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Assessing human-wildlife conflict: A case of human-elephant conflicts in and around Proposed Wonegizi Nature Reserve, Liberia

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Author's declaration

No portion of the work referred to in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

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ABSTRACT OF THESIS submitted by:
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Abstract

The expansion of human settlement and agricultural activities are growing in and around protected areas (PAs). This is a pressing issue that often fuels human-wildlife conflicts (HWC). In Liberia, human-elephant conflicts have been increasing, and assessment of these interactions is lacking. The study used semi-structured interviews with various stakeholders to assess the factors responsible for elephant-human conflicts in and around the Proposed Wonegizi Nature Reserve (PWNR) in Lofa County, Liberia. Elephant and human conflicts in and around the PWNR were found to be driven by both environmental and social risk factors. Environmental risk factors were weather, planting season, rural settlement expansion, population increase, and farming/agriculture practices. Social risk factors were stakeholder resentment, lack of trust, social inequity, conflict, political instability, power disparity, centralized decision-making, perceptions, and belief systems. Corruption and rural poverty also contributed to the conflict. The IUCN Red List's critically endangered African Forest Elephant benefited from Liberia's wildlife legislation. Elephants were responsible for crop damage, property damage, and human deaths. Elephant damage increased in communities adjacent to the proposed protected area, with corridor communities suffering the most. The most affected stakeholders were farmers, who were upset and wanted to quit farming. Traditional subsistence farming was a significant concern and suffered the most from elephant damage. PWNR communities had no elephant or wildlife damage compensation programs. Other costs, such as ecosystem degradation, mental and psychological health, and biodiversity loss due to farming, were not accounted for. Mitigating measures were ineffective due to crop location and types.

Keywords: human-wildlife conflict, forest elephant, Liberia, *Loxodonta cyclotis*, protected areas, subsistence agriculture, Proposed Wonegizi Nature Reserve (PWNR).

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List of Abbreviations

AEAP: African Elephants Actions Plan

ASD: Assistant Superintendent for Development

CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora

CPW: Chief Park Warden

CSOs: Civil Society Organizations

DC: District Commissioner

DCAs: Damage-Causing Animals

ELRECO: Elephant Research and Conservation

EPA: Environmental Protection Agency

FAO: Food and Agriculture Organization

FDA: Forestry Development Authority

FFI: Flora and Fauna International

FPA: Front Page Africa

FUNL: Farmer Union Network of Liberia

HEC: Human-Elephant Conflict

HWC: Human-Wildlife Conflict

IUCN: International Union for Conservation of Nature

IUCN-WCC: International Union for Conservation of Nature World Conservation Congress

IUCN-Red List: International Union for Conservation of Nature Red List of Threatened Species

LCDA: Lofa County Development Agenda

LISGIS: Liberia Institute for Statistics and Geo-information Services

LME: Lands, Mines and Energy

MIA: Ministry of Internal Affairs

NEAP: National Elephant Action Plan

NGOs: Non-governmental Organizations

NICFI: Norwegian International Climate and Forest Initiative

PAs: Protected Areas

PWNR: Proposed Wonegizi Nature Reserve

SADS: Skills and Agriculture Development Services

SCNL: Society for Conservation of Nature

UNEP-WCMC: United Nation Environment Programme World Conservation Monitoring Centre

CHAPTER ONE - INTRODUCTION

Human-wildlife conflict (HWC) is a global phenomenon (Sharma et al. 2021), and most of the wildlife involved are protected or endangered species that have lost their historical ranges and/or undergone population decline (Nyhus 2016). The occurrences of HWC are considered almost unavoidable, but a failure to acknowledge their significance has recently resulted in controversial issues among authorities, people, and local communities (Hill 2004). It has considerably contributed to a negative attitude toward wild animals. Conflicts between humans and wildlife result in the loss of many lives—both humans and wildlife—threaten the livelihoods of millions of people around the world, and put at risk the achievement of long-term conservation goals such as the maintenance and persistence of protected areas and the development of constituencies that are in favor of wildlife conservation (Sukumar 1994; Treves & Newton-Treves 2005). HWC endangers the survival of wildlife and has avoidable adverse effects on people's livelihoods, security, and well-being. Those affected are among the most marginalized and vulnerable individuals who reside in and around protected areas (IUCN-WCC 2020). Also, global population growth has prompted numerous conservation efforts to protect and preserve a variety of wildlife, but it has also exacerbated tensions between humans and wildlife (Thirgood et al. 2005). It is possible to look at these interactions from both a negative and a positive angle, as humans also value wildlife for socio-cultural reasons or as a resource (Robinson 2005). When perceived from a more optimistic point of view, wildlife can be valued as game that can be hunted for both socio-cultural interests and the purposes of trophy or recreational hunting (Thirgood et al. 2005). The significance of wildlife extends well beyond the realm of hunting. It is essential to the upkeep of ecosystems by offering ecosystem services of economic, cultural, educational, and existence value, all of which contribute to the general well-being of planet Earth and the people who live on it (Gomez, van Vliet, and Canales 2022). However, from a negative perspective, there are direct and indirect damages. Direct damages

have impacts on both humans and wildlife, including loss of life (humans and wildlife), property damage (livestock, crops, homes, fences, food stores, infrastructure, etc.), and indirect damages that result in economic losses (money) and even time (Thirgood et al. 2005). Therefore, HWC involves understanding people's values, beliefs, and attitudes to help mitigate the associated costs (Thirgood et al. 2005). The management of HWC can not only be based on individualistic perspectives but also on policy, decision-making, and discourses among all other actors involved (Thirgood and Redpath 2008). The human dimensions study acknowledges the complex interplay between internal (one's own experience and evolutionary background) and external (one's own social, cultural, and economic milieu) influences on one's perspectives and values (Treves 2014). The level of animosity may also exacerbate tensions between people who care about biodiversity and those who care about human rights, adding another dimension to the conflict situation (Treves 2014; Hallgren 2017). As a result, human-human conflicts can complicate already complex human-wildlife conflicts, which may be the result of social factors (Dickman 2010).

1.1. PROBLEM STATEMENT

Liberia, a country where the population is growing (LISGIS 2022) after 14 years of civil unrest (Cecelia 2010), has seen an increase in the competition for resources. People are now occupying those areas that were once forests and habitats for wildlife, particularly those living in and around protected areas, whose agricultural activities are threatening biodiversity (Nikoi and Djossa 2016). Unsustainable land use systems and farming practices, such as slash-and-burn or shifting cultivation, are alarming threats to habitat loss, fragmentation, and degradation (Saysay et al. 2016). As a result of these activities, rural communities in and around protected areas are often in contact with wildlife.

The Proposed Wonegizi Nature Reserve (PWNR), located in the northwestern corner of Liberia, is no exception. The area is home to a variety of species, many of which are endangered, such as the African forest elephant (*Loxodonta cyclotis*), chimpanzee (*Pan troglodytes*), pygmy hippopotamus (*Choeropsis liberiensis*), giant ground pangolin (Smutsia gigantea), western red colobus (*Piliocolobus badius*), and many threatened birds, reptiles, and amphibians. The PWNR covers an area of 37,979 ha and a leakage belt or zone (the area around a protected area that may be subject to human activities such as logging, agriculture, or the development of infrastructure, all of which can have a significant negative influence on the protected area as well as the goals of its management and conservation efforts) of 32,147 ha (Hcv 2018). The region has mature forests, but 7% of the land is already used for farming (HCV 2018). A recent report (ELRECO 2021) estimated that there are between 350 and 450 elephants living in the northwest forest block of the country. Although ELRECO (2021) assumed that there were at least a thousand forest elephants in Liberia, further data was needed to confirm this conservative estimate. But elephant poaching and killing are grave problems for forest elephants in Liberia. Since 2018, 18 elephants have been killed in the country, with 10 of these in the northwest forest block and eight in the southeast forest block (Liberian Daily Observer 2021). It has also been reported that at least eight elephants were killed in the Northwest landscape in the last five years (FFI 2021). The degradation and fragmentation of elephant forest habitats as a result of slash-and-burn agriculture, particularly the forest wetlands that elephants prefer, are also viewed as threats or contributing factors to the decline in elephant numbers, as well as causing an increase in the incidents of human-elephant conflicts (HEC) (FFI 2021). Poaching and agricultural activities that disturb the forest have influenced how elephants behave, leading to HWCs in the PWNR. So elephants move to farmlands to look for food. Farmers are typically passive, flee farms, or give up farming altogether, and the reports of human and elephant conflicts, a dominant topic among local people, call for further

investigation (Liberian Daily Observer 2021). As a result, angry and frustrated locals often threaten to kill crop-raiding elephants, demonstrating a negative attitude toward elephants and elephant conservation. Between 2005 and 2023, there have been numerous articles (AllAfrica.com 2005, 2006; Local Voices Liberia 2018; Liberia News Agency 2019; FPA 2021; Day Light 2023; Liberian Daily Observer 2023a, 2023b) in local online news about elephant damage in the PWNR and other parts of Liberia. Farmers are reportedly upset at the degree of elephant damage, dissatisfied with the way the Liberian Authority is addressing the problem, and want to give up farming altogether (Local Voices Liberia 2018; Liberia News Agency 2019; FPA 2021; Day Light 2022; Liberian Daily Observer 2023c). Despite efforts to reduce the conflicts by all parties involved, including national initiatives like Liberia's National Elephant Action Plan (NEAP), there are still conflicts between the elephants and humans and among all stakeholders involved.

Based on the broad range of HWC impacts (environmental, human safety, crop damage, and socioeconomic impacts), consequences and responses suggest that those involved (governments, wildlife management organizations, researchers, and local communities) must understand the human dimension of the conflict situations in order to implement the necessary and most appropriate mitigation strategies to address the problem for the benefit of people, wildlife, and the environment (Redpath et al. 2015). Applying the appropriate methods to mitigate the conflict will necessitate a detailed assessment of the social and environmental risk factors to understand the conflict situation.

1.2. AIMS

The study aims to assess the conflict between humans and elephants in and around the PWNR using a conceptual framework developed by Dickman (2010) to understand the underlying causes and identify factors responsible for increasing HWCs. Through this, the social and

environmental risk factors responsible for the impacts experienced by those affected by the conflict will be identified and examined. The research also aims to provide potential solutions and make recommendations to help mitigate HWCs.

1.3. RESEARCH QUESTIONS AND OBJECTIVE

The study consists of four main research questions:

1. What are the underlying causes and consequences of HWCs in the PWNR?
2. How effective are the current measures in place to mitigate HWC in the PWNR?
3. What potential solutions are there for mitigating HWCs in the PWNR?
4. What lessons can be learned from other similar PAs, in other regions or globally, that have successfully managed HWC?

The research questions are meant to guide understanding of the underlying environmental and social risk factors responsible for the human-elephant conflict in and around the PWNR. Also, the research's objectives are to assess the perspectives on the conflicts between elephants and humans while considering the following:

1. The level of damage caused by elephants and its impacts.
2. The main drivers/causes of the conflicts.
3. Role of wildlife laws/legislations (protected wildlife management laws)
4. Elephant management by the Forestry Development Authority

1.4. OUTLINE

The subsequent chapters are intended to contribute to answering the research questions. Chapter Two will provide an overview of existing literature concerning HWC and elephants, as well as an overview of the Wildlife Conservation and Protected Areas Management Act of Liberia and a summary of the National Elephant Action Plan (NEAP) of Liberia. The methods utilized to perform the research will be described in Chapter 3. The fourth chapter will present

a summary of the essential findings. The key findings of the study will be discussed in Chapter Five. Chapter Six will include answers to research queries as well as recommendations for possible HEC management and mitigation.

CHAPTER TWO – LITERATURE REVIEW

Human-wildlife interactions in Africa are as old as agriculture (Treves and Naughton-Treves 1999). Historians from the pre-colonial and early-nineteenth centuries recorded locations in Africa and elsewhere where wildlife (such as elephants) invaded human cultivations, resulting in significant food shortages (Barnes 1996). Nonetheless, large mammals were viewed primarily as a resource to be exploited and not a significant threat during the pre-colonial period (FAO 2009). With the advent and development of modern agriculture in the 20th century, exploitation decreased, and conflict became the predominant way of contact between humans and wildlife species (FAO 2009).

When agricultural crops are produced inside or near the habitats of wildlife such as ungulates and primates, the wildlife tends to cause damage to the crops. Numerous ecological, social, and political issues are present in this conflict, which can involve animals as large as elephants or as small as rats (Naughton-Treves 1998; Nyhus et al. 2000; Conover 2002). Elephants, hippos, buffaloes, and large predators are responsible for most human deaths and injuries; most attacks involve individuals extracting resources from wildlife habitats or protecting their fields or livestock from damaging wildlife (Linuma et al., 2022).

The African forest elephant (*Loxodonta cyclotis*) is a culturally significant symbol in many African societies (Gobush et al. 2021). The African forest elephant and the African savanna elephant (*L. africana*) are among the few genuinely iconic animals found across the continent of Africa. They are the subject of countless folktales, songs, and traditions (Gobush et al. 2021). However, elephants are considered pests or problem animals in the range countries due to the damage they cause to crops, properties, and humans (FAO 2009). It is essential to point out that elephants are capable of breaking into storage bins as well as cottages on farms during the

dry season to steal grain (FAO 2009). If they do so, there will be far more severe repercussions for food security.

There are numerous strategies for reducing HEC (Dickman 2010; Pinter-Wollman 2012). There have been strategies for controlling elephants (using culling, contraceptives, and breeding control) and translocation (Pinter-Wollman 2012). However, a method such as translocation for reducing human-elephant conflicts related to crop damage has not been successful and has had a significant effect on the survival of African elephants. A 2005-2006 controlled study in and around a national park in Kenya by Pinter-Wollman et al. (2009) found that translocated crop-raiding African elephants had a lower survival rate than non-translocated elephants on the same site. The success of other management strategies, such as expanding elephant habitat through the development of wildlife corridors and transfrontier zones, requires coordination among several states.

Moreover, there may be difficult political and logistical hurdles to overcome when working cooperatively (Pinter-Wollman 2012). Also, there is increasing research and literature focused on other conflict mitigation strategies (such as electric fencing, hard fences, chili fences, beehive fences, compensation, taste aversion, sterilization, land use change, etc.) for wild animals that demonstrate potential (Dickman 2010). However, measures to manage HWC must be considered part of an integrated strategy, not in isolation (Barlow 2019); not all these actions may effectively handle every HWC problem. But according to Barlow (2019), these actions might be a good reference for individuals thinking about what combination of techniques to employ when managing HWC situations in specific contexts. On the other hand, prohibiting the killing of problem animals during hostilities will not stop animal deaths unless the government has the resources to implement the law and the solid backing of the community to support its enforcement (Barlow 2019). Understanding "why' and 'how' the conflict arises

offers the foundation for a greater understanding of the contributing elements and for delivering the most appropriate and successful mitigating solutions.

2.1. GLOBAL PERSPECTIVE OF HWC

2.1.1. Nature of Damage

The essence of the damages caused by HWCs is not always evident because the reporting varies depending on stakeholders' thoughts, opinions, and reports. Emotional influences on these people can lead them to exaggerate the true scope of the conflict (Anthony et al. 2010). It may be possible to determine the perceived nature of the conflict by considering different levels, including local, national, and individual, using Dickman's (2010) hyper-awareness of risk. People can exaggerate the magnitude of losses experienced from wild damage, knowingly or unknowingly, creating more fear of damage for others, whether they have experienced it or not (Dickman 2010). The way in which the media portrays wildlife damages can have a big impact on how people perceive them. A press statement by Forestry Development Authority (FDA) in Liberia strongly objected to a New Dawn Newspaper report alleging that a group of elephants emerged from the forest and invaded an entire electoral district, destroying several houses and crops and driving villagers out of their villages FrontPageAfrica-FPA (2022). These are derived from the opinions and perspectives of various sources, some of which include experience and facts or from the observations and encounters of a larger society, as well as preconceptions (Dickman 2010). The conflict between humans and wildlife will only worsen as time goes on because the resources at stake have a monetary value, and damage is often caused by protected wildlife species (Graham, Beckerman, and Thirgood 2005)

2.1.2. Drivers of HWCs

In the least developed or developing countries that are home to a diverse range of cultural, tribal, and religious practices, many populations rely heavily on forests and the resources they

provide as a means of subsistence (Amin et al. 2022). Conflicts between humans and wildlife often arise because of these human interventions in the forest ecosystem. Although human-wildlife conflict occurs in protected areas, a decline in the habitat for the population of large mammals may attract them to crops. According to the IUCN (2022), HWCs are widely spreading because of human population growth, agricultural expansion, infrastructural development, climate change, and other drivers of habitat degradation. Timoshyna and Rodina (2019) summarized the drivers of the human-wildlife-livestock-crops interface. They mentioned that infrastructure development, disconnect from nature, corruption, and a lack of education for disadvantaged groups negatively impact humans, wildlife, and associated resources. Therefore, any factor that brings people into contact with wildlife may likely cause conflict.

Breitenmoser (1998) explained the success of conservation efforts that led to the recovery of indigenous ungulate populations, such as deer and chamois, through reforestation and banning livestock from the woods in Switzerland. According to Breitenmoser (1998), this increased the ungulate populations, contributing to the increase in browsing and damage to the forest, which has economic consequences for forest management.

Conservation success requires intricate management to balance animal and human requirements (Breitenmoser 1998). As a result, institutions responsible for mediating conflicts between wildlife and human populations might often struggle to respond effectively due to a lack of public education and involvement, and Breitenmoser (1998) noted that nature conservation organizations are usually not highly regarded in rural areas, and rural communities do not always accept ecologists and conservationists as partners. The fundamental difference in the nature of perception between rural and urban populations can further complicate conflict resolution (Breitenmoser 1998). This shows that effective communication,

public involvement in conservation efforts, and the challenges institutions face in achieving them are essential.

As Anthony et al. (2010) put it, the lack of trust and acceptance can make it difficult for institutions to communicate with and effectively involve rural residents in conservation efforts. Anthony et al. (2010), therefore, outline four reasons that make responsible institutions struggle to respond effectively: (i) lack of good information regarding the scale and nature of the conflict, which can lead to distorted reports and opinions that create a false impression of the problem, preventing resources from being directed towards perceived problems rather than actual concerns; (ii) keeping records can be unsystematic, and responding to accidents might be delayed by overlapping and inadequate institutional frameworks, resulting in insufficient data on the nature and extent of the damage being left wanting. (iii) The distribution of competencies among various entities can weaken some institutions' legitimacy, impede efforts to manage damage-causing animals (DCAs), and hinder efforts to promote goodwill and conservation. (iv) Tensions between specialists in conservation and locals over DCAs might intensify existing social confrontations and conflicts with protected areas over other issues. According to Anthony et al. (2010), establishing institutions that meet the requirements for effective governance for PAs is a complex process that requires substantial investments of time and resources for knowledge development and stakeholder collaboration.

There are characteristics of the environment that are noted to facilitate HWCs. According to Dickman (2010), factors unique to a specific environment, such as physical environment characteristics and the distance or location of the crops (for instance, crops located near forest edges are more likely to be raided by wild animals), are likely to increase the severity of wildlife damage. (Tweheyo, Hill, & Obua 2005) note that the scarcity of foliage in the environment contributes to increased wildlife damage to such crops. Dickman (2010) added that people

should consider land use management strategies such as planting chili instead of maize that cannot be eaten by elephants and protecting their assets and livestock with dogs and predator-proof enclosures. However, switching crops would also attract wildlife that consumes the new crops, and dogs may be unable to defend livestock from large carnivores such as lions. As a result, it is essential to consider all these environmental drivers when identifying the damage caused.

HWCs can also result from environmental factors like urbanization, agricultural expansion, and population growth. According to Robinson (2005), as human populations grow and encroach on wildlife areas, competition for resources intensifies, leading to more conflicts between humans and wildlife, and humans' land use systems may also contribute to the causes of conflicts. Okello (2005) noted that changes in land use could lead to increased conflicts as animals may be forced to move into areas where they are not welcome. However, the mitigation of conflicts will depend on how organizations, individuals, and authorities respond.

2.1.3. Response to HWCs

Most responses to conflicts are directed either toward organizations, individuals, law enforcement agencies, or wildlife that causes damage. According to Treves and Naughton-Treves (2005), there are two types of responses to animals that cause damage: lethal control and non-lethal control. Lethal control has proven to be the least expensive and most effective way to reduce damage, primarily from large mammals. In the absence of control from outside, reasonable people in conflict with wildlife may, for instance, allocate their time to farming and hunting so that the gain on time allocated will provide more resources to every engagement to get a similar dividend (Blute and Rondeau 2005). When human and animal disputes happen, in most cases, individuals who are not directly affected argue that people should have the right to use conflict reactions such as force or aggression. This has the propensity to cause various

illegitimate reactions that are not commensurate with the damages caused by the wildlife under discussion (Dickman 2010). Most people respond to conflicts by complaining to groups, authorities, or law enforcement about the harm that wildlife is causing them, either verbally or physically. This allows those in legal authority to take action to lessen the damage. If nothing is done to mitigate the effect, it could threaten authorities' credibility and put lives at risk (Anthony et al., 2010). Dickman (2010) also provides an extensive summary of several lethal and non-lethal perspectives directed toward damage-causing animals in response to conflicts (Table 1).

Table 1: Mitigation measures used in human-wildlife conflicts. Adapted from Dickman (2010)

Conflict Mitigation approach	Techniques	Examples
physical separation of conflicting species and resources	Fencing/enclosing resource	Livestock enclosures; placing fences, electric fences, trenches, fladry, trenches, netting or other defense structures around resource
	repellents/deterrents and scaring devices	visual repellents, acoustic repellents, chemical repellents (including odor and taste repellents) rubber bullets or other projectile
	Fencing protected areas	Projectile deterrent radio-activated guard boxes Electric fencing or other fencing around Boundaries of protected area
Guarding assets	Guarding and warning animals	Specialized livestock guarding dogs, other guarding animals such as donkeys and llamas, Local dogs to warn of predator presence
	Human guardians	Human guarding resources, for example staying in crop fields to scare away herbivores, herders going out with stock or staying in/around enclosures to protect from carnivores
	Physical devices on livestock	protection collars, king collars, cyanide collars
Habitat use and modification	Habitat manipulation to reduce conflict	mowing vegetation around airports to reduce birds strikes, increasing heather on grouse moors to reduce grouse predation, burning vegetation to reduce cover for wild animals
	Habitat zoning	Demarcate habitat into different land use zones to prioritize human or wildlife use
Behaviors modification of	physical aversion	Electric collars on conflict-causing animals to avert them from approaching resource

conflict-causing species	Condition taste aversion	Lithium chloride and other chemicals applied to resource, to cause discomfort and aversion after consumption
Behavior modification of humans	Livestock management	synchronizing breeding, more conscientious herding, guarding, enclosing stock, carcass disposal and avoidance of conflict hotspots
responsible for resource	Relocation of peop	local people encouraged or made to move out of wildlife areas
	Education and awareness	Reducing own risk factors, e.g., reducing driving speed to avert deer-vehicle conditions increasing knowledge of the ecology of conflict-causing and the best techniques for reducing conflict use of conflict verification teams to help people correctly identify species causing conflict
Use of buffer resources	Buffer crops	Planting of buffer crops to reduce consumption of importance resources
	Artificial provision of alternative food sources	Diversionary feeding for conflict-causing species
	Maintenance of alternative food sources	Maintenance of wild prey for carnivores, maintenance of wild crops for herbivores to avoid consumption of human resources
conflict-causing species		to avoid conflict, selective culling to limit population growth
	Retaliatory killing	Killing of conflict-causing species as a response To on-going conflict
	Problem animal control	Targeted lethal control of 'problem animals'
Non-lethal control of	Sterilization	Contraception, physical sterilization of conflict-causing animals
conflict-causing species	Removal of problem animals	Translocation, relocation, placement of wild conflict-causing animals into captivity
Reducing costs of conflict	Alleviating economic costs of conflict	compensation schemes for wildlife losses, insurance cover for resources
	Economic incentives to maintain conflict-causing Species	Direct payments for conservation of conflict-Causing species
	Alternative income generation	Diversifying income sources away from pure dependence upon resource under competition
	Increasing benefits of wildlife	increasing economic benefits of wildlife, e.g., through tourism, revenue-sharing schemes or wildlife-related employment, and/or increasing lifestyle benefits, e.g., providing recreation opportunities through activities such as wildlife viewing or hunting, or provision of meat from wildlife hunting

As Anthony et al. (2010) proposed, human-wildlife conflicts can threaten human security and biodiversity conservation efforts due to ineffective and sometimes poor lethal control methods. If nothing is done to mitigate the effect, it could threaten the credibility of authorities and put lives at risk (Anthony et al. 2010). As Anthony (2021) puts it, wildlife damage, primarily caused by wildlife from protected areas, will persist if protected areas or other management institutions do not adequately address such conflicts. Despite the various strategies to reduce wildlife damage, there are still conflicts after measures have been taken to mitigate the damage. This demonstrates that going forward, success in resolving conflict will require the consideration of all-encompassing behaviors and capacities, specifically the human dimension of conflict situations (Dickman 2010).

2.1.4. Dickman's Conceptual Framework

The interaction between humans and their environment exacerbates the human-wildlife conflict, which is at increased risk due to risk factors like the cost of consequences, human response, and its effects (Dickman 2010). Dickman (2010) established a conceptual framework to organize these risk factors to better explain the complex interaction between social, cultural, and individual factors that affect animal damage recognition and people's hostility toward wildlife. Dickman (2010), therefore, categorizes risk factors into environmental and social categories. Consequences for the human-wildlife conflict at hand can be drawn from each of them, as they each have their own costs in response to a given response (Figure 1). Both factors are conditional on the specifics of the HWC context being discussed. However, having an awareness of these aspects allows for identifying factors that can define the conflict and determining the key measures that can aid in resolving the situation. Dickman (2010) provides a summary of the majority of environmental and social risk factors frequently used in HWCs. While not extensive, these considerations are an excellent place to start when choosing a particular conflict situation.

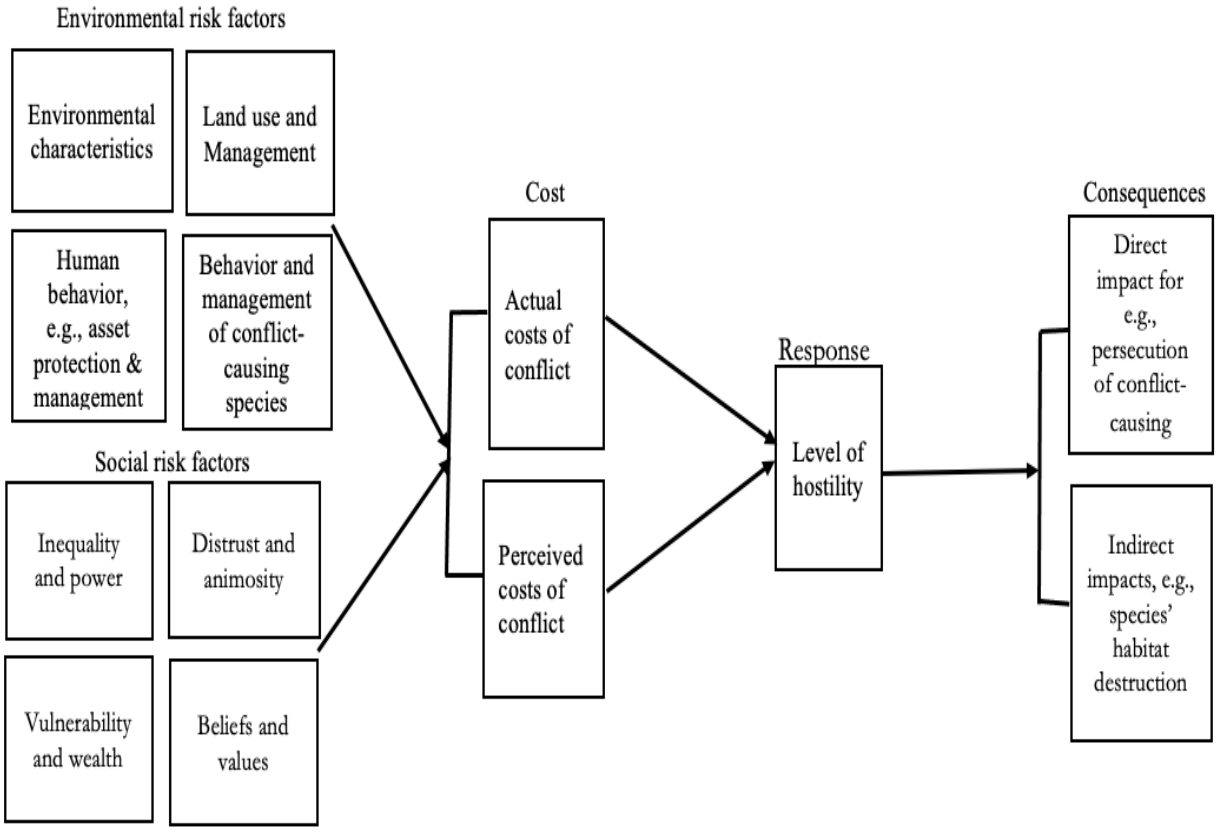


Figure 1: Conceptual Framework of some of the factors likely to affect the intensity of the human-wildlife conflict. Adapted from Dickman (2010).

2.1.4.1. Environmental Factors or drivers of HWC

Environment-specific factors can alter the severity of wildlife damage, including the characteristics of the environment in a particular location, such as the proximity of crops to the forest's edge, can intensify wildlife damage caused by wildlife (Linkie 2007). Nyhus et al. (2000) found that the primary factor for wild herbivores like elephants and buffalo was their response to seasonal changes in the ecosystem, which pushed them to venture beyond their usual range in search of dietary preferences rather than water. In contrast, other research has found that a household's proximity to a water source is a significant damage factor (Naughton-Treves 1998).

How land is used and managed can also play a crucial role in how conflict occurs. In their study, Parker and Osborn (2006) reported that switching from growing maize to farming chili, which is less attractive to crop-raiding elephants, can improve local livelihoods and reduce

HWC. Better asset management by humans using herders, enclosures, and dogs can lessen wildlife damage and shield livestock from wild animal attacks (Dickman 2010). Dickman (2010) outlined various strategies for reducing HWC, including husbandry practices such as asset production and management, and such measures considered strategies such as fencing protected areas, using physical devices on livestock, and employing specialized livestock guarding dogs or other animals to protect assets from predators. Several carnivores' behaviors, such as surplus killing, might lead to conflicts with humans, and Dickman (2010) discussed some possible solutions to this problem, such as selective culling and targeted lethal control of "problem animals." A better knowledge of species' behaviors that cause conflict and the implementation of more appropriate management measures are necessary to reduce friction (Dickman 2010).

2.1.4.2. Social Factors or drivers of HWCs

When discussing HWC, social factors, or the human dimension, are often overlooked despite their potential significance. Animals play significant roles in nearly every culture, but mythology (e.g., vampirism) can profoundly impact how people perceive certain species, such as bats, by portraying them negatively as birds of witches (Prokop, Fančovičová, and Kubiatko 2009). This perception of certain species as inherently evil or harmful (Dickman 2010) can lead to the continuation of this perception, even if wildlife damage has been completely mitigated. Prokop et al. (2009) said that education could reduce such perceptions. On the other hand, Dickman (2010) stated that it is typically challenging to get rid of such deeply ingrained beliefs. Even so, they must be considered in conflict studies.

From yet another angle, HWCs can be seen as a social conflict. Dickman (2010) claimed that social change may significantly impact people's attitudes toward species more than actual wildlife damage does. Dickman (2010) used Tanzania as an example, where there are alarming

tensions over spotted hyena predation because some believe certain ethnic groups in the region can bewitch and train the animals to kill other people's livestock. (West 2001) reported that such negative perceptions extend beyond carnivore species, including herbivores and other diverse species like elephants, chimpanzees, and wild pigs. As a result, hostility towards the species stems from more than just the damage it causes to society.

Dickman (2010) emphasized the importance that numerous social elements (such as inequality and power imbalances, mistrust and hatred between groups, vulnerability, and wealth) play in influencing or shaping people's opinions regarding wildlife damages and, in turn, influencing HWC resolutions. When wildlife causes damage, rural residents frequently blame the more powerful urban elites responsible for protecting or imposing wildlife (Dickman 2010). Vulnerability is another factor that comes into play. The lack of income increases vulnerability and, as a result, hostility toward the costs imposed by wildlife. However, how a person or group views the harm that wildlife causes may ultimately depend on their beliefs and values (Dickman 2010). According to Dickman (2010), it is vital to have a solid understanding of the intricate nature of the interaction of cultural, social, and personal elements, which, in the end, decides how expensive conflicts are regarded. A better knowledge of the conflict situation may be attained by investigating the societal causes of the conflict.

2.1.5. Socioeconomic impacts of *HWCs*

HWCs can have significant social and economic impacts on local communities through the loss of crops, animals, income due to disease control and treatment, human injuries, and inconveniences caused during the protection of crops and livestock (Kariuki 2022). HWCs also threatened food security in local communities that largely depended on subsistence crop farming and the sale of livestock (Kariuki 2022). Nationally, in a developing country, crop loss and livestock loss can have minimal impact. Still, to the affected household, it means a loss of

food supply, which can lead to more problems for local communities (Kariuki 2022). The forms and impacts of HWC vary in terms of space and time. IUCN acknowledges that human-wildlife conflicts affect crop and livestock production, revenues, and the safety of humans (IUCN-Wee 2020).

Additionally, IUCN-WCC (2020) recognizes that human-wildlife conflicts threaten food security and hinder the attainment of sustainable development goals and financial growth. There may be additional, less obvious, yet equally significant social and economic effects of HWCs. According to Kariuki (2022), because of the presence of elephants in their communities, for instance, people in Kenya were reluctant to engage in socioeconomic activities. These consequences can also be viewed negatively as direct and indirect damages. For humans, according to Messmer (2000) and Nyhus (2016), it can lead to loss of crops or livestock, property damage, and even death; for wildlife, it can lead to displacement from their habitats, reduced food sources, and even death. Nyhus (2016) also reported that conflicts between people and wildlife over crop and property damage could hurt local economies by reducing tourism or stopping farming activities. According to Thirgood et al. (2005), determining how to deal with HWCs will necessitate understanding what people value, believe, and think to help reduce their costs.

According to Barua, Bhagwat, and Jadhav (2013), the current approach to HWC scenarios frequently overlooks the health-related consequences: opportunity costs, such as time and resources spent dealing with conflict, and transaction costs, such as legal fees and compensation, all of which are hidden impacts of HWC. Mayberry, Hovorka, and Evans (2017) looked into the visible and hidden implications of HEC on the well-being of people living in subsistence-based or low-income communities close to protected areas. They found that those affected were concerned about food insecurity, other apparent consequences of elephant crop

raids, and the hidden effects of less safety and limited mobility, which threatened their livelihoods and daily lives. According to Widman, Steen, and Elofsson (2019), who estimated the productivity and labor-related costs of carnivores based on costs associated with carnivore attacks, there are additional expenses associated with sheep farming in areas with high densities of carnivore attacks.

Pooley et al. (2017) reported on the limitations of current approaches to mitigate HWC, which emphasize the visible or direct costs of negative impacts and advocate for an interdisciplinary approach to comprehending and enhancing human-wildlife relations. Drawing on diverse disciplinary perspectives, Pooley et al. (2017) asserted that the demand for rapid 'win-win' solutions conceals critical underlying drivers of conflicts and that efforts to mitigate HWC will fail if these drivers are not considered. DeMotts and Hoon (2012) examined the issues of wildlife conservation, addressing the costs and damages caused by wildlife to humans and emphasizing the establishment of wildlife damage compensation programs. However, according to DeMotts and Hoon (2012), these compensation systems have flaws such as excessive administrative expenses, corruption, inefficiency, and a failure to consider social and cultural aspects that affect diverse groups. DeMotts and Hoon (2012) argue that compensation is a reactionary solution and that prevention and mitigation techniques should be prioritized to aid primarily female-headed households and underprivileged communities in dealing with the expenses of living with wildlife. However, Widman, Steen, and Elofsson (2019) suggest that a government-financed flat-rate remuneration would result in lower transaction costs compared to the current practice.

On the other hand, Mayberry, Hovorka, and Evans (2017) noted that relations between the community and the government are strained due to conflicting priorities for conflict mitigation and communication. They suggested that community coexistence programs that provide

education through improved communication and information exchange and greater access to conflict mitigation resources can assist in addressing opportunity costs resulting from safety and mobility concerns. To apply the right approach that addresses HWC (including the cost and benefits of wildlife conservation) and to assist in informing future mitigation strategies, a thorough and systematic understanding of the social context is essential (Dickman 2010, DeMotts et al. 2012).

2.1.6. Protected areas in HWC

IUCN defines a protected area as "a clearly defined geographic region that has been recognized, dedicated, and managed through legal or other effective means to achieve the long-term conservation of nature, with associated ecosystem services and cultural values." (Dudley 2008). Six management categories—one with a sub-division—are added to the definition (see Table 2). There are over 120,000 areas that have been designated as protected, which account for approximately 13 percent of the land surface of the earth; they include both areas that are classified as belonging to one of several management categories as well as areas that are not classified, such as community conservation areas and private reserves (UNEP-WCMC 2008). The six management categories are summarized in Table (2) below.

Table 2: IUCN protected areas management categories: information source from UNEP-WCMC (2008)

Management categories	Definition
○ Category Ia: strict nature reserve or wilderness protection ○ Category Ia: wilderness area	• an area managed primarily for science or wilderness protection. They are marine or land areas with major representations of ecosystems, geological characteristics, and/or species that are largely accessible for scientific study. • PA managed mainly for wilderness protection. A vast area of unaltered or minimally altered land or sea that retains its natural characteristics.
○ Category II: National Park	• conservation area whose primary purpose is to safeguard natural systems while

	providing recreational opportunities. A marine or terrestrial protected area is one that has been set aside for the following: (a) long-term ecosystem preservation; (b) prohibition of exploitation or occupation; and (c) the promotion of scientific inquiry, academic study, religious practice
○ Category III: Natural monument:	• a protected area set aside to preserve some aspect of the natural world (typically one that is particularly rare or significant culturally)
○ Category IV: Habitat/Species Management	• protected region maintained largely for conservation through management intervention (managed purposely to ensure the maintenance of habitats to meet the requirement for specific species)
○ Category V: Protected Landscape/Seascape	• a marine or terrestrial protected area where human and natural interactions have over time produced areas of distinct characteristics like ecological and/or cultural value, aesthetic value, and high biological diversity, and which are managed primarily for landscape/seascape conservation or recreation.
○ Category VI: Managed Resource Protected Area	• protected area managed for sustainable use of natural resources (Its relatively untouched natural systems conserve biological diversity and provide a sustainable flow of natural products and services to meet community needs.)

Protected areas are important tourist attractions, watershed protection points, national identifiers, and places to conserve biological diversity (Jeffrey 1996). In the recent past, protected areas have also been tagged as “national parks” or “national nature reserves” (Jeffrey 1996) for their actual output to a country. However, over a long period of time, protected areas have become the perfect niche for conflict between humans and wildlife. Also, the underlying tension between national and international efforts to preserve biodiversity and local economic imperatives to protect people's health and standard of living is starkly on display in protected

areas (Terves 2014). New methods, often called "co-management," are used worldwide to help settle conflicts in and around protected areas (Jeffrey 1996). But protected areas have been criticized for their unexpected consequences, contributing to their undemocratic imposition of societal goals on local populations (West and Brockington 2006; Treves 2014).

2.1.7. Mitigating strategies in practice for HWCs

As the prevalence of HWCs rises, so does the importance of developing effective strategies for mitigating their effects. Expert approaches that favor either changing wildlife behavior through lethal control, relocation, fences, zoning, or offering financial incentives, such as compensation for impacts on livelihoods or payment for ecosystem service, to get people to accept wildlife have so far dominated the idea of promoting coexistence in HWCs (Treves and Karanth 2003; Dickman, Macdonald, and Macdonald 2011; Hodgson et al. 2020). Osei-Owusu (2008) reported on the success of these strategies for mitigating human-wildlife conflict in Ghana, where a program called the Human-Wildlife Conflict Mitigation Project has been implemented to reduce the conflict between humans and elephants.

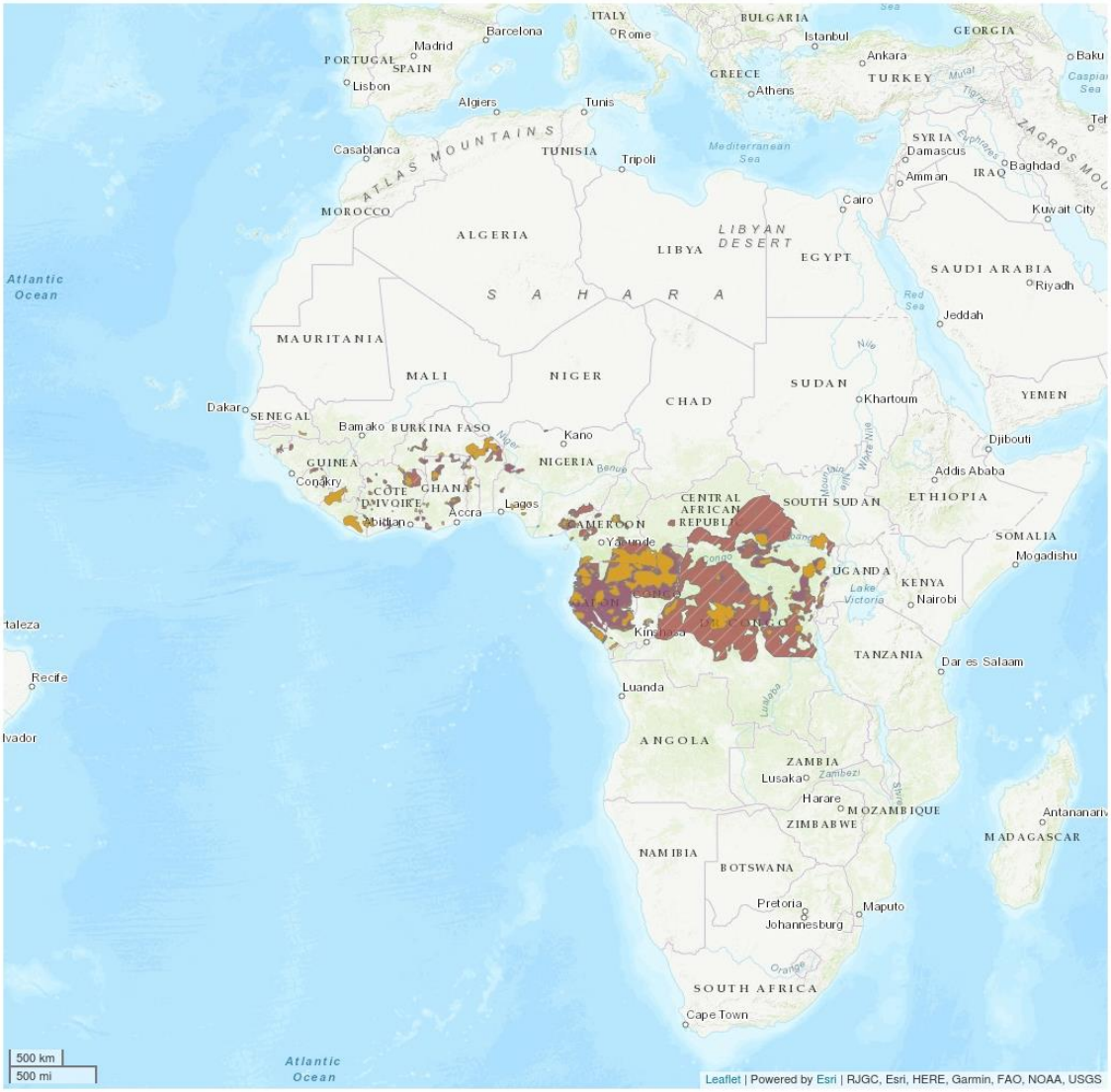
However, the criticism of these methods stresses the significance of the human elements of HWC and coexistence (Dickman et al. 2013; Pooley et al. 2017; Redpath et al. n.d.). As Anthony et al. (2010) proposed, human-wildlife conflicts can threaten human security and biodiversity conservation efforts due to ineffective and sometimes poor lethal control methods. König et al. (2020, 2021) mentioned that there are no simple techniques for resolving HWCs. Still, it requires more engagement with the human element in creating the best available methods to tackle the problems. Understanding the human dimensions and their effective measures could be a success for the area in which they are applied.

2.2. AFRICAN FOREST ELEPHANT (*Loxodonta cyclotis)*

2.2.1. Global Range Distribution

Loxodonta cyclotis, also known as the African forest elephants, are critically endangered species (IUCN 2023) with an overall decreasing population (Gobush et al. 2021) that once inhabited the whole humid forest region of western and central Africa but are now restricted to 20 countries (Fig. 2). According to Bouché et al. (2011) and Thouless et al. (2016), their range is shrinking and highly fragmented in western Africa, where seven range countries are located. Recent sightings of African forest elephants in Angola and South Sudan provide evidence of their existence, despite the absence of population census data (Gobush et al. 2021). In the Gambia, they are regarded as extinct on a national scale (Gobush et al. 2021). Six countries in central Africa are home to most of the remaining population, which now occupies an area that is thought to be 25% of their historical range (Maisels et al. 2013).

In regions inhabited by elephants, they are often considered pests or problem animals due to their ability to cause injury to humans and damage to crops (FAO 2009). In Africa, deforestation, habitat loss due to logging operations, land use systems, poaching, and the extraction of natural resources are more devastating and are the leading causes of the decline in the population of forest elephants (Ngama et al. 2016).



Legend

- EXTANT (RESIDENT)
- POSSIBLY EXTANT (RESIDENT)
- POSSIBLY EXTINCT

Compiled by:

IUCN SSC African Elephant Specialist Group 2021

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Figure 2: Range map of African forest elephants, Loxodonta cyclotis. Adapted from Gobush et al. (2021)

2.2.2. Biology

2.2.2.1. Habitat

African forests elephants occupy a broad range of habitats, notably lowland humid forests, tropical rainforests, the lower portions of the Afro-montane Forest, arid woodlands, and savanna forest mosaics (Gobush et al. 2021). They are found in a wide range of elevations, from the coastal forests along the Atlantic Coast to the Albertine Rift, roughly 2,000 meters above sea level (Gobush et al. 2021). They can travel great distances, typically in response to fruiting events and the necessity for mineral salts. The home ranges of African Forest Elephants can extend anywhere from less than 10 km2 to more than 2,000 km2, and they exhibit regular migratory patterns as well as range residence (Blake et al. 2008; Schuttler et al. 2012). As opposed to the local vegetation types, human pressure—such as highways, settlements, and villages—determines their migration patterns (Blake et al. 2008; Molina-Vacas et al. 2019).

2.2.2.2. Diet

frican forest elephants typically eat plant matter, and most of their diet comprises leafy greens, fruit, and tree bark. They get the minerals their diets lack by going to salt licks, sometimes known as mineral licks, and even by eating soil (Turkalo and Fay 2001; Turkalo et al. 2013; Cromsigt et al. 2018). They may spend 70–90% of their days foraging and consuming 100–300 kg of food each day (Owen-Smith 1989). Forest elephants might benefit from being primarily frugivorous because of their habitat in tropical rainforests.

2.2.2.3. Breeding And Reproduction

Mature sexuality in elephants typically occurs between the ages of 12 and 14, and the species has been documented living well into its seventh decade (Chusyd et al. 2021). Elephants have a longer gestation time (22 months) than any other terrestrial mammal and reach sexual maturity and bear offspring at ages similar to human beings (Wittenmyer et al. 2013).

Reproduction in forest elephants, for instance, appears to begin at a later age, around the age of 20 on average, with birth intervals ranging from 5–6 years (Turkalo et al. 2017; Chusyd et al. 2021). Although it is uncertain if the relative delay in gestational age observed in forest elephants is typical of forest elephants as a whole or unique to the community investigated (Chusyd et al. 2021), females of all three species can have offspring well into their 60s (Moss 2001; Turkalo et al. 2018; Chapman et al. 2019).

2.2.2.4. Longevity and Mortality

Aging is a dynamic process that varies significantly between species. Elephants are K-selected animals; they typically have a single progeny and mature slowly. They are the second-largest terrestrial mammal after humans (Ortega & Eggert 2004; Wittemyer et al. 2013; Turkalo et al. 2018). It is known that wild savanna and forest elephants, as well as semi-captive Asian elephants, can live well into their 70s (Chapman et al. 2019; Lee et al. 2012). Because of their extreme longevity, elephants may have developed defenses against common age-related illnesses like cancer and memory loss (Chusyd et al. 2021).

2.2.3. Impacts Associated with Elephant

Depending on the area—forest, savanna, grassland, or desert—each species of elephant (African forest elephant or African savanna elephant) provides a different range of specific ecosystem services. Still, particular local conditions and the surrounding geography are taken into account. Their ecological importance lies mainly in consuming vast quantities of plant matter (Owen-Smith 1989). African forest elephants, being highly frugivorous, play a crucial role in ensuring the health of their ecosystems by maintaining biodiversity and spreading plants throughout the world's vital carbon-sequestering tropical forests (Blake et al. 2009, Terborgh 2016). They are essential in seed dissemination for certain tree species (Blake et al. 2009; Campos Arceiz and Blake 2011; Beaune et al. 2013), particularly the carbon-rich seeds of big

trees (Stephenson et al. 2014). It has been demonstrated that the reduction of large herbivores in the Amazon affects the quantity of carbon stored there (Doughty et al. 2016), and the same may occur in Africa. The existence of a wide variety of species native to Africa's forests depends on forest elephants' ability to create and maintain clearings in mineral-rich soil, as well as their ability to spread modest micronutrients in a biased manner to places that are further away (Turkalo and Fay 2001; Turkalo et al. 2013; Cromsigt et al. 2018).

2.2.4. HWC Management at the Government's Agencies level in Liberia

There are various ministries and agencies in Liberia involved in land-use planning and land management, including the Ministry of Lands, Mines, and Energy (LME), the Ministry of Agriculture (MA), the Ministry of Internal Affairs (MIA), the Forestry Development Authority (FDA), and the Environmental Protection Agency (EPA). However, only the FDA deals directly with HWC issues, and planning by other ministries frequently may lead to an increase in conflict since it does not prioritize HWC. Consequently, the FDA is under increasing pressure to address HWC without the assistance of other ministries, whose decisions and policies may exacerbate the tensions. The FDA cannot resolve the conflict sustainably, and this situation needs to be rectified urgently. The FDA is under pressure in certain parts of the country, where residents believe they are being hit harder than others. Speaking to Front Page Africa on HWC management on Thursday, June 15, 2017, the FDA Managing Director "noted that FDA offices across Liberia had reported intensifying problems and incident reports relating to HWC, describing the elephant and primates attack as an unfortunate situation that needs attention. Measures are urgently required to mitigate the conflict and increase the benefits of living alongside wildlife" (FrontPage-FPA Africa 2017). As a result, a significant amount of pressure has been put on authorities due to the injuries to local people and the substantial damage to their crops and properties.

2.2.5. Effectiveness of the Wildlife and Protected Areas Management Act of Liberia

The National Wildlife and Protected Area Management Act (2017) aims to ensure that Liberia's rich biodiversity is protected and that forest-dependent communities can access and responsibly use wildlife resources. The Act comprises provisions that regulate PAs, wildlife conservation, wildlife usage rights, and international agreements through the functioning of the FDA under the Act and the execution of the convention, as well as violations and punitive measures. The Act also includes provisions for community-based forest management to improve community livelihoods while accomplishing conservation goals. However, the policy has focused primarily on the timber-producing value of forests without paying attention to the numerous functions of forests as habitats for species (Curry-Lindahl n.d.). The only value of wildlife resources mentioned in the Act is their potential for use in recreational activities, even though these are among Liberia's most valuable natural resources. In addition, there has not been the establishment of any wildlife refuges yet, and overexploitation and the degradation of habitats due to unsustainable land use systems have resulted in a tragic loss of forests and wildlife resources, which has mainly gone unchecked due to a lack of sufficient measures for conservation, management, and utilization (Curry-Lindahl n.d.). It is also worth mentioning that Liberia's game population is not effectively protected by the current wildlife regulations. This is because national parks are proposed but are never correctly delineated, gazetted, or patrolled, and the present legislation is not adequately enforced (Curry-Lindahl n.d.). As a result, species that are protected across Africa are theoretically protected in Liberia. This continues to exacerbate the conflict between local communities and wildlife, particularly among those living near protected areas, since most of this protected wildlife is found vandalizing crops and properties in these communities.

2.2.6. Liberia National Elephant Action Plan (NEAP)

The NEAPs are based on the African Elephant Action Plan (AEAP), established in 2010 by all African elephant range countries to protect elephants and provide benefits for those living with elephants (African Elephant Fund 2023). In 2015, Liberia became the first West African country to pledge support to safeguard elephants and develop the National Forest Elephant Action Plans of Liberia (NEAP) through the advice of her partner, Flora and Fauna International (FFI) in Liberia, to complement the broader African Elephant Action Plan through the provision of guidance for the conservation and protection of forest elephants in Liberia. Many measures were proposed under the NFEAPL, but priority was given to 15 sets of measures formulated into key action plans meant to be implemented in Liberia (Freeman 2019, FDA 2019). Working through the FDA and its partners, the Liberian government is now responsible for implementing the plan's most relevant initiatives to maintain elephant populations and sustain local economies. The action plans for each of the 15 initiatives are as follows:

1. Train Forest rangers on the use of SMART TOOL for data collection, analysis, and reporting
2. Conduct elephant status and distribution surveys and data collection.
3. Strengthen the ability to combat wildlife trafficking, including interagency, inter-sectoral, and interregional collaboration and coordination.
4. Drafting and complementing a national strategy on human-elephant conflict management and prevention
5. Identify a promote culturally appropriate best practices for elephant conservation.
6. Train communities and journalists on forest elephants' conservation and biodiversity issues
7. Develop community monitoring of elephant populations.

8. Raising awareness of the plight of forest elephants to form an essential part of conservation in Liberia.
9. Build capacity in law enforcement and better equip law enforcement officers.
10. Train customs agents, public prosecutors, and commercial staff at transportation hubs and borders to recognize products like elephant products as evidence of wildlife crimes.
11. Support situational law Enforcement to engage communities in elephants' protection and conservation.
12. Strengthen wildlife regulations and CITES enforcement.
13. Strengthen the ability and capacities of the FDA, EPA, and other relevant national government institutions and CSOs to combat wildlife trafficking and improve elephants' management.
14. Promote inclusive governance and effective institutions for elephants' conservation and natural resource management at all levels, including the continuation of ongoing activities that promote land reform, land turner and property rights for women, and natural resource governance.
15. Improve access to remote sensing data and use SMART at all protected Areas in Liberia to collect, analyze, and share data on elephant conservation; generate, analyze, and share data between relevant Liberian institutions and development partners.

2.2.7. Summary

From the literature, HWC drastically impacts biodiversity, farmers' quality of life, and their ability to make an income. The socioeconomic consequences extend to the community, as farmers are debating leaving. There must be research on the greater implications of HWC beyond the farmers to provide better mitigating strategies.

Moreover, research on HWC is needed worldwide, especially in developing nations where the problem is more severe and has a more significant impact on the livelihoods of local communities. Such a study can help identify what factors are unique to a specific region that contribute to HWC and provide information for the creation of mitigation solutions that are context-specific. Also, there is a need for more research on the social and human dimensions of HWC, including different stakeholders' beliefs, values, and attitudes. Understanding these social aspects is critical for developing effective and socially acceptable mitigation strategies.

CHAPTER THREE - METHODOLOGY

The study undertook a comprehensive assessment of the conflict between elephants and humans in and around the Proposed Wonegizi Nature Reserve in Lofa County, as well as the factors that contribute to it. Information was gathered utilizing both primary and secondary data collection methods. Most of the pertinent information that was gathered during the search for secondary data are presented in Chapter Two. The findings that were obtained from the primary data collection are discussed in Chapter Four. To identify the causes of the conflict between humans and elephants in and around the Proposed Wonegizi Nature Reserve in Lofa County, communities surrounding the PWNR were sampled. In addition, a significant number of key stakeholders involved in the conflict were chosen to participate in semi-structured interviews.

3.1. LOFA COUNTY IN LIBERIA

3.1.1. Important facts

Lofa County, the second largest county in Liberia, also known as the 'breadbasket of Liberia,' is located in the northernmost portion of Liberia (Fig. 3). The county is bordered by Bong County in the south, Gbarpolu County in the west, and Sierra Leone and Guinea in the north-western and north-eastern portions, respectively. The county covers an area of about 9,982 km^2 (Lofa County Development Agenda-LCDA 2008), with a population of approximately 382,736 (LISGIS 2022). Lofa County constitutes the first level of administrative division in Liberia, with six districts (MIA 2023).

Figure 3 Location of Lofa County (in black). Adapted from Global Forest Watch (2023).

Lofa County has a diverse geography, with plateaus and mountain ranges hidden beneath rolling hills, and the mountain ranges rise to an altitude of 600 m. The area's three most prominent mountain ranges are the Wologisie, Wutivi, and Wonegisi. The region's most enormous breadth is 130 km between the Lofa River and the St. Paul River, and it contains several hills, valleys, and waterways (LCDA 2008). The landscape is also characterized by tropical rainforest, which can be subdivided into high forest, broken forest, and low bush. "Moist Semi-Deciduous Forest" refers to the most prevalent forest in Lofa County (LCDA 2008). The county is a highly populated region, with more than 60% of the population relying on mainly subsistence agriculture as their primary source of income, with several small and medium-sized plantation activities (NICFI 2016).

3.1.2. Farming in Lofa County

Subsistence agriculture in Lofa County is mainly done through slash-and-burn or shifting cultivation (Ministry of Agriculture-MoR 2009; NICFI 2016), and forty percent of the population in Lofa County relies significantly on agricultural value chains. A pre-study report and program proposal (2016) commissioned by the Norwegian International Climate and Forest Initiative (NICFI) estimates that there are roughly 440,149 ha of cropland in Lofa County, of which only 86,217 are currently being utilized. Out of this total, smallholders are cultivating 68,789 hectares, while major plantations are cultivating 17,428 hectares. As a result, the area of Lofa County contains around 353,931 ha of farmland that might be utilized. There are approximately 31,477 farming families (households), and each owns an average of 2.19 ha of land, according to the same NICFI source's findings.

3.2. STUDY AREA

The study was conducted in and around the PWNR in Zorzor and Voijama Districts, Lofa County. The area was selected due to the complex nature of the conflict between humans and elephants as a protected species, the abundant forest resources that provide habitats for a wide variety of wildlife, and the system of agricultural practices in the region.

Based on these reasons, the research focused on the farming communities in and around the WPPA, where a semi-structured interview was conducted with farmers (Fig. 4). A total of 8 communities were selected based on the FDA's recommendation, the types of farming practices and systems of land use, and reports on the level of elephant damage in the region. The eight communities (Luyeama, Lutizu, Gblakplazu, Kortee Town, Dougomai, Johnson Town, Bulor, and Guela; Fig. name in back) selected are all located in rural settings and mainly in and around the proposed forest areas. All the communities are in forested areas with restrictions on hunting, mainly protected wildlife. Agricultural practices in the regions are

traditional subsistence farming systems in rural areas, with the majority involved with agricultural cropping (rice, cassava, eddoes, maize, pineapple, pumpkins) and cash crop production (coffee, cocoa, palm) and a minimum level of mix-cropping and agroforestry practices. The study area also consists of customary, private, and public lands. The heterogeneity of such a landscape provides a more precise picture of the complex nature of the conflict between humans and elephants in Lofa County.

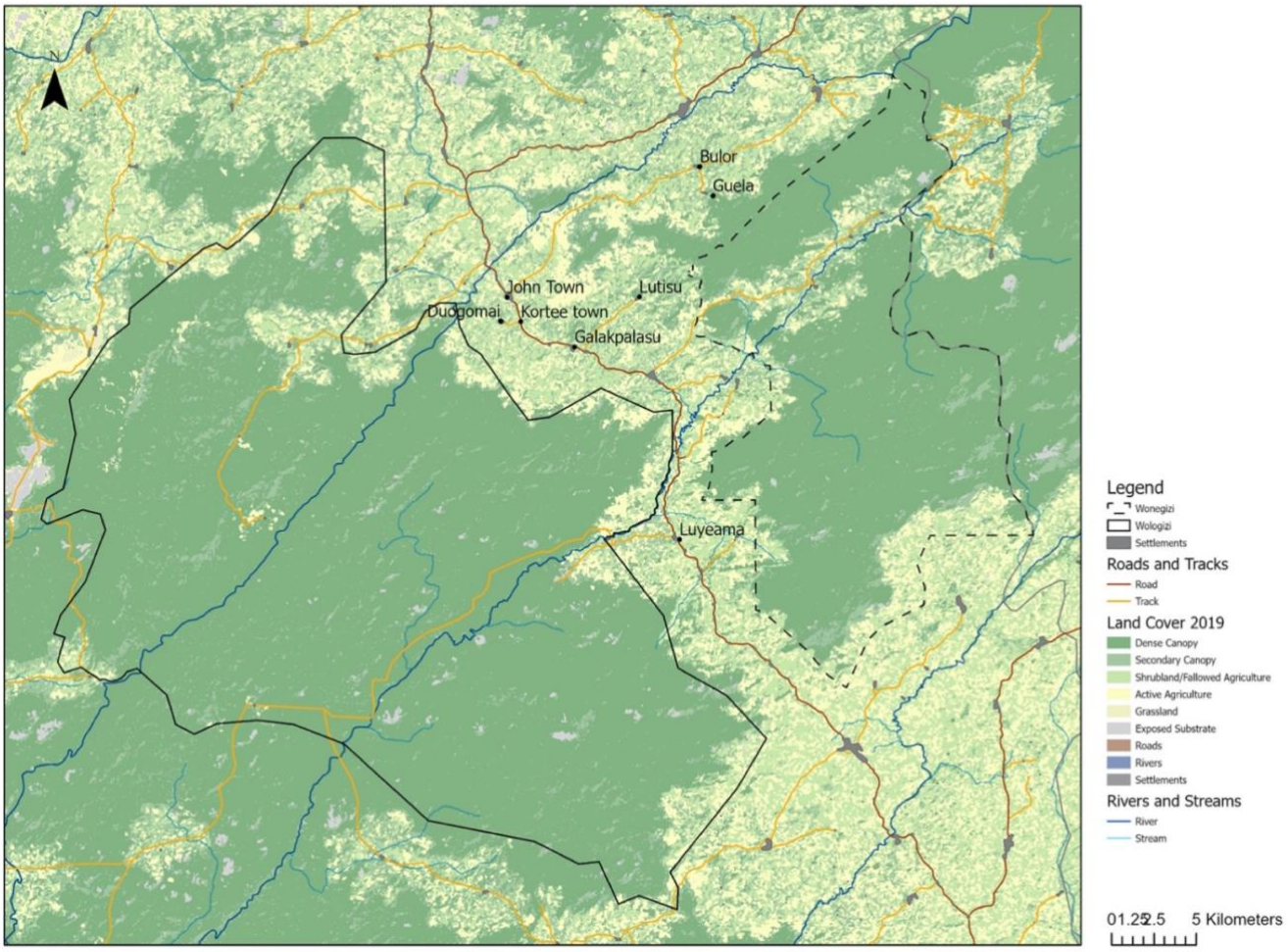


Figure 4: Map of selected communities in the study area (selected communities are named in black). Produced by Ribera (2023)

After the study communities were selected, an email was sent to the head of the FDA department in Lofa County requesting the contact information of farmers in the farming communities in and around the PWNR. A list containing the contact information of farmers and community leaders (chiefs, elders, youth leaders, and women leaders) was compiled using the information source (FDA). From this information, 28 individuals were initially identified as farmers and owners of private farmlands or community lands in and around the WPPA. Based on availability, each farmer presented on the list was interviewed. However, a few farmers were unavailable because they had moved to another region or were unavailable during the interview in their community. The participant farmers were each asked to recommend anyone who could be available and willing to provide information for the study. The contact information for the recommended individual was compiled. Farmers were found and interviewed in each of the eight selected communities.

3.3. METHODS

3.3.1. Secondary Data Collection

To assess the factors responsible for the conflict between humans and elephants in the Proposed Wonegizi Nature Reserve (PWNR) in Lofa County, a secondary data search was conducted from January to March 2023. During this process, various sources surrounding HWCs were assessed, such as local and national news articles, conservation NGOs and organization websites, documents and reports from NGOs and government agencies, existing wildlife management legislation, and policy frameworks. Other related sources that could provide relevant information to better understand the implications and impacts of human and elephant conflict were also evaluated. In addition, a review of the key actors involved was also carried out.

3.3.2. Primary Data Collection

Primary data was collected to support the secondary data and integrate the factors that various stakeholders will provide to be responsible for HWCs. In this case, the data was focused on the following:

1. Farmers in the study area
2. FDA rangers responsible for patrolling the around the Proposed Wonegizi Nature Reserve
3. President/vice president of Farmer Union Network of Lofa County (FUNLC)
4. Commissioner for the communities in the study area
5. Development superintendent for Lofa County

Notes were taken during the community engagement meeting organized by Conservation International in Gblakplazu on March 31, 2023, in which the biodiversity officer and landscape manager of FFI, the district commissioner (DC), and the Chief Park Warden (CPW) of FDA were in attendance. The engagement was geared toward the continued discussion on establishing clear boundaries for the proposed protected areas with farming communities. Community dwellers mentioned the issues of human-elephant damage. Every party gave their opinion on the matter, and all stakeholders during the meeting discussed some strategies that needed to be implemented. The engagement process was an open discussion where community dwellers, mainly farmers, were allowed to express their grievances and ask conservation NGOs and heads of government agencies questions.

3.3.3. Semi-Structured Interview with Stakeholders

Semi-structured interviews were carried out as the primary data collection method to get first-hand information from a wide range of stakeholders since they are flexible in several contexts and make interviewees feel more comfortable (Creswell and Creswell 2018). The study has a set of questions geared explicitly toward the various stakeholders, including the Farmer Union

Network of Liberia (FUNL), farmers, Forest Development Authority (FDA) rangers, and the commissioner of the local communities. There are seventeen communities in the study area; however, the research solely focuses on the eight communities most affected by the human-wildlife conflict scenario in the region. As a result, 30 participants were chosen from the eight communities to participate in a semi-structured From this sample frame or size, three farmers from each community making up the 8 HWC communities were selected, and 1 participant each from FDA-Ranger, FFI/SCNL/CI, ELRECO, SADS, and the District Commissioner and Assistant Development Superintendent that are working in the region was also selected and interviewed.

3.3.4. Coding of research participants

The various categories of participants interviewed were assigned codes, using acronyms and names such as 'community' to ensure confidentiality. The number was randomly assigned. Initially, each community was coded as Community 1, Community 2, Community 3,....., and Community 8. Based on these orders, farmers in each farming community were coded as community 1_farmer 1, 2, 3; community 2_farmer 1, 2, 3;... community 8_farmer 1, 2, 3. However, in the result presentation, the following phrases were used to refer to participant farmers: one of the farmers, two of the farmers, three or four farmers, etc.

The participants from government agencies and NGOs were coded as follows: FDA Ranger (Forestry Development Authority Ranger), SADS Focus person (Skills and Agriculture Development Services Focus person), ELRECO focus person (Elephant Research and Conservation focus person), ADS (Assistant Development superintendent), DC (District commissioner), FUNL focus person (Farmer Union Network of Liberia focus person), FFI focus person (Flora and Fauna International focus person), CPW of FDA (Chief Park Warden of Forestry Development Authority), etc.

3.3.5 Sampling technique and method of data analysis

Researchers used a purposive sampling method (Palinkas et al. 2015) to select research participants. The survey's participants were chosen based on their knowledge and experience about the subject and the insights they might bring to the research (Palinkas et al. 2015). Snowball sampling was used where possible for any interviewee that could recommend someone who could also provide meaningful information on the subject or conflict situation (Palinkas et al. 2015). The interviews were conducted in person and held in offices and at the homes and farms of the farmers. An iPhone Xs Max telephone voice memo recorder was utilized to record their responses.

The data was analyzed on a question-by-question basis using deductive coding (Skjott Linneberg and Korsgaard 2019) to search for recurring topics and trends shared by the participants and to make an effort to conclude how the data can be utilized. The method was chosen based on a pre-determined initial set of codes (Skjott Linneberg and Korsgaard 2019) derived from this study's research questions and framework. The audios were transcribed using a paid version of Cockatoo transcription software, and the coding was done using Delve qualitative coding software. A further review of the transcripts was done manually to double-check their quality and understanding before uploading them to the coding software.

3.4. SYNOPSIS OF IMPORTANT STAKEHOLDERS IMPLICATED IN THE CONFLICT SITUATION

3.4.1. Farmers

Regarding the stakeholders involved in the context of the conflict between humans and elephants, the functions that farmers play as environmental modifiers are among the most significant. The types of crops planted, as well as their timing and location, may have an impact

on elephant damage. As Parker and Osborn (2006) put it, switching from growing maize to farmichili, which isli, less attractive to crop-raiding elephants, can improve local livelihoods and reduce HWC. Dickman (2010) added that farmers should consider land use management strategies such as planting chili on farmland closer to the forest instead of maize, which elephants eat.

3.4.2. Farmer Union Network of Liberia (FUNL)

The FUNL, as a not-for-profit organization, represents farmers' interests by helping to strengthen farmers' socio-economic status, protecting farmers' rights to access resources that support their livelihoods, increasing their agriculture productivity, and supporting initiatives that reduce poverty amongst rural farmers. In addition, it acts as a lobbying group that gives farmers a platform to air their grievances. Also, FUNL and farmers' associations are expected to back up the work of the government and development partners by getting local resources, like people, to accept and use new farming technologies, making the best use of the limited resources given to help with project implementation, and making sure the projects will last.

3.4.3. Forestry Development Authority (FDA)

The Forestry Development Authority of Liberia oversees preserving the country's forests for the benefit of present and future generations through appropriate, long-term management practices. The primary responsibility is the conservation and long-term maintenance of all forests and their associated resources, based on the best available scientific information and in accordance with legislation and the country's commitments to numerous international treaties and conventions. In the context of human-wildlife conflict, the FDA is the direct representative and key policymaker for Liberia's forests and wildlife resources.

3.4.4. Rangers

Forest rangers in Liberia are responsible for patrolling and maintaining order in protected areas, monitoring wildlife, combating wildlife trafficking, engaging local people in conservation, mediating disputes by supporting communities in resolving HWC, and promoting ecotourism.

3.4.5. Elephant Research and Conservation (ELRECO)

Dr. Tina Vogt and Bernhard Forster, two ardent environmentalists, founded ELRECO, a non-governmental organization (NGO) that is devoted to protecting the environment, in Germany in 2017 (ELRECO 2021). They found one of the presumably largest surviving groups of forest elephants in Liberia, located in West Africa. ELRECO's primary efforts focus on ensuring the survival of forest elephants and the ecosystems in which they live in Liberia and nearby nations. The protection and study of forest elephants in West Africa is also a particular focus of ELRECO's attention and efforts. In the context of human-elephant conflict, ELRECO has started an engagement process with communities in Liberia about the conservation and importance of elephants and to train communities and stakeholders about some solutions to human-wildlife conflicts (Daily Observer 2023b).

3.4.6. Conservation NGOs

Non-governmental organizations (NGOs) like Fauna & Flora International, Conservation International, and the Society for the Conservation of Nature are responsible for carrying out conservation initiatives that protect and manage forests and wildlife and advance rural economic development. They work with government entities to create safeguarding initiatives for Liberia's parks and reserves. They are responsible for engaging rural communities with agriculture programs that support livelihoods and protect biodiversity. In the event of an HWC issue, they are to coordinate with the relevant government authorities to engage communities and develop more effective resolution options.

3.4.7. Assistant Superintendent for Development (ASD) in Lofa County

The ASD is responsible for all developmental activities at the county level. The ASD works with government partners in the county to implement regional and local projects that support the county and rural livelihood development. He works with the county governments in making and enforcing rules and regulations within their borders and approving annual budgets and long-term plans for county development. The office of the ASD implements the national mandate of the government by helping partners of the government enforce the protection and management of biodiversity at the county level. In the case of HWC, the ASD coordinates with the FDA in making policy and decisions on farmers' complaints.

3.4.8. District Commissioner (DC)

The district commissioner oversees and monitors all administrative matters in the district. He handles all development management matters, initiating initiatives, and cooperating with government partners within the district. In accordance with customary law, he adjudicates appeal cases and is accountable for law and order. He also has ad hoc tasks regarding the welfare of his tribe, such as initiating development projects. In the event of a human-elephant conflict, the paramount chief notifies his office, and his office meets with FDA personnel in his district to determine the most effective course of action.

3.4.9. The Skills and Agricultural Development Services (SADS)

SADS is a leading environmental organization in Liberia, implementing innovative programs to enable the economic valuation of ecosystem services. Since its founding in 2004, it has worked to promote conservation, social justice, and human rights through initiatives like public outreach and educational programs (Mulbah P. G. et al. 2016). SADS places a significant emphasis on improving the livelihood of rural populations by utilizing participatory methods to actively involve rural communities in mapping their assets and assessing their needs, with

the ultimate goal of promoting the development of sustainable communities. In the case of HEC, they receive farmers' complaints and report them to conservation NGOs and the FDA for proper redress. They are also to partner with conservation NGOs in training farmers about various agricultural practices using food crops and non-food crops.

3.4.10. Society in general

HWCs have essential repercussions for society, ranging from their effects on the economy to their implications for health and safety. Elephants threaten individuals' security, including through fear or physical attack that may lead to death or mental and psychological health issues for humans. It may also pose threats such as property damage (e.g., homes, kitchens, crops, etc.).

However, society may also feel concerned by the management actions of elephants, mainly decisions surrounding the damages caused by such a protected species. In Liberia, the issues of protecting species and land ownership or land use systems are combinations of issues concerning who owns the land and how the land should be managed to protect species. In the Wonegizi landscape, enforcing the legislation through awareness creation to protect elephants and other wildlife species is the proposed solution for managing wildlife and its impacts. The tensions between authorities and local communities on who owns lands and how species are protected, as well as the impacts of these decisions on society, must be accounted for.

3.5. Ethics protocol

The research was conducted in accordance with the Central European University Research Ethics, which prioritized the participants' welfare, privacy, consent, and anonymity. Throughout the entire study, there was no risk to any participant, and their participation was strictly professional.

Participants were formally asked to participate in the study, and participation was voluntary. It was entirely up to them whether they chose to participate, and no one was coerced into participating; there was no monetary compensation for participants.

Participants' confidentiality was protected, and all information provided during the interview was kept anonymous. All participants' responses remained confidential and were kept only by the researcher conducting the interview. The researcher further ensured the data's confidentiality by not gathering any information that could be used to identify any participant and by presenting the findings to minimize the likelihood that readers would attribute the data to any specific interviewee.

The information gathered is saved on the researcher's personal computer, smartphone, and Google Drive. A password strictly controls and safeguards access to any stored data. The data will not be shared with a third party, and the researcher will guarantee that all data-containing items, such as notebooks and printed materials, are always safeguarded.

3.5. LIMITATIONS

When social norms or illicit acts influence people's reactions — for example, "shovel, shut up, shoot"—it becomes difficult to measure such behaviors (Treves 2014). As a result, self-reported opinions and feelings—or the researcher's assumptions of them—will dominate the data (Treves 2014), with all the potential limitations that may follow.

The availability of stakeholders for the interview, mainly local farmers, was limited due to time constraints and other commitments. Not all stakeholders were interviewed since no official from the Farmer Union Network of Liberia or the Society for Conservation of Nature was found in Landscape. However, their perspectives on the issues raised by the Skills and

Agriculture Development Services (SADS) representative during the stakeholder engagement meeting held in Gblakplazu were considered.

Another limitation was the massive research gap in HWC in Liberia. Obtaining recent and extensive information on HWC in Liberia was challenging due to the lack of scientific or credible information. Most of the available information was from local news articles, which may not present the actual nature of the conflict situation.

Additionally, the FDA department lacked documentation (i.e., records or reports) on the frequency of wildlife damages and the number of complaints, necessitating the reliance on verbal information to collect data on HWC in the PWNR communities. This method may not always be accurate, as participants might overstate the information.

Subject sensitivity and the local context, such as tradition, culture, and values, may have skewed the data since a respondent might provide information based on personal values and beliefs regarding the species involved in the conflict. In order to avoid such biases, the researcher spoke with numerous shareholder groups and placed emphasis on data mentioned by more than two respondents.

Lastly, a semi-structured interview is time-consuming and may subconsciously steer interviewees toward specific replies or responses.

3.6. SUMMARY

Chapter Three of the study describes the primary and secondary data collection methods. An overview of the research and a summary of the stakeholders implicated in the conflict are also provided. The following chapter (Chapter 4) gives the study results based on the collected data. Chapter Five discusses the complicated nature of the conflict between humans and elephants in Lofa County, providing an overview of the contributing factors. The conclusions on the

conflict situation and recommendations for potential mitigating strategies that have worked in other regions will be presented in Chapter 6.

CHAPTER FOUR - RESULTS

The Fourth Chapter provides a summary of the farmers' socio-demographic and farming practices, as well as interviews with farmers and an overview of the key findings from the semi-structured interviews with diverse stakeholders (farmer, FDA Ranger, District Commissioner, Development Superintendent, Agri-organization called Skills and Agriculture Development Services (SADS focus person), Elephant Research and Conservation (ELREC focus person), and FFI Agri-specialist). The results are categorized based on the questions asked during the interview. In addition, we provide a synopsis of the main points discussed at the FFI/SADS-led stakeholder engagement meeting and an overview of an informal discussion with an FDA ranger and eco-guards.

4.1. PRESENTATION OF INTERVIEW WITH FARMERS

4.1.1. Overview of farmers' demographic and farming practices

19 of the 24 farmers surveyed were male, while 5 were female, and the average number of respondents was 44 (range: 25–69). Farmers in this study had, on average, 16 years of experience (range: 2 to 34). During the study period, actively farmed areas ranged from 3 to 202 ha, with a mean of about 35 ha. On average, farmers have suffered from elephant damage for approximately 9 years (min. =1 and max. =19). 20 of the 24 respondents are actively engaged in subsistence farming through shifting cultivation, while the remaining 4 have been cultivating permanent farmland. Among the 20 subsistence farmers, ten farmlands are located near the forest, six are in the young bush (secondary forest), and four are within the forest. The farmers cultivate food crops and non-food crops, with the majority engaging in mix-cropping. Each individual cultivated the following types of crops: rice (21), plantain (16), banana (14), maize (10), pepper (10), cassava (10), eddoes (8), beans (8), peanut (7), pumpkin (6), bitter ball

(6), palm tree (6), cocoa (5), coffee (5), okra (3), orange (3), Hevea brasiliensis (2), and pawpaw (1).

20 respondents explained that farming practices in their area are solely traditional subsistence farming through shifting cultivation, where farmers move from one location to another each year and crops are planted only during specific times of the season. They mentioned that they mainly grow their crops at the beginning of the rainy season (late April) and start harvesting at the end of the rainy season (mid-November). This may have contributed to the elephants' constant visits because of the following:

- Location of farmlands with proximity to elephant habitats
- Farm size and types of farming practices
- Distance of local forest and proposed protected area
- fixed planting season time
- distance from water source
- types of vegetation
- types of crops planted
- increased expansion of agricultural land
- forest resource utilization

These factors may attract elephants, especially when their habitats are fragmented, and they are left with limited space to compete for resources. Distance to water sources, crop types, and the location of farmlands may attract elephants to damage crops due to the availability of food close to their confined environment. Respondents explained that the increase in rural population, encroachment on elephants' habitats, and the continued practice of shifting cultivation had confined elephants to one location, making the elephants roam about in communities and on farms in search of food.

4.1.2. Level of Elephant damage

The farmers stated that elephants had always damaged all their crops. The main crops that elephants eat are rice, eddoes, plantains, bananas, palm, peanuts, cassava, maize, and pineapple. "I have famiy and I need to support them," says one respondent, whose 2 ha of plantain farm were lost to elephants. 4 farmers reported that crops such as beans, pepper, and bitterballs are less vulnerable to elephant damage. However, farmers reported that those crops (i.e., beans, bitterball, coffee, and cocoa) that elephants do not eat can still be destroyed by elephants when they eat other crops. 5 farmers reported that their properties, mainly rice kitchens, had been damaged by elephants overnight. One farmer reported that in 2019, an elephant killed a hunter protecting his crops from an elephant invasion. Fig. 5 below shows palm trees damaged by elephants on two farmer's farms.

Figure 5: Elephant damaged a palm tree on Farmer's farm in Lutizu. Photo credit: by E. BESTMAN.

None of the 24 farmers stated that the damage level had decreased; nevertheless, 15 respondents reported that it had increased annually since 2005, when they first experienced it. It was noted by 6 farmers that the damage level has remained the same each year. 3 farmers

said they could not tell if the damage level had increased or decreased, but elephants visit their farms annually. The mitigation strategies used by farmers during the time of the study are:

- Noise (shouting, knocking empty containers, knocking old zinc and cup, and blowing horns, whistles, and banging metals such as cutlass, scrap metal, pot & pot tops)
- Burning pepper bricks
- Scary man (white and red clothes statue built in the form of a human on farms)
- Fences (groundhog fence and pepper grease fence)
- Burning of elephants' dump mixed with palm kernel shell
- Megaphone
- Use a light at night
- Local Farm bell
- Put rat poison on crops
- Sleep on the farm continuously

Based on observations made on several farms, the following pictorial illustrations (Fig. 6) of methods employed by farmers to control wildlife were collected and documented.

Figure 6: Scary Man and Local Farm Bell Measures Observed on Farmers' Farms. *Photo Credit: by E. Bestman*

Respondents reported that burning pepper bricks, burning elephant droppings mixed with palm kernel shells, making noise, and continuously sleeping on farms were effective in reducing elephant damage. 5 farmers said it is the responsibility of the Forestry Development Authority (FDA) to provide and build all needed materials that can reduce elephant damage. Their rationale was that since the government mandates that the FDA safeguard elephants and other wildlife, it is a government animal. Therefore, the government should deploy personnel to implement control measures. 4 of the 6 farmers who claimed they had not used any method stated that, after a long day of farming, they are exhausted, require relaxation, and have no time to use any technique. Two farmers said the measures worked for them, while three reported that they worked intermittently. 8 farmers claimed that regular farm guarding was the only effective technique that worked exceptionally well but that it was challenging because their farms were two to three hours' walk from their villages and they lacked the resources to sleep on the farms.

It is interesting that one farmer mentioned spraying his pumpkins with rat poison, a chemical poison that locals use to get rid of rodents, to prevent elephants from completely ruining his crops. The farmer claimed that elephants are humans since they can distinguish between pumpkins with and without chemicals and consume exclusively the latter. 4 farmers asserted that the two types of fences used have not effectively reduced the damages. They said that once the pepper grease fence is used during the rainy season, the rain washes away the grease and the scent of the pepper. However, they believe it could be helpful during the dry season. The second fence, the 'groundhog fence' (mainly made for groundhogs), was considered too short, and the materials used were not strong enough to stop elephants from invading their farms. Fig. 6 shows the type of fence used on one of the farmers' farms during the farm visitation.

Figure 7: Type of fence used by farmers to reduce wildlife damage (Grand Hog Fence). Photo credit: by E. Bestman.

4.1.3. Human and Elephant coexistence

Of the 24 farmers, 13 claimed that they could not coexist with elephants, and their main reason was that (i) elephants are destructive, (ii) they cannot control them due to their size, and (iii) it is not possible and safe to live with a wild animal because it harms their children. 6 farmers said that it is possible, but (i) only if the measures are applied continuously, (ii) they are friendly animals, and (iii) they may benefit the community in the future. 2 farmers stated it is possible to coexist with wildlife like elephants because they have seen movies from other countries where elephants and people are living together. One farmer stated that it is possible because they are compelled to do so by the government and stated, "We have no power to kill or drive them away; we are forced to coexist with these large and lethal wild creatures."

4.1.5. Elephant role in the environment

When asked about the role of elephants in the environment, the respondents cited that elephants play both good and bad roles in the ecosystem. Respondents to be good or bad roles. Some good roles mentioned were: (i) it provides more carbon stocks; (ii) it helps fertilize the soil; (iii) it transports different species within the environment; (iv) it provides roads for rangers and visitors in the forest; (v) it provides food for other animals; and (vi) it is an essential species in the ecosystem. 6 respondents claimed that elephants do more harm than good because they are destructive creatures. 2 interviewees argued that the elephants' sole purpose is to benefit the government, which is why, according to them, the government protects elephants more than the suffering farmers. Five respondents claimed ignorance regarding elephants' ecological significance.

4 responders cited the elephants' valuable contributions to the community. Those contributions stated were: (i) it can be used for tourism, (ii) it can generate funding for government and local communities, and (ii) it can be used for research purposes.

4.1.6. Elephant Management

According to the opinions of 3 respondents, elephnats continue to inflict damage on farmers in the Lofa landscape because they are protected by law. Farmers said that since the government declared that wildlife be protected, they benefit nothing from preserving it. They claimed that the government should take the elephants out of their environment or fence the entire forest. 2 farmers claim that the difficulties they are fixing in the Wonegizi landscape due to elephant damage are because the law only protects the animal and not human interests.

4.1.7. National Elephant Action Plan (NEAP)

Of the 24 farmers affected by elephant damage, 6 said they had heard about the NEAP in a workshop organized by the FDA. 3 respondents said they had heard about NEAP on local radio. They all doubted NEAP's ability to lessen the severity of elephant damage. 'If the FDA cannot reduce it, then who can?' was the argument of one farmer.

4.2. SEMI-STRUCTURE INTERVIEW WITH KEY STAKEHOLDERS

As stated by the FDA ranger, the scenario of elephant damage in rural communities and farmlands is a worrying concern in the Wonegizi environment and throughout Liberia. He said that elephants consistently cause damage to farmlands and destroy farmers' crops annually and have become a significant challenge for the communities. He mentioned that the FDA has become aware of the critical nature of the problem due to the ongoing pressure they face because of complaints received from farmers. According to the FDA ranger, farmers are the primary individuals emotionally, physically, and financially affected by the damages. He noted that the communities complaining about elephant damage are not all communities in the Wonegizi landscape but, more specifically, relatively close to the proposed protected area. According to an FDA ranger, an elephant's large size, and insatiable thirst make it challenging to keep under control. He asserted that elephants require ample space because of their intelligence. The FDA ranger noted that the conflict scenario is a problem that needs to be addressed and is a concern in the landscape. He felt that understanding the importance of elephants in the environment and community was essential to damage mitigation. He also claimed that the limited number of rangers in the landscape poses a serious challenge and that the government needs to be proactive to increase the number of rangers ('like the park headquarters, if we have about 15 to 20 rangers, at least we could have more manpower for patrol," he stated).

The FDA ranger believes that the damage elephants continue to inflict on farming communities should not be overlooked. He stated that, as of now, they are not aware of the exact population of elephants in the landscape. Still, based on his observations from patrol activities, the elephant population is increasing. His opinion on the increase in the elephant population was based on observing the number of footprints in the forest. The main issues the FDA ranger stressed concerning elephants were the physical, economic, and emotional distress they are causing rural communities, especially the constant invasion of farmlands. He claimed that the movement of elephants in rural communities also poses safety concerns.

4.2.1. Factors responsible for Elephant Damages

The FDA ranger highlighted several causes that are contributing to the high level of elephant damage in the Wonegizi landscape: (i) human encroachment; (ii) elephant management; (iii) high increase in rural population; (iv) land use practices; (v) farming pressures; (vi) location of farmland and settlement; and (vi) extensive economic development initiatives. The Development Superintendent (DS) mentioned that the leading cause of the damage is the rising level of rural poverty, which requires that rural inhabitants demand more resources to survive. He felt that high rural poverty and the increased population have led to unsustainable agriculture practices that deplete the elephant habitat.

According to the DS, the fragmentation of the elephants' habitat will force them to locate food in adjacent farmland or communities, as there will be limited food in their restricted habitat.

4.2.2. Elephant Damage Level

The DS cited that elephant damage levels are increasing mainly in communities around the proposed protected areas. According to the chief elephant keeper for ELERCO, the degree of elephant damage in the region is highly alarming, and six farmers lost their rice kitchens in 2022. He stated that the level of damage has been high since 2014. The FDA ranger said that

he could not measure if the level of damage is increasing or decreasing, but complaints are always coming—"more especially when the season comes, we always receive complaints." However, he also felt that the damages were seasonal.

On the other hand, the district commissioner (DC) claimed that the damage level is the same" because, since last year, we have not experienced much damage like that." He claimed that since Flora and Fauna International (FFI) started telling communities recently to do a gazettement within the forest region, only a few people can complain that elephants visited their farms, ate their plantains, scattered all their grains, and ruined their kitchens. The farmers who don't practice "smart farming," as the DS and the FDA ranger define it, are the ones who end up in high damage zones.

4.2.3. Compensation for elephant damage

According to Lofa County's focus person for Skills and Agriculture Development Services (SADS), the issue of compensation has been one of the more significant challenges faced when it comes to addressing wildlife damages in general. He said that compensation of any kind for elephant damage is lacking in the landscape and across Liberia. He mentioned that the issue of compensation is yet to happen; however, elephants' damage to farmlands and crops is still happening, and nothing is being done to account for the losses farmers are experiencing. He noted that there is a need for compensation since it might be discouraging for farmers to farm for an entire year and then have their crops damaged or destroyed after they have worked hard to grow them. According to the district commissioner (DC), farmers who have suffered damages should receive agricultural seedings as a form of compensation.

Additionally, he suggested that farmers should be encouraged to refrain from farming in areas close to or deep into the forest. It was reported that the worst damages were done to crops that were either due to be harvested or had already been harvested, which contributed to economic

losses as well as indirect losses such as a lack of money to send children to school or pay for adequate medical treatment. The FDA ranger and the ELRECO focus person contend that crop replacement or monetary compensation for wildlife-caused crop damage do not address the root cause of human-wildlife conflict, which is habitat loss and fragmentation as a result of farming practices. He asserted that remuneration might increase the likelihood of abuse, corruption, and fraud and make farmers incapable of helping themselves in the future. This align with what Niskanen & Org (2006) mentioned that compensation programs across Africa have been ineffective and vulnerable to exploitation. In Liberia as mentioned by the FDA ranger, public corruption and politics have been the main drivers of the failure of conservation programs.

4.2.4. Farmers resentment

According to the SADS Focus person, farmer hatred stems from a sense of abandonment and frustration regarding damages, "since in many cases farmers contact us to inform us that your elephants are destroying our crops and you insist that we should not shoot them." He claimed that nothing is done to support the farmers when such incidents are reported to the FDA. According to him, the FDA-assigned personnel in the landscape always respond to farmers by stating, "We will see what we can do—your report has been sent to headquarters," or "We are still awaiting orders from our bosses." However, according to the FDA ranger, the resentment towards elephant-caused damage is sometimes exaggerated and varies from community to community. He continued by saying that farmers who have not even experienced losses in the neighborhood are the most resentful as a result of how others exaggerate the extent of elephant damage. He claimed that it had increased people's fear of damage, regardless of whether they had personally experienced it, leading to an increase in hostility toward elephant-caused damage. He narrated an instance where some members of one community called and reported that elephants had spent three days on their farms eating their crops and were afraid to go on

their various farms. According to him, four rangers were dispatched to the area, only to discover that the elephants were in neighboring communities, and the complaining community informed the rangers that they worried the elephants would soon approach their farms based on the information from the neighboring communities.

4.2.5. Agriculture in the Wonegizi Landscape

According to DC, farmers in most of the highly damaged regions have started in recent years to either be fish farmers or engage in charcoal production. He claimed that because farmers need trees from the forest to make charcoal, even those who have started producing charcoal are significantly more likely to fragment elephant habitats. The ASD added that in Liberia, it was known that elephants had turned farmers into artisanal miners. The FDA ranger noted, however, that farming in the area had historically been done chiefly for subsistence and through shifting cultivation, in which farmers moved from one location to another. According to him, such actions always put farmers in contact with wildlife, significantly affecting farmers because the wildlife is legally protected from being killed. He stated that farming practices that favor wildlife destruction have discouraged many farmers, and some are considering giving up their farming endeavors. According to the DC, an increase in elephant-caused damage has increased the number of farmers engaging in activities other than farming or growing tree crops, particularly coffee. He argued that most farmers have significant constraints since they cultivate crops that they cannot consume.

4.2.6. Elephant Management and the role of legislation

The FDA has the tools to solve the issue, says ELRECO's focus person, but they must exercise caution while dealing with farmers, unlawful hunters, and traders.

In the opinion of the ELRECO focus person, elephant management issues and wildlife management, in general, are significant. He added that the only means by which government

entities, primarily the FDA, enforce the law is by communicating and preaching the law in communities concerning wildlife management or by arresting and confiscating dry meat. He argued that once society or communities are granted stewardship, they may select which measures are appropriate.

The ELRECO Focus person felt that the Liberian government relies too heavily on NGOs and other partners to maintain biodiversity. He asserted that it is a significant issue because "what if the NGOs or partners leave?" he questioned. The case of Noku, a young elephant whose parents were slain and who was subsequently rescued, exemplifies the government's reliance on non-governmental organizations to manage wildlife, he said. According to the ELRECO focus person, Noku eats every three hours, and the total monthly cost of her food is one thousand ($1,000) United States dollars. "Thanks to ELRECO, who have been instrumental in caring for Noku since her rescue," he wishfully remarked. He claims that if it had been left to the government alone, Koku would have died long ago. In his opinion, the only time government officials from the agency visit Noku is when there is a large-scale initiative involving wildlife management in Liberia. He claims that state actors only participated in these programs for financial gain and not for the primary goal of wildlife management. These programs intended to conserve wildlife and reduce wildlife-related damages are sometimes neglected or abandoned due to unethical actors, according to the ELRECO expert. He believes key actors must modify their mindsets to assist partners in promoting and conserving biodiversity and supporting rural populations.

According to the FDA ranger, there are prohibitions on hunting or killing protected species, yet unlawful hunting still exists. He stated that it is not because the legislation is not enforced but because corruption and a lack of management actions have hindered the law's implementation and effectiveness. When individuals are caught illegally killing a protected

animal or farming in a protected zone, according to the FDA ranger, superiors from their headquarters use their authority to release the individuals. He described an instance in which multiple arrests had been made and authorities had ordered the release of the suspects and their dried meat. He also recounted a story in which two elephants were killed, and the perpetrators were apprehended and condemned to jail pending trial. Still, to their surprise, the police informed them that the perpetrators had fled overnight. The ranger felt that state officials were behind the killing of elephants for their ivory.

The FDA ranger believed that legislation exists to resolve conflict, whether it be human-wildlife conflict or illegal hunting or killing of wildlife; however, chronic corruption and what the Liberian man referred to as "he's my brother or she's my sister," allowing the perpetrators to go free, are affecting the management of elephants and other wildlife in Liberia. According to the ranger, appropriate action should be taken when these situations occur rather than waiting until all species are extinct before acting. He stated that the law must take its course regardless of whether the perpetrator is a brother or sister and that corrupt actors must recognize the significance of biodiversity conservation and change their behavior. According to the FFI's biodiversity officer, the solutions to the elephant damage in the Wonegizi Scape were varied and region-specific. However, the NEAP and the wildlife management law were highlighted as crucial to reducing the conflict.

4.2.7. Management of other protected wildlife

According to the FDA ranger, the dispute and problems around elephant damage have diverted their focus away from conflicts with other wildlife, such as hippos (*Hippotamus amphibius*), red river hogs (*Potamochoerus porcus*), chimpanzees (*Pan troglodytes*), et cetera. He explained that the legislation protects these species, but they are now being killed because authorities attention is being diverted to the devastation caused by the elephants. The FDA

ranger disclosed this information in an informal discussion after confiscating four bags of dry meat that contained all the mentioned protected wildlife. He stated that the legislation prohibits killing, shooting, hunting, trading, or keeping protected wildlife as pets. In addition, he said that most of these species are rare and require significant protection, and that the law should be implemented to ensure the survival of their populations. According to the FDA ranger, destroying wildlife (mainly endangered species) and their habitats will have devastating impacts on other organisms and society.

4.2.8. Liberia National Elephant Action Plan (NEAP)

The FDA ranger stated that the NEAP is loaded with mechanisms that can reduce wildlife damages in general; still, its implementation has been slow in Liberia since its beginnings, and it has not been adopted in the Wonegizi landscape. The ranger, however, claimed that the NEAP is the reason for the scheduled stakeholder engagement meeting on specific issues with the landscape. The NEAP, he said, is still being debated among experts and government agencies, and the public is not yet aware of its existence. He felt that politics and chronic corruption had impeded the advancement of many of these plans.

4.3. FFI-SADS COMMUNITY ENGAGEMENT MEETING

4.3.1. Factors responsible for Elephant damages

The main point taken from the community engagement meeting in Gblakplazu on March 31, 2023, was the flagging of the boundaries between communities and the proposed protected area and between communities and communities. The issue of land ownership, which in most cases creates conflict between communities, was discussed, and communities in attendance agreed to meet on a stipulated date to show their boundaries in the presence of the FDA and partners so that flagging can be done. The issues of elephant damage were also discussed, and

individuals from each community talked about using the methods (pepper bricks, burning elephant dumps, etc.) taught but mentioned that the methods were not working for them.

The FFI focus person and the Chief Park Warden (CPW) of FDA encouraged the communities to apply the methods continually and that human-wildlife conflict will always exist once human activities continue to overlap with wildlife habitats. In addition, the FDA's CPW advised the communities to be aware of the potential influence of weather changes on elephant behavior. He advised farmers to be mindful of the season when elephants cause the most crop damage to know when to grow certain crops. One method mentioned to the communities to reduce the damages was to stop farming inside or close to the protected areas. The SADS focus person told the communities to think about smart farming and that each farmer should try to maintain one farmland. One farmer asked how smart farming can be done, and the Skills and Agriculture Development Services (SADS) focus person told the farmer that as the engagement progressed, they would teach them how to farm in one area. The biodiversity officer of FFI noted that all these factors contribute to the level of elephant damage to crops, but it requires all stakeholders' involvement. The FDA CPW also reminded the farmers that although humans have no control over weather or seasonal changes, farmers should be aware of seasonal variability because of the unpredictable nature of elephant behavior.

4.4. Informal discussion with FDA ranger and Eco-guards

4.4.1. Institutional Problems affecting biodiversity and HWC management in Liberia.

According to the FDA ranger, there are limited rangers and resources to help protect wildlife. Also, in an informal discussion with four ECO-guards, they reported that they have worked for four years with a promise from the government that they would be employed, but to no avail. The four eco-guards stated that when they were farming and hunting, they could take care of their families, but since the government took them to work as eco-guards in the proposed

protected forests, they are given monthly stipends that cannot take care of their needs and families. As a result, they plan to go back to farming and hunting since the government cannot employ them.

There were also issues of incompetency, where the FDA ranger reported that most of the volunteers and a few rangers lacked knowledge of the legislation and critical biodiversity issues. The FDA ranger also asserted the unfair treatment they receive from the FDA's headquarters, especially concerning program implementation issues. The ranger claimed that they are only recognized and forced to work when a program pays ransoms to patrol for researchers or newly available NGOs that want to implement a project in the landscape. This is the exact statement of the ranger: "We who are on the frontlines should be allowed to benefit from these programs, but those who decide to do office work—once there is money in the program, they leave their office work and come here, spend one or two weeks and get paid one to two thousand dollars and go back—they use us and give us little or nothing". As a result, the ranger said they only patrol when they want, and the reason was the unfair treatment from the headquarters and the lack of material resources to be on the frontline.

There was also a lack of good record-keeping on HWC in the landscape. Within the landscape, all the FDA authorities asked could only refer me to the NGO called Elephant Research and Conservation (ELRECO). As stated by the ranger, "If you need a record or written report on HWC or HEC, I think you should ask the ELRECO people; maybe they have, but we only receive verbal complaints from farmers, and we go there to drive the elephants away or see what the elephants have done, and we call our bosses and report to them". When asked by the ELRECO focus person, he stated that he is only aware of recent research on the forest elephant population in Liberia; it was further noted by the ELRECO focus person that the result of the study is not available now and that there are no written records on HWC or HEC in his care,

and if there were one, he has no knowledge of it. As Anthony et al. (2010) mentioned, the lack of good record-keeping, the lack of reliable information on the nature of conflict, the distribution of competencies, tensions between specialists in conservation and locals, and the lack of trust in authorities can make responsible institutions struggle with conservation efforts. This can be seen in the Wonegizi landscape from the results, and Anthony et al. (2010) noted the need to establish institutions that meet the requirements for effective governance for PAs since it is a complex process that requires substantial investments of time and resources for knowledge development and stakeholder collaboration.

CHAPTER FIVE - DISCUSSION

This chapter considers the findings reported in Chapter Four and the elements discussed in Chapter Two to evaluate the environmental and social factors contributing to the elephant-human conflict in and around the Proposed Wonegizi Nature Reserve (PWNR) in Lofa County. The aim is to use Dickman's (2010) conceptual framework discussed in Section 2.3 to provide an overview of factors responsible for the conflict in question.

5.1. DICKMAN'S (2010) CONCEPTUAL FRAMEWORK

5.1.1. Environmental risk factors

The study area's diverse landscape (tropical rainforest, which can be further divided into high forest, broken forest, and low bush) as well as rural areas with customary, private, and public land ownership, where most of the population engages in traditional subsistence farming (primarily the production of crops through shifting cultivation) and a minimal amount of mix-cropping, agroforestry, and livestock raising, are all part of the environmental risk factors presented by Dickman's (2010), and they are likely to influence the conflict situation at hand. It is evident from the responses to the semi-structured interviews that individuals believe that how humans manage the landscape or their land use practices play a significant role in understanding the effects of elephant damage on people, communities, and even society.

5.1.1.1. Environmental characteristics

Timing and allocation of resources are becoming less predictable because of environmental factors like the increase in specific conditions (variation in seasonal changes or weather), and the prior experiences of the elephants (the matriarch) can no longer be relied upon. These factors may cause elephants to forage for food and water in agricultural areas or other areas occupied by cattle. These factors, which humans cannot control, can increase the constant

invasion of elephants on farmlands, especially those close to their habitat, causing crop damage. The CPD of the FDA informed farmers that because elephant behavior is unpredictable and their habitats cannot provide the necessary food, this may increase the level of elephant damage. In a similar vein, Elephants on the Move—Connecting Research (2021) discovered that many species, including elephants, celebrate the beginning of a new life at the end of the rainy season because the ecosystem is bursting with fresh, lush growth and water is abundantly accessible. Elephants can assemble in vast numbers without worrying about being outcompeted because resources are abundant. According to the same report, Elephants on the Move—Connecting Research 2021, elephants travel long distances during the dry season to find water and food, and they also employ matrilineal memory to return to their favorite feeding grounds. As a direct consequence, elephants are more inclined to look for food and water in agricultural areas or other places where cattle are kept. This is in line with what respondents said: that elephants' visits to their farms increase from October to December (the last month of the rainy season and the first month of the dry season).

5.1.1.2. Behavior and management of Elephant

It is shown from the responses of stakeholders that the management of elephants has heavily focused on law enforcement without community involvement and that the government has relied on partners to solve all biodiversity-related issues, which may have the ability to affect the resentment that farmers manifest. Additionally, the FDA ranger and the ELRECO focus person based their claims about the increase in the elephant population on their observations of elephant footprints in the forest rather than on actual scientific data. This may affect management decisions and practices, but knowing the existing population could help make decisions about their impact on society. As mentioned by the FDA ranger, issues of corruption and a lack of management actions have hindered the law's implementation and effectiveness. It may also affect farmers' resentment because programs meant to support them do not, in most

cases, reach them or impact them positively. However, the FDA ranger mentioned that the level of damage is high in areas where farmlands are close to the confined population of elephants. It was also shown from farmers' responses that the government only cares about the protection of wildlife, which may also affect the management of elephants because there is an apparent human-human conflict since one group is focused on protecting the species while the others are concerned about the damage the species is causing them.

5.1.1.2.1. Compensation Schemes

There is no compensation system for elephant damage to the landscape or throughout Liberia, as the Skills and Agricultural Development Services (SADS) focus person mentioned. This is a serious situation, mainly if the species inflicting the harm is a state wildlife; aggrieved populations frequently want financial compensation as soon as possible. However, Niskanen & Org (2006) mentioned that compensation programs across Africa have been ineffective and vulnerable to exploitation. This aligns with what the ELRECO focus person mentioned: compensation for crop damage does not solve wildlife conflict. But the SADS focus person said if the government or NGOs cannot provide compensation, they should create other programs like tourism that could generate income and employment opportunities for local communities—creating these kinds of programs that allow the local communities to make income is seen as promising in the elephant-human conflict situation. In the absence of these, the damage level is still increasing and may not reduce any time soon.

5.1.1.2.2. Humans and elephant coexistence

It was clear from the responses of individuals that they cannot coexist with elephants because elephants are destructive, and the size of the elephants means they cannot be controlled. The reality is that they have been coexisting, but it could turn into negative coexistence on the part of farmers since they feel more affected. There are damages, as the ELRECO focus person

mentioned, but appreciating the value of elephants may help to balance the need for coexistence. However, as the SADS focus person stated, the effects that farmers are experiencing could result in the manifestation of resentment toward coexisting with wildlife. Balancing the needs of people and the importance of elephants could be crucial to peaceful coexistence.

5.1.1.3. Land use planning

5.1.1.3.1. Rural expansion

As mentioned by the ASD, rural development issues had influenced the level of elephant damage. Farmers have noted that after the civil unrest, they arrived and settled on these pristine lands that belonged to their ancestors and have since developed and expanded their settlements. As mentioned by the DS, this has reduced the elephants' habitats and confined them to one place. The FDA ranger emphasized the position of settlements in wildlife corridors as a major problem because it affects wildlife movement and poses a safety risk to nearby communities. As Hariohay (2013) mentioned, many locations, especially in developing countries, have seen a loss in forest cover because of increased human settlement. As stated by the FDA ranger, people coming from exile who are not aware of wildlife corridors but want to develop faster in areas elephants have been using to move to other habitats The location of the communities between the two proposed protected areas is a huge problem for wildlife, humans, and decision-makers, as there will always be encounters between them.

According to the ELRECO focus person, the rural population is increasing, and previously uninhabited regions are becoming inhabited. This may undermine the equilibrium between humans and biodiversity and produce significant economic and social issues. As stated by the ASD, the land space is not expanding at the same rate as the population; as a result, farmlands

and rural villages are placed either within wildlife corridors or near wildlife habitats, allowing elephants to damage the available resources (crops).

5.1.1.3.2. Farming

As mentioned by the FDA ranger and the ASD, the types of agricultural practices are one main problem for the level of damage. They claim that since farmers are farming inside or close to the forest, they are encouraging damage to themselves. But farmers' crop choices and planting places are determined by their income, the price of their crops, and the soil's fertility, not by the potential severity of damage caused by elephants. Without knowledge of how to lessen damages, the types and locations of crops may affect the regions that elephants may destroy; as farmers cited, rice, eddoes, cassava, plantains, bananas, and pineapples are vulnerable to wildlife damage. As Parker and Osborn (2006) mentioned, switching from growing maize to farming chili, which is less attractive to crop-raiding elephants, can improve local livelihoods and reduce HWC. As stated by the FDA ranger, the proximity of farmlands or crops may also influence the damage level. This is in line with Eustace et al. (2022), who found that elephants destroyed significant areas of farmland close to the forest. The location of farmlands and the crop types should be considered when the need to reduce wildlife damage arrives.

According to the FDA ranger, farming practices that disrupt elephants' natural habitat, such as shifting cultivation, in which farmers move from one site to another in search of suitable soil, are a crucial factor influencing elephant behavior. The various systems of farming practices should also be considered when assessing the damage caused by elephants.

5.1.1.4. Human Behavior: Asset protection and management

5.1.1.4.1. Farmers damage mitigation strategies

Farmers have reported using various methods (noise, burning pepper bricks, scary man, fences, burning elephant dumps, local farm bell) to deter elephants from damaging their crops without

changing their farming or cropping methods. This has the unintended consequence of driving elephants into neighboring farmlands, rural areas, and forests in search of food and water. Some farmers felt it was the government's responsibility to implement these measures through the FDA, while others said that implementation was entirely up to the individual farmer. In cases where farmers cite farming near or within the proposed protected area as having the potential to affect the effectiveness of these methods, such farming may have an effect. Therefore, location factors may be necessary when employing these strategies.

5.1.2. Social risk Factors

Dickman (2010) mentioned social risk factors as having the potential to affect stakeholders' perceptions or attitudes. The degree of stakeholder trust, their opinions on the conflict, and the efficacy of various measures may all have an impact on the extent of crop damage. According to Dickman (2010), social change may have a more significant impact on people's attitudes toward species than actual wildlife damage does. The animosity towards the species is not solely based on the damage caused by wildlife but also on these social factors; people's perceptions can also be shaped by their values and beliefs.

5.1.2.1. Inequity and Power

Farmers say their communities rightfully own the forest where the elephants are found, but the government treats it as if it does not. “The government has all the powers; that is why they are taking our forest without compensation,” one farmer stated. Such a system of ownership and use of power by both local people and authorities has the potential to influence the level of damage since local communities are not shown much concern. Farmers in the study area feel powerless because they are not fully involved in key decisions and because government opinion on the matter surrounding wildlife does not favor them. According to farmers, the power to “conserve or protect wildlife” is in the hands of the government and local people, who only

follow orders. The DS noted that governments hold power over elephant management, but how that power is used depends on how governments relate to local communities.

According to the Assistant Development Superintendent (ASD), the district commissioner has the authority to organize and communicate with local communities about elephant damage and to work with FDA to find a solution to the problem; however, in most cases, the district commissioner is excluded from such discussions. Although governments have the potential to bring about change, how that authority is exercised is cause for concern.

5.1.2.2. Distrust and animosity

Many farmers in the research area displayed distrust, mainly toward the government's representatives (FDA personnel). Farmers feel that communicating with the FDA did not help reduce the damage caused by elephants, and that damage can be mitigated to some extent through conversation with supportive FDA personnel. Such perception may increase elephant damage as farmers will want to talk to people they feel are supportive or knowledgeable. The main destruction was based on farmers' concerns about who should take responsibility for the crop damage caused by state wildlife. This demonstrates that farmers require compensation because they perceive that species owners cannot control the species. This has the potential to escalate the distrust of farmers towards the FDA.

As Anthony (2021) mentioned, wildlife damage, primarily caused by wildlife from protected areas, will persist if protected areas or other management institutions do not adequately address such conflicts.

There were varying degrees of distrust among farmers and communities. It was mainly an argument about the ownership of farmlands, or a piece of land located on the community boundaries. It further increases land use competitiveness and rivalry among farmers and

community members. This implies a need for education regarding attitudes and how they might be modified regarding the right to own a farm or community land.

5.1.2.3. Vulnerability and wealth

Farmers' sense of vulnerability increased as the extent of crop damage and animal attacks increased. One farmer has claimed that an elephant murdered a hunter in 2019 as he was trying to save his crops from elephants. The extreme poverty and food insecurity that plagued the rural communities in the research area may have made them more susceptible. The prevalence of inadequate conservation programs and techniques as well as the limited availability of alternative sources of subsistence were both seen to have had an impact on this.

Concerning the issue of wealth, farmers' poor economic conditions, coupled with their lack of access to economic and material wealth, as indicated by farmers' responses and research observations, may have influenced their decisions to engage in activities like fishing, charcoal making, or illegal hunting.

Both vulnerability and wealth play a role in influencing the conflict between humans and elephants. The lack of resources to reduce the damage's extent, which made the conflict scenario worse, served as evidence of this.

5.1.2.4. Beliefs and values

According to the FDA ranger and the ASD, what needs to be changed is the farming method to a more innovative farming system that does not deplete the habits of the elephant. The practice of subsistence farming is fragmenting the habitat of wildlife and depleting the forest ecosystem. In the Wonegizi landscape, shifting cultivation has had a detrimental impact on biodiversity in the area. However, the district commissioner (DC) stated that not only farming should change, but the level of communication on how farming should be done is essential. He

claimed that changing farmers' beliefs in the method of farming will require full support for local people living in abject poverty, whose only means of sustenance is subsistence agriculture. Farming communities should be told about the effects of traditional farming practices and their future impacts on biodiversity and society. This might aid in changing the perspectives of the government and farmers, in particular.

Another issue mentioned by farmers was that the elephants are humans and that they are possessed by a particular spirit that leads them to destroy crops. One farmer reported that in 2021, an elephant possessed by an evil spirit killed a logging worker. A farmer who claimed elephants are humans gave the reason that only humans can identify which crops have poison or not, but since the elephants can differentiate the crop, he applied the chemical that elephants are humans in animal form. This demonstrated that animosity toward the species is based on both these social factors and the harm caused by wildlife. As Dickman (2010) mentioned, social change may significantly impact people's attitudes toward species more than actual wildlife damage does, and West (2001) reported that such negative perceptions extend beyond carnivore species, including herbivores and other diverse species like elephants, chimpanzees, and wild pigs. However, Prokop et al. (2009) stated that education and awareness could reduce such perceptions.

5.1.3. Cost: actual and perceive costs

Cost can be viewed as "real (actual)" or "perceived" cost. Farmers cited various costs regarding the human and elephant scenarios in the Wonegizi landscape. The actual costs recorded by farmers consisted mainly of crop losses and property damage, which incurred direct monetary costs for farmers. This may have resulted in secondary costs, such as financial losses and food security issues for farmers' families and farming communities, and contributed to the social-psychological effects of coexisting with wildlife because of panic attacks. According to what

was indicated by the FDA ranger, actual costs such as the fragmentation and deterioration of elephant habitats may have led to an increase in the level of elephant damage. Therefore, damage to the ecosystem could also affect species' survival, which costs society in replenishing the habitat or accounting for the cost of species protection or population management.

Regarding the perceived cost, farmers were impacted by their beliefs, previous experiences of crop loss, and the level of media coverage. Most of the stakeholders claimed that elephants posed a threat to their safety, property, and means of subsistence. For example, one farmer reported that a hunter died in 2019 while protecting crops from elephants, and two farmers reported that elephants damaged their property, such as their rice kitchen. On the other hand, perceptions might also play a part in developing fear, negatively influencing people's attitudes toward elephants. Consequently, some farmers may decide to eliminate elephants due to these attitudes.

Besides physical, emotional, or mental health problems due to crop or property damage experienced by farmers, no diseases transmitted by elephants were reported by any stakeholder, and it was challenging to measure psychological or physical costs. However, physical health may have been the process taken to reduce the damages, and mental health may be the psychological stress experienced by stakeholders due to their inability to manage damages.

Understanding both actual and perceived costs can aid in developing appropriate measures to tackle the underlying causes of conflict and encourage sustainable cohabitation between animals and society, mainly rural farmers.

5.1.4. Response

Responses from various stakeholder groups regarding the conflict between humans and elephants in the study area can be broken down into four categories: verbal, educational,

preventive, and legal. According to Dickman (2010), who emphasizes that responses are not always equivalent to the number of damages caused but rather depend on a wide range of environmental and social risk variables, people may overestimate the losses they suffer as a result of damage.

5.1.4.1. Verbal Responses

The form in which responses are employed in the study area, as per responses from various stakeholders interviewed, has been done verbally through formal and informal means. The formal verbal responses have been made through dialogues amongst government agencies (FDA and EPA), conservation NGOs, and local communities. This is evident from the community engagement meeting that FFI and SADS held with local residents in one of the study area's communities to discuss the human-elephant conflict and suggested protected area demarcation.

According to respondents, the informal responses have been made in the form of dialogues amongst affected farmers or community members or complaints made by one or two farmers to FDA personnel, the development superintendent, or the district commissioner. This was mentioned by the FDA ranger, ASD, and DC about receiving complaints from farmers through phone calls or when they visited some of these communities.

Media reports (FrontPageAfrica.com) have also focused on elephant damage across Liberia. It is vital to have effective verbal responses to develop trust among the stakeholders. Still, it is also essential to grasp the social and cultural context in which the conflict occurs to mitigate it effectively.

5.1.4.2. Educational Responses

Respondents highlighted that education through awareness was the primary mechanism utilized by various stakeholders to minimize the costs (both perceived and actual) experienced by those implicated. As mentioned by the FDA ranger, ELRECO focus person, and FFI biodiversity officer, they have started organizing community engagement activities to educate farmers and community dwellers about strategies to reduce elephants' damage. According to the FDA ranger, the awareness campaign, which began in late 2022, has proven effective in some communities, but the willingness of farmers to continue applying the measures was the key to the issues raised. This may be significant because when people are informed about the conflict scenario, their perception of wildlife and the damage they inflict may change.

5.1.4.3. Preventive Responses

These are activities done to prevent damage from occurring or reoccurring. Farmers reported using preventive responses (such as noise, fencing, pepper bricks, a scary man, the use of light, a local farm bell, etc.). But many of the farmers reported these as ineffective in reducing the damages. As mentioned by the FDA ranger and the ASD, the farmers are most affected because of their farming methods and the location of their farms. This was alluded to by Eustace et al. (2022), who found that elephants destroyed significant areas of farmlands close to the forest and that the location of farmlands was the main factor that influenced the level of damage. Changing land use practices was the only preventive method that has not changed based on stakeholders' responses. The location of crops may have influenced most of these preventative methods. However, as the SADS focus person suggested, changing land use practices through smart farming (farming in one area using conservation agriculture) could significantly lessen human impacts on wildlife habitats.

5.1.4.4. Legal Responses

Legal responses in the study area were mainly based on using the legislation to manage damage-causing species. As mentioned and discussed in the community engagement meeting, the participants discussed the proposed designated reserves (Wonegizi and Wologizi) to clearly define the buffer zones of these proposed protected areas from the communities, as lack of demarcation was an influencing factor in the level of elephant damage, as stated by the FFI biodiversity officer. This may have been a potential means of reducing conflict since the demarcation may stop farming activities in the elephant habitat.

The legislation may also discourage activities such as hunting protected wildlife in and outside protected areas. As alluded to by the FDA ranger, the current legislation (Wildlife Management Act 2016) forbids hunting, killing, trading, or using protected species as pets, inside or outside protected areas. He also cited that the legislation prohibits anyone in a position to purchase an enormous quantity of meat, be it from protected or non-protected animals. According to the rangers, there are fines and penalties for these acts because they are considered illegal under the law.

5.1.5. Promises

Promises in HWC are essential when fulfilled but dangerous when left unfulfilled. The FDA ranger stated, "When farmers have problems with elephant damage, we visit the area and occasionally tell them we will see what to do." This statement sounds like a promise in the ears of the affected. Many farmers alluded to this that each time they report issues of elephant damage to FDA personnel, they (farmers) are told to be patient and that the FDA personnel always say, ‘We will see what to do or the complaints have been sent to the headquarter, and they will get back to them as soon as possible.’ Farmers stated that they could wait until they forgot the past wound and started farming again. As a result, the farmers have lost confidence

and trust in the FDA and usually refer to the elephants as FDA elephants. Anthony 2021 mentioned that if protected areas or other management institutions do not adequately address such conflicts, wildlife damage, primarily caused by wildlife from protected areas, will persist.

5.1.6. Consequences: Direct and Indirect

The consequences of the situation surrounding the conflict between elephants and humans in the landscape from the responses show that it has been detrimental to ecosystems and society. The consequences are direct and indirect, and their occurrences have contributed negatively to rural communities' livelihoods and biodiversity conservation.

5.1.6.1. Economic consequences

As the DS and SADS focus person indicated, there are implications linked to the economics of farmers owing to crops and property damages. These consequences have affected the livelihood and food security of families and rural communities in the Wonegizi landscape. Consequently, many farmers felt frustrated, leading them to consider engaging in activities other than farming.

5.1.6.2. Environmental consequences

As stated by the FDA ranger and assistant superintendent for development (ASD), the traditional subsistence farming practices of moving from one location to another in search of fertile soil each year have fragmented and degraded the elephant's habitat. The destruction of ecosystems, which leads to a decline in biodiversity, has a detrimental impact on the wildlife population since it restricts their range and the availability of food and water resources. The struggle for resources might affect the survival of the elephant population.

5.1.6.3. Safety of community or society

The massive size of elephants causes farmers and community dwellers to worry that elephants will physically attack them. One farmer reported that an elephant had killed a hunter protecting

his crops from elephants. Fear, anxiety, and stress caused by such circumstances harm the mental health and well-being of impacted farmers and rural communities.

CHAPTER SIX – CONCLUSION AND RECOMMENDATIONS FOR POTENTIAL METIGATION

This chapter will present recommendations based on the findings presented in Chapter Four and the discussion in Chapter Five. The recommendation will highlight what needs to be done to reduce the conflict situation as well as a practical example that has been successful in other regions.

6.1. CONCLUSION

The findings from the study, in terms of the factors responsible for the conflict between elephants and humans in and around the Proposed Wonegizi Nature Reserve (PWNR), show that elephants are responsible for damage to crops and property and the deaths of humans. It was found that the level of elephant damage in and around the PWNR is mainly increasing in communities close to the proposed protected areas. The most affected communities are those within the corridors of the elephant. In this conflict, it is seen that the farmers are the most affected, and they are very frustrated over the level of damage and want to give up farming.

It was found that rural development through the expensing of rural settlements and the creation of new settlements, traditional subsistence farming practices (shifting cultivation), forest fragmentation, and degradation were influencing factors that caused changes in the behaviors and movements of elephants, contributing to the level of damage. Additionally, there were weather or seasonal factors (types of planting season, climate change), which humans do not have control over and which also characterized the conflict.

It was clear that the issue of rural poverty and limited access to resources influenced the farming practices of the rural communities, which led to the loss of natural habitats for elephants and, in turn, contributed to elephant damage. It is also worth mentioning that population pressure was another major factor in habitat loss as the rural population is growing and the land space

remains constant; humans and their farming activities are now occupying those areas that used to be forests.

The corruption issue was found to have affected programs and developmental activities that may have reduced the damage level. Corruption was seen to have negatively impacted rural farmers and conservation efforts.

On the part of farmers, they can influence elephant behavior due to the location and types of crops grown, the planting season, and the measures used to reduce the level of damage. Changing the farming method and land management practices can potentially lessen the damage. The willingness of stakeholders, mainly farmers, to apply techniques and change farming practices were essential factors in damage mitigation, not necessarily the dialogues that may have existed between farmers, farming communities, and other key stakeholders. Without the farmers' willingness, the resentment would continue to be expressed since farmers have felt that nothing is being done to reduce the level of damage caused by elephants.

It was also found that several methods were being introduced to farmers, but the findings show that these methods were not effective in reducing the damages. This is because of the location of farmlands inside or close to the protected areas and the types of crops grown, which favor elephants. Farming far away from forests or wildlife habitats and understanding the varieties of crops to grow or how to grow the types of crops were necessary for reducing the damages.

Also, each individual resented one another regarding land ownership, where to farm, where not to farm, and who owns the farmlands. This created serious conflict between community members and farmers. As a result, the land use management system was affected since some farmers or communities felt the land was not theirs; they used it in any way that might anger those showing ownership. Clearly, the communities showed resentment toward the government

for taking their land without benefits. This also affected the conservation of biodiversity in the region, as farmers were farming in a way that may hurt government actions.

Clearly, the legislation used in the study area and across Liberia is strictly for protecting wildlife. As a result, farmers felt the law did not support their interests or benefit them. This created problems for those implementing the law, mainly FDA personnel. Also, using political will or power as government to force rural communities to do what government cannot reduce the damage level Decentralizing management and decision-making has the potential to reduce the damages.

Preventing future political, social-cultural, and economic conflicts in Liberia and the transboundary regions (Guinea, Sierra Leone, and Ivory Coast) requires more study of the elephant population there. An up-to-date and precise population estimate of western African forest elephants is potentially crucial for the success of conservation and conflict management initiatives in the future.

It's important to emphasize that the landscape's complexity necessitates a decentralized decision-making system at several levels. This will allow local, national, and landscape stakeholders to maintain and manage conflict situations by using a collaborative landscape approach to impact mitigation activities. It is also essential to consider how the dynamic can be sustained in the face of future population growth and climatic conditions.

6.2. RECOMMENDATIONS

Every possible measure must be taken to raise community awareness, education, and assistance in corridors or hotspot communities regarding where and how to farm, which types of crops to grow, and how and where to grow them. If the government wants to use legislation to protect wildlife, it needs more qualified rangers. But with limited materials, human resources, and

incompetent and untrained rangers, the implementation of the legislation will continue to be poor. There is a need to decentralize the support system in every FDA department if they are to succeed. Those frontline rangers need more national and international training to equip them with the necessary knowledge to implement the legislation and handle critical biodiversity issues. Material resources for patrol should be provided for all rangers since the lack of resources cannot encourage rangers to go on patrol Also, there is a need to increase the number of rangers because the limited number presents a serious challenge within the landscape. This could aid in enforcing the wildlife law and minimizing illegal wildlife trading and hunting throughout Liberia.

To prevent making complainants feel neglected and powerless, the response process or feedback to concerned stakeholders must be done in a timely manner and within the shortest possible timeframe. This should be immediately followed by swift management actions to mitigate or prevent damage from occurring or recurring in order to reduce the frequency and severity of damage.

Since most farmers and members of communities feel scared, frustrated, neglected, and powerless, which in most cases leads to animosity toward elephants, with the belief that the only answer is to kill the damage-causing elephants, communities need to be fully integrated, empowered to be major decision-makers, and share ownership of the resources. This necessitates a solution, which might be the application of various conservation strategies to benefit both biodiversity and human well-being.

One alternative solution could be multiple uses of landscapes through tourism, ecotourism, photo-tourism, or wildlife watching with strict protection guided by local leadership, participation, and benefit sharing to solve the human-elephant conflicts since it can generate income and employment opportunities for local communities. This technique of combining

different conservation tools, which has the potential to minimize HWC, has proven effective in local communities and wildlife conservation (Thouless 2015). For example, it has been cited that wildlife management measures in Namibia have successfully ensured vital local leadership, participation, and benefit sharing through the integration of sustainable usage, strictly protected areas, and photo-tourism (Thouless 2015; Naidoo et al. 2011). This has been demonstrated to reduce conflict between humans and wildlife as well as between humans, helping to enhance local livelihoods and contributing to conservation efforts in the region. To promote conservation efforts and reduce the impact of HEC in the complex Wonegizi landscape, a combination of some of these techniques could be a useful example to adopt as a paradigm for future action.

Another real alternative solution in the context of the complex Wonegizi landscape would be community-based natural resource management (CBNRM), which is one solution for HWC that could be suitable in the development context. For example, the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) in Zimbabwe, which has been cited as a successful application of CBNRM in Africa (Gandiwa et al. 2013; Frost and Bond 2008; Taylor 2009; Muchapondwa, Carlsson, and Köhlin 2008), could be suitable in the context of Liberia.

The primary target of the CAMPFIRE program is undeveloped rural areas needing long-term development management and sustainable usage of natural resources like forests and grasslands, water, and wildlife on community lands. Taylor (2009) says that the main idea of the program is that communities can choose whether or not to take part, but they are given custody of and responsibility for managing natural resources if they do. Therefore, Taylor (2009) asserts that the management and exploitation of resources will be accomplished through collective ownership, with explicit rights to use and benefit from natural resources and formal

institutions for doing so. Rather than focusing solely on conservation, shifting the focus to economics and land usage may open significant new avenues for supplementing conventional and subsistence agriculture methods in remote indigenous communities with complex land ownership systems.

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Appendices

Appendix 1. Images of Elephants damages to property during farm visit

Fig. A. Damages caused by Elephants on roads (Farms Road)

Fig. B. Image of kitchen damaged by elephant on farmer's farm (happened in 2022 November)

Fig. C. Elephants Footprints on a newly burned farm (Farm adjacent to forest)

Fig. D. Damages caused by Elephant to crops (Plantain and Banana)

Appendix 2. Images of farms Location

Fig. D. Image of Farming inside forest

Fig. E. Image of farming closed to forest.

Fig. F. Image of farming outside the forest (permanent farmland with mix cropping system)

Appendix 3. The story of Noku (an orphan elephant) and its relevant to the conflict situation

According to the ELRECO focus person, the FDA confiscated Noku, an orphaned elephant calf, in a remote village in the Northwest landscape of Liberia in 2022. He claimed that the calf's mother might have been poached, and the young calf, about 5-6 months, was left to survive on her own. At that age, according to him, Noku required human care, which was and remains a considerable challenge. The first challenge he stated was the lack of an elephant orphanage or zoo in Liberia to address the situation. Another challenge he noted was that Noku could not chew solid food, so she needed milk to survive. In the event of finding a solution to Noku's situation, says ELRECO focus person, FDA called the Elephant Research and Conservation in Liberia (ELRECO) in February 2022 and explained Noku's condition. He claimed that the government was not able to safe Noku since the country lacks an elephant orphanage or zoo. As a result, says the ELRECO focus person, ELRECO stepped in to take help Noku. He claimed that ELRECO had collaborated closely with the FDA to give Noku care and future options since then. As he sees it, the plan is for Noku to eventually be rehabilitated so as to live freely in a nearby protected area with other wild elephants. Fig. 8 shows Noku happily welcoming the researcher into her home. This reveals the long-term impacts of the HEC conflict situation because Noku's parents were killed due to continuing complaints from farmers, as reported by the FDA ranger and the ELRECO focus person. As a result, it has burdened society, government, and NGOs with caring for the young elephant that could have been breastfed in the forest by her mother. It shows that recognizing the importance of biodiversity conservation and rural sustainability through community-based natural resource management (CBNRM), which brings together all actors to share the benefits of resources and make equal decisions regarding their use, could help reduce this societal burden and could have positive impacts on rural livelihood and biodiversity conservation efforts in an underdeveloped country like Liberia.

Fig. g: Picture of Noku welcoming the researcher. Photo Credit. J. W. Kesselly