conflict-prone species. This data can be fed into the alert system to notify communities before wildlife enter human settlements.
* Also we can think of adopting a Mobile application with a push notification to alert communities of impending wildlife movement. In areas with poor internet connectivity, offline SMS systems can be used. Or we can create **community-based alert hubs**, where one person in a village can receive notifications on behalf of the whole community, so as to help overcome the issue of poor network coverage.
* Building on **Fazil et al.'s seismic sensor system**, which detects ground waves caused by large animals like elephants, we propose enhancing this system to include **acoustic sensors** to detect wildlife calls or movement sounds. These sensors could provide early warnings to communities living close to wildlife habitats, allowing them to respond to wildlife movement before conflicts arise.
* Use of data inputs such as weather patterns, crop harvesting cycles, and wildlife behavior can be used to identify trends that lead to conflicts. For example, elephants are known to raid crops during dry seasons when water and food are scarce. A machine learning model could predict when these situations are likely to occur and send alerts ahead of time.