THE ERA OF ELEPHANTS: RURAL CHANGE AND VULNERABILITY IN THE OKAVANGO DELTA, BOTSWANA

A Dissertation

by

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ABSTRACT

Negative interactions between humans and elephants are a concern in places where they cohabitate. Elephants threaten the lives and livelihoods of individual people, and people are an existential threat to the survival of elephants. In the Eastern Panhandle of the Okavango Delta, Botswana, the population of elephants has doubled in the past ten years and 16,000 people share space and resources with 18,000 elephants. I ask how are individuals, households, and communities vulnerable and how do they adapt to life with elephants? Through a year of mixed method ethnographic research in Mokgacha Village, I 1) explore how people harvest firewood, 2) investigate how people make resettlement decisions, and 3) document the relationship between resettlement decisions, firewood harvest, and vulnerability to elephants. Gender, age, and ethnicity influence livelihoods and mediate how people are vulnerable to elephants. People adapt by harvesting firewood in groups, changing the time of day they harvest, collecting elephant-felled firewood, and sharing firewood across households. Men are more vulnerable to elephants due to cattle-based livelihoods that put them at risk to unwanted interactions with elephants. Historically, resettlement was driven by access to resources, cooperation with others, and exposure to disease. Today, people resettle in part due to elephants, but also due to changing livelihood opportunities and infrastructural development. People resettle around family in part because family networks facilitate informal resource-sharing strategies that buffer vulnerability of elders and foster community resilience. National villagization policies centralize residential plot

allocation decisions and threaten to spatially separate households, with impacts on informal resource-sharing strategies and resident vulnerability to elephants.

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When I first chose to do my research on the village of Mokgacha in July 2016, I drove from the Ecoexist research camp by Xachirachira *moraka* to Mokgacha for only a few days, spending several hours each time in the village. I conducted a series of interviews with several residents based a certain criteria, generally around questions of how people and elephants use natural resources and space. Back then, as a helicopter researcher who came in and out for a few hours at a time, it seemed all so clear. Elephants, I quickly found each time I asked residents about elephants, were the sun. I never imagined what a complex solar system I would find the following year when I embarked on what has amounted to my first ethnographic study, only parts of which I manage to share in this dissertation.

This research would never have been possible were it not for the willingness of the people of Mokgacha village and associated settlements—Danga, Tinxo, Chinatown, Mawana, Nxiniha, and Kavumo—to allow me to share in the mundane, the joy, and the sorrow of life. I am forever changed by their generosity, their pushback against my assumptions of how to live, and their challenge to make my research meaningful to them. I hope I was able to share with them half as much as they shared with me, and I am grateful for the friends I made. Most importantly, I would like to thank my wonderful assistant, Ipolokeng Katholo, without whom my time in Mokgacha would have been both colorless, humorless, and most challenging. Her mastery of language, culture, and

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Contributors

This work was supervised by a dissertation committee consisting of Dr. Stronza and Dr. Shaffer of the Recreation, Parks, and Tourism Sciences Department, Dr. Songhurst and Dr. McCulloch of the Ecoexist Project and adjunct faculty in the Wildlife and Fisheries Department, Dr. Werner of the Anthropology Department, and Dr. Rodriguez of the Agricultural Communication, Education, and Leadership Department at the Ohio State University. This work was permitted by the Government of Botswana Ministry of Environment, Wildlife, and Tourism (permit # EWT 8/36/4 XXXVII (15)).

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NOMENCLATURE

Key Setswana terms

Borotho- bread

Ipelegeng- a government public works program whereby village residents are selected for work in the village and paid a small monthly sum

Kgosi- a village headman (plural: *Dikgosi*)

Kgotla- public meeting, referring to a designated location in the village

Mafisa- a traditional system of cattle lending

Mokoro- a dugout canoe (plural: *Mekoro*)

Moraka- a cattlepost (plural: *Meraka*)

Other key terms and abbreviations

ECO- Ecoexist Community Officer

Delta- the Okavango Delta, Botswana

DWNP- Department of Wildlife and National Parks

HEC- Human-elephant conflict

HEI- Human-elephant interactions

Kraal- a cattle or sheep enclosure

Panhandle- referring to the Eastern Panhandle of the Okavango Delta

NSP- National Settlement Plan

VDC- Village Development Committee

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1. INTRODUCTION

> …we were in a district frequented by elephants, for wherever we looked, trees were broken down, large branches snapped off, and bark and leaves strewn about in all directions, whilst the impress of their huge feet was to be seen in every piece of sandy ground.
>
> - Excerpt from A Hunter's Wanderings in Africa (Selous, 1881)

1.1. Defining the "era of elephants" in the Okavango Delta

The 20 kilometer drive from Seronga Village, the administrative capital of the Eastern Panhandle of the Okavango Delta, to Mokgacha, a small village of around 500 people where I spent nine months conducting ethnographic research, takes anywhere from 30 minutes to an hour, depending on the state of the sandy road. Mud or reed huts with thatch roofs scatter the landscape, and while most of these rural *meraka* show signs of life—clothes drying on reed fences, buckets sitting on the sand, fresh footprints indicating where the resident has gone—a few groupings of a handful of homes have been left to the forces of nature (Figure 1). Thatch roofs are left to cave in. Walls have all disappeared, leaving behind only the wood pole skeleton. These are the abandoned *meraka* of the Delta.

Figure 1. An abandoned *moraka* (background) on the drive from Seronga to Mokgacha. The dead tree bent over in the foreground indicates the influence of elephants on the landscape, even close to human settlements.

Not unlike Selous' 1881 account of traveling in search of large "tuskers," elephants worth hunting for their extraordinary tusks, elephants have also made their mark on this landscape. Several timeworn pathways meander across the road, the deep sand of the Kalahari Desert packed down and the bushes worn thin from frequent brushing against thick elephant skin. In more heavily wooded areas, larger trees are pushed over at their base or trunks are broken off a few feet off the ground (Figure 2), left to sprout new leaves and branches or die, facilitating the transition between woodland and grassland (Caughley, 1976). The impact of elephants on trees is a sign of the strength of elephants, reminding rural community members who still rely on the power of fire to fell big trees that this is a shared landscape.

Figure 2. Example of elephant-caused damage to trees.

Along the drive, a strategically placed elephant skull, bleached white from the sun, marks the turn-off for a *moraka* (Figure 3). To an outsider like myself when I first arrived in 2016, and maybe even a passing elephant, the massive bleached skull might signal something more menacing than a driveway marker. In a *moraka* further along, a group of women sit outside their homes, turning baobab bark, stripped from the trees by elephants, into rope by rubbing the bark's fibers between the palms of their hands and their thighs.

Figure 3. A bleached elephant skull marks the turnoff to a *moraka.*

I define human-elephant interactions (HEI) as any direct or indirect encounter between people and elephants. While scholars have explored many of the negative interactions between people and elephants, often called human-elephant conflict (HEC), very little research has explored the complexity of dimensions of HEI for people who live with elephants, including those that may be positive, neutral, and complex. For instance, a 73-year-old man carpenter from Danga *meraka*, a settlement of four households just beyond Mokgacha on the drive from Seronga, explained that, "The elephants are doing a good job on the wood. [But] they bring sorrow and sadness to our fields where they destroy everything." By this, the carpenter meant that the impact of elephants on trees is helpful to his livelihood since he benefits from easily available wood. Yet, this relationship is complex because he, like other rural residents, live a subsistence lifestyle, relying on a suite of livelihoods, including farming on which elephants are having a detrimental impact. By favoring one aspect of interaction over another, often times with a focus on agricultural competition, scholars and practitioners limit how they understand and engage with HEI.

Regardless, negative interactions between humans and elephants are a concern in all places where humans and elephants cohabitate (Sukumar, 2003). These interactions threaten the lives and livelihoods of people and are an existential threat to the survival of elephants (Woodroffe, Thirgood, & Rabinowitz, 2005). The chances for and outcomes of negative HEI are increasingly problematic as humans move into and transform previously inaccessible places and as elephants under threat in countries known for illegal ivory trade take refuge in more protectionist-oriented countries (O'Connell-Rodwell et al., 2000; Leggett, 2006; Pozo et al., 2017).

Botswana is a diamond in the rough for elephants. In Botswana, the elephant population has tripled in the past twenty years, likely largely due to immigration from neighboring countries rather than through natural population growth (Songhurst, McCulloch, & Coulson, 2016). Scholars hypothesize that Botswana is attracting immigrant elephants due to a combination of factors, including low population density (Selier et al., 2016), resource availability (Roskaft et al., 2014), and protectionist policies (Vandewalle & Alexander, 2014). Today, Botswana is estimated to be home to between 130,000 and 142,000 elephants, approximately 37% of Africa's savanna elephant population (Chase et al., 2016). Nowhere have increases in elephant populations been more dramatic than in northern Botswana and the Eastern Panhandle of the Okavango Delta, specifically, where elephants currently outnumber the human population, a change that has taken place only in the past few years (Pozo et al., 2017; Songhurst, 2012). Life in this era of elephants is shaped by the ever-present possibility of encounters between humans and elephants.

My first season of fieldwork in Botswana in 2016 opened my eyes to the complexity of HEI around movement and natural resource use. Two fatal interactions in particular intimately shaped the focus of my research. First, one cold winter night, a young man in his early 30s shot a lone bull elephant that had twice crossed his residential fence to pick fruits from a tree growing over his thatch roof hut. His wife and young child huddled inside while he stood vigil for hours until the elephant finally breathed its last breath in the dark hours of the morning. The next day, under supervision from local Department of Wildlife and National Parks (DWNP) representatives who stood watch over the tusks of ivory, men from the village hacked at the elephant's thick skin with axes to get at the meat, while women and children stood around holding empty containers, waiting for their share. In this part of Botswana, meat of any kind is a luxury since people otherwise subsist largely on sour milk and maize meal.

A few weeks later in a neighboring village, a lone elephant trampled a man to death as the man ventured into the woodlands to harvest firewood for his family. His daughter found his body the next day and as the village began to mourn, the DWNP's Problem Animal Control Unit was called in to cull the suspected elephant. While people tend to think of the village as a place for people and the woodlands as a place for elephants, the life histories, cultures, and resource needs of both species bring us to interact across the landscape in meaningful ways that can result in the loss of life or the recognition of life in the other.

In this chapter, I argue that HEC as a lens is insufficient to understand HEI. HEC scholarship relies on a natural hazards paradigm that assumes the need for technological

or material intervention to reduce encounters (Dickman, 2010). HEI, on the other hand, elaborates a historical and cultural perspective that allows for perceived risk and vulnerability of rural residents, shaped by livelihoods, identities, norms and customs and institutions (Parker & Tapsell, 2009), to influence the diversity of human responses to elephants. Similarly to the ways that a landscape is rich for livelihood activities because of the very factors that make the landscape risky, for example farming on volcanic soil by a volcano or near to perennial water sources prone to flooding (Cannon et al., 2014), elephants, too, both enrich the shared landscape and make it risky for people, in particular for people who are vulnerable to the impacts of negative HEI. Where people and elephants share resources, risk perception, vulnerability and the ways that people adapt to life with elephants is integral to understand HEI.

I first situate the era of elephants in Northern Botswana before I explore how humans and elephants have together shaped the historical and current social-ecological context. I then delve into the natural hazards literature, and make a case for exploring HEI through the lens of risk perception, social vulnerability and adaptation. Finally, I conclude by drawing connections across the era of elephants, HEI, and risk perception, vulnerability, and adaptation in order to suggest a new way to think about HEI as produced through cultural and social change.

1.2. Situating the era of elephants

In places where humans and elephants live together, scientists recognize that it is impossible to understand the movement and resource use of one species without

understanding the movement and resource use of the other. In northern Botswana, the human response to elephants is shaped by life in what I have come to refer to as the "era of elephants," a period of time for people living in what other scholars refer to as "an elephant landscape" (Salerno et al., 2018) because of the dominant role of elephants as ecosystem engineers. I, too, elicit ideas of an elephant landscape due to the many ways that elephants influence the vegetation and movement of animals and people; however, I emphasize the importance of time as a critical factor because, for people living here today, elephants were not always so physically omnipresent.

People, especially of the Bayeyi and BaHambukushu tribes of Northern Botswana, have retained cultural concepts of inheritable family totems that include elephants, among others. Specifically, elders from all tribes recalled various notions of totems, mainly related to different wildlife species that are inherited through family lineage. They noted various taboos associated with their totems, most frequently around types of forbidden meat, however when inquiring about whether or not totems are still important today, one elder Bayeyi woman told me, "Totems are important to help researchers." This sentiment widely reflects a loss in the cultural value of totems, including those around elephants, and may be emblematic of broader socio-cultural changes happening across the landscape.

In addition to the changes that have led to an apparent loss of the value of totems, changes in elephant populations influence how people perceive the ways that they can live. With few exceptions, older residents only first saw elephants when they were already grown adults and can fully recount their first elephant sighting. Young people

today have all grown up knowing that elephants are everywhere and frequently see live elephants while traveling in a car along the road, traveling by foot to collect natural resources, or even from the comfort of their homes when elephants approach the village.

In contrast, several older residents recalled only ever having seen elephant footprints in the sand for most of their lives until recently. They remembered how, as children, they confused elephant footprints for the print left by a mortar in the sand, and asked their parents why someone would carry a mortar through the woodlands. Mortars are thigh-high hollowed-out logs used with a large wooden pestle for pounding large quantities of maize, sorghum, and millet from seed into grain. Mortar bottoms have a circular shape that, to an unaware eye, leaves a pattern resembling the distinct pattern of an elephant foot when lifted from the sand.

Changes in the elephant population have fundamentally reshaped how people live. As Mpho, an elder from Kavumo *moraka* described what life was like in the past, "There were no elephants. We were farming at our fields and by this time [in the early evening], we'd knock off and walk home without any problems." Now, not only has general freedom of mobility been limited by growing elephant populations, other aspects of life and livelihoods have similarly been fundamentally reshaped. For example, as Mpho's quote illustrates, residents who wish to harvest food from their fields must spend several months during the growing and harvest season living at their fields in watch huts to try to protect their crops from elephants. To give more perspective, following extensive fieldwork spanning almost 50 years from 1950 through 1994, Larson (2001) noted that residents of the Okavango Delta experienced crop raiding by hippopotami yet

made no reference to crop consumption by elephants. In contrast, while harvesting firewood in the savanna with my neighbors, residents of Mokgacha during the early winter in June 2018 in the early afternoon, they rushed me to hurry up with collecting data because they feared crossing paths with the elephants we heard rumbling in the distance.

The era of elephants extends beyond sheer numbers. Older residents claim that elephant behavior, too, is different from in the past. Now, they say, elephants are aggressive and not afraid of people. As one Mokgacha elder explained, "In the past, we weren't hearing about elephants killing people. Today there are so many. When I was young, I never heard of an elephant killing someone. Only if you were hunting them, that's when an elephant could kill you." As Mpho from Kavumo further explained, "Elephants these days are more aggressive. If they see someone they just want to fight. If you go back to Mokgacha at this time [in the early evening] you'll see. Elephants in the past, if they saw a person, they'd just run."

Both of these perceived changes in overall population and behavior of elephants are influenced by comparative changes in HEI within a human lifetime. In order to understand HEI, it is critical to incorporate human perceptions of change (Dickman, 2010), and the era of elephants is my attempt to make the way that people perceive change in HEI implicit to this dissertation. Indeed, elephants are a central concern for people living in the Okavango Delta. Elephants were responsible for the deaths of 36 people in Botswana in 2018 alone (Chaukura et al., 2020). As explained in a letter written by community leaders from across Southern Africa in response to an article

published in *Science* on trophy hunting bans, "Every death is a tragedy, and often involves family breadwinners" (Chaukura et al., 2020), meaning that the impact of elephant-related deaths impacts not only individuals, but households and communities, reverberating across social scales.

The era of elephants is integrally linked to the connected nature of and tension between development and conservation. In Mokgacha, 20 purposively selected village leaders free listed 49 different problems in total for the major concerns for a person living in Mokgacha. Responses fell into one of seven different categories, including those related to development and infrastructure, social life, environment, health, and wildlife [Appendix A]. Using a Smith's salience analysis (Quinlan, 2005), the top three most salient concerns were unemployment (.467), elephants (.424), and lack of a health clinic in the village (.412).

High rates of self-described unemployment linger around 26% of the adult population (n=64 out of 246), and men and women rely on farming in addition to a diverse suite of subsistence-based livelihoods, including fishing and reed harvest. Resource harvest brings people into the savanna woodlands and Delta, and in this way, unemployment mutually shapes people's interactions with elephants, as did the lack of health clinic for the fact that people would often make the long walk to Seronga and chance unwanted HEI along the way. This was explained by a the Senior Wildlife Warden, responsible for community support and outreach for the DWNP, who explained that,

> Development may reduce the risk to elephants, and although education is low, education here in the area and the finding of jobs in the area will help to reduce

> the pressure on women, specifically. When people aren't as dependent on natural resources, they will be at less risk than they are now.

For one 39-year-old church leader who did not include elephants on his free list of problems for someone in Mokgacha, he explained that he simply forgot to include them on the list because "elephants are everywhere." In this way, people perceive elephants both as a significant and persistent risk to their lives and livelihoods, as well as one that is almost forgettable because it has become a part of the everyday landscape.

The era of elephants, therefore, refers to a specific time and place and is meant to evoke tension between development and conservation, modernity and times past. It is situated in comparison to the past, because history is critical to explaining HEI today (Fernando et al., 2005). It is built into a context of diverse cultures and livelihoods, because elephants have long featured as central to the life ways of people from the area and the stories people tell about their origin (Larson, 1975). It is rooted in formal and informal governing institutions because of the role of land and resource access in guiding where people can settle and carry out livelihoods, thereby influencing where and how people interact with elephants as they move across the landscape (Gupta, 2013). The era of elephants is this dissertation's punctuation because even when I do not explicitly reference it, it lingers carefully within and following each statement.

1.2.1. Human-elephant interactions in the era of elephants

In human-elephant shared social-ecological systems across Africa, elephants respond to human resource use, movement and settlement in complex ways. Elephants are impacted by land fragmentation (Leggett, Fennessy, & Schneider, 2003; Wittemyer

& Getz, 2007), and they have been shown to prefer certain paths of movement in order to avoid higher population densities of people (Songhurst et al., 2016). Elephants alter their speed of movement across human-dominated landscapes, likely in order to avoid risk, and will modify the time of day they visit certain areas in order to visit small landholders at night and larger ranches during the day (Graham et al., 2010).

Elephants are more likely to approach human settlements at night when people are already inside their homes (Buchholtz et al., 2019). A recent study found that individual elephants make different land and resource use decisions around human activity, indicating that individual elephant preference drives resource selection with potential consequences to HEI (Bastille-Rousseau & Wittemyer, 2019). Elephants are most deeply impacted by HEI when they are killed, either in retaliation to specific encounters, or through state-sanctioned culling directed at individuals or entire herds when a country has decided that there are too many elephants in a given location (Nelson et al., 2003).

People, on the other hand, have been shown to experience both visible and invisible burdens from living with elephants. Visible burdens include quantifiable damage to livelihoods, in particular through crop-raiding (Jackson et al., 2008), destruction of property, such as buildings (Barua et al., 2013), significant influence on woodlands (Buchholtz et al., 2019) and other natural resources and entire ecosystems (Skarpe et al., 2004), and even the trampling and killing of people (Tchamba, 1996). Much of the scholarship on visible burdens implicitly uses a natural hazards lens (Naughton, Rose & Treves, 1999; Naughton-Treves & Treves, 2005) but largely focuses

on the material conflict between humans and elephants through crop consumption by elephants and the subsequent food insecurity of farming households (Hoare, 1999; Hoare & Toit, 1999; Dublin & Hoare, 2004; Sitati & Walpole, 2006; Fairet, 2012; Shaffer et al., 2019).

Other scholars uncover "invisible" uncompensated, delayed, emotional, psychological, or social costs of the impact of human-elephant interactions on people and rural communities (Ogra, 2008; DeMotts & Hoon, 2012; Jadhav & Barua, 2012; Mayberry et al., 2017). Invisible burdens tend to be overlooked in conservation and development policy and practice, though they carry significant costs such as emotional trauma from unwanted interactions with elephants or reduction of personal security or freedom of movement (Barua et al., 2013). These restrictions have dramatic ramifications for the people who live with elephants, including impacts on their mental well-being, and ability to carry out livelihood activities such as farming and harvesting natural resources (Mayberry et al., 2017; Jadhav & Barua, 2012; Ogra, 2008).

Studies of HEI tend to focus on the impact of one species on the other and are often framed as HEC, a body of literature that until recently has been synonymous with the agricultural costs for people who live with elephants. Countless studies have focused on technological solutions to spatially separate elephants and people through pest management-type approaches, such as through the use of movement corridors and agricultural crop protection (e.g., Hedges & Gunaryadi, 2010; Jackson et al., 2008; Pinter-Wollman, 2012; Sitati & Walpole, 2006). In her seminal work, Dickman (2010) argues that scholarship built on assumptions that antagonistic interactions between

humans and wildlife can be resolved through the use of mitigation strategies lacks integration of the critical concepts of risk, cultural conceptions and attitudes, and social conflict driven by social change or loss of voice. In other words, HEI is, at its heart, a social problem requiring socially integrated solutions.

Externally-driven solutions are purported to reduce the costs and increase tolerance for people who live with elephants, but may instead exacerbate the problem because researchers tend to approach the problem with the aim of delivering conservation benefits rather than culturally-relevant reconciliation (Redpath et al., 2015). In fact, locally relevant solutions may be long lasting. Because people who live with wild animals are exposed to the "vicious cycle of marginalization associated with small and frequent hazards" (Gaillard et al., 2019, p. 55-56), they are likely to learn from their exposure and adapt techniques that can be beneficial to themselves and their community and may facilitate the survival of elephants.

In more recent years, scholars have proposed incorporating an integrated land-sharing approach to reconcile the issues at the heart of human-wildlife conflict, rather than relying on a conventional land-sparing approach commonly used to designate human-versus-wildlife spaces (Crespin & Simonetti, 2019). Similarly, a recent study found that scholars disproportionately focus on the negative interactions between people and wildlife, which can bias conservation planning by failing to consider diverse types of human-wildlife interactions (Bhatia et al., 2019). This may not only overlook neutral or positive types of interactions, but may impact the ability for people to develop local adaptations that can reduce the intensity or impact of unwanted interactions.

People who share space with elephants are often rural residents who are highly dependent on natural resources beyond farmland; their livelihoods and culture are intricately connected to their environment. For rural, resource-dependent people who are faced with any significant environmental change, including a rapid increase in elephant populations as documented in the Okavango Delta, those who are able to recognize and adapt to the change are thought to be less vulnerable to the impacts of that change (Maru et al., 2014; Miller et al., 2010; Smit & Wandel, 2006). Perceived risk, vulnerability, and by consequence, adaptation, therefore may have consequences for HEI and their outcomes.

1.3. Human expansion by way of elephants

Elephants and people have long lived side-by-side. Some scholars argue that it is no mistake that pre-human ancestors and elephant species from the family *Elephantidae*, which includes mammoths and elephants, share documented range. Historically, there were many different genera and species within the order of Proboscidea, spanning Africa, Eurasia, and North America (Haynes, 1993). The availability of elephants as a food source was likely critical to the evolution of *Homo sapiens* (Ben-Dor et al., 2011; Yravedra et al., 2010). Pre-human ancestors were known to have more success when they hunted in groups, and elephant meat was shared within the group, furthering the evolution of human cooperative behavior (Agam & Barkai, 2018; Ben-Dor et al., 2011; Sukumar, 2003).

Similarly, elephant species have evolved over time, going extinct in part from being overhunted by groups of early humans (Brook & Barnosky, 2012; Corlett, 2013; Surovell et al., 2005). Today there are only three living species of elephants left on the planet. Two of them are in Africa, specifically the forest elephant (*Loxodonta cyclotis*) and the savannah elephant (*Loxodonta africana*), and one is found in Asia (*Elephas maximus*). Arguably at the expense of elephant species, some scholars claim that people are people because, not in spite, of elephants (Locke, 2013; Lorimer, 2010).

In central Southern Africa, the earliest known settlement is Tsodilo Hills, which was occupied from 100,000 years ago by nomadic hunter-gatherer or pastoralist tribes, especially //ani Khwe (Tlou & Campbell, 1984; Wilmsen, 2014). They remained nomadic for thousands of years, which gave them the advantage of being able to seek out or avoid seasonally available resources and wildlife (Turner, 1987). Although there is little evidence, hunter-gatherers undoubtedly relied on elephants for meat, hide, ivory and bone, likely selectively taking out weak or sick individuals from groups of elephants (Sukumar, 2003). In southern Africa from about 1000 AD, other societies began interacting with the nomadic tribes, trading goods originating from Indonesia and India, such as chickens and glass beads, for locally available goods, especially ivory (Denbow, 2011).

Before the introduction of guns, people used traditional methods to hunt elephants, using sneak-attacks and axes to cut at the Achilles tendon, or by waiting for them in trees and stabbing them with heavy spears made for that purpose (Selous, 1881). In those days, hunting was a slow process that took several days in order to harvest a

single elephant (ibid). Although elephants and ivory were long traded around the African continent and with Europe (Håkansson, 2004), reports show that people, likely the Tawana, traded ivory dating back to the mid-1660s with the Dutch East India Company (A. Campbell, 1990). As demand for ivory increased in tandem with the European colonization of Africa, hunters developed new hunting methods, such as pit traps, fire, and barbed spikes in holes that would pin the elephant in place (ibid). The demand for elephant products decimated populations of elephants along the coast, and hunters expanded into the central part of the continent to Botswana (Vandewalle & Alexander, 2014).

The Bayeyi people from the Barotse Empire (now the Zambezi region of Namibia, northern Botswana, Zambia, Angola, and Zimbabwe) are thought to have first settled the Okavango Delta and Ngamiland in the mid-1700s (Tlou, 1972). British Major A. St. H. Gibbons, who travelled across Africa from 1858-1916, kept a diary of his travels and briefly mentions how a group of BaHambukushu hunters, led by their rainmaking chief, followed a group of elephants and stumbled upon the Okavango (Gibbons, 1904). Larson (1970) elaborates on this story, detailing how a hunt for elephants by a group of BaHambukushu hunters led to the settlement by the BaHambukushu in the Okavango Delta: In the mid-1700s, the powerful Hambukushu Rainmaker, Chief Mashambo of the Barotse Empire, grew angry at the Lozi people, a unified group of diverse tribes of the Barotse Empire, who refused to pay him tribute for an abundance of rain the previous year. He decided to teach them a lesson by refusing to make rain that year. His own people, the BaHambukushu, suffered greatly and had to

forage to survive. One day, a hunter reported to the Chief that he had sighted elephants to the west of their kingdom. The Chief and his hunters went out in search of elephants, and after growing weary from a failed hunt, they stumbled upon the rich Okavango Delta. “Though they never did catch the elephants, it was these animals who led them to the new land. In gratitude the Chief adopted the elephant as one of their tribal totems” (Larson, 1972, p. 114).

Tlou (1972) credits the expansion of the Barotse empire as causing increasing tensions over the Bayeyi and BaHambukushu, resulting in small secessions of waves of migration of the Bayeyi and BaHambukushu people from the Zambezi region to the Okavango Delta region, which once connected through a vast floodplain from Lake Ngami through the Chobe region. Throughout the course of history of peoples in southern Africa, different tribes of people inhabiting the area around the Okavango Delta used available resources in culturally specific ways (Table 1) (Surovell & Waguespack, 2008; Tlou, 1972). While scholars generally think of the ethnicity of inhabitants as influencing specific livelihood strategies, people from different tribes likely interacted and shared knowledge with each other, leading to technological changes and improved resource exploitation over time (Tlou, 1972).

Prior to formal colonization in 1885, people inhabited the Delta, either living on their own or in groups based around cooperation, including marriage, and social tension between families and groups (Schapera, 1970a). Each tribe had its own headman, who managed the area, allocating land, governing resources, giving seeds, and resolving conflict (Hoon, 2004; Schapera, 1970b). Natural resources were central to all aspects of

life, as people extracted almost all of their living and livelihood from them, including the homes they built, the wild food they harvested, the water they drank, and the land they farmed (Schapera, 1970a).

Table 1. Key tribes inhabiting the study site and Okavango Delta region, including estimated occupancy date and historical livelihoods (adapted from Tlou, 1972).

Tribe name	Place of origin	Inhabiting Okavango region since	Historical primary livelihood strategies
//ani Khwe (baNoka)	Northern Okavango Delta	Autochthonous	Fishing, gathering, and "vegeculture"*
Boga Khwe (BaSarwa)	Zambezi sandbelt region	Autochthonous	Hunting and gathering
BaHambukushu	Katima Molilo, Namibia	Before 1800	Dryland farming, fishing, and gathering
Bayeyi (Yei)	DiYei, Zambia	Before 1750	Fishing, floodplain farming, and gathering
BaTawana	Southern Botswana	1800	Cattle keeping, dryland farming

*"Vegeculture" refers to the removal of competitive plants from areas where wild desirable plants are harvested (Tlou, 1972, p. 153).

However people did not settle in a single location since environmental factors mediated suitability of residence in and around the Okavango Delta. These factors included rainfall and the availability of water, natural boom and bust cycles of tsetse fly and other livestock diseases like rinderpest and hoof and mouth (Junker et al., 2008; Tlou, 1972), as well as changes in wildlife populations that influenced hunting and gathering strategies of people (Skarpe & Ringrose, 2014).

A. Campbell (1990) deduced that around the early 1800s before mass ivory exploitation began, elephants likely numbered somewhere between 200,000 and 400,000

in Botswana, mostly in the north of the country. Driven by colonial demand for ivory, hunters greatly reduced elephant populations from southern Botswana and left most of the population significantly reduced in the north of the country (Junker et al., 2008), leading to near extirpation of the species from the area (Skarpe & Ringrose, 2014).

By 1830 the British colonial powers put in place the first of many southern African hunting bans on elephants in the Eastern Cape of South Africa because only two small herds were left (Meredith, 2001). White ivory hunters and their families moved north in southern Africa, entering unexplored veld in the Botswana region and further east in what is now Zimbabwe (ibid). At first, explorers found a place teeming with elephants. In 1848, Scottish explorer David Livingstone, accompanied by English explorer William Cotton Oswell, reached near Lake Ngami at the drainage of the Okavango River. Oswell described how,

> I came, as I got clear of the bush, upon at least four hundred elephants standing drowsily in the shade of the detached clumps of mimosa trees. Such a sight I had never seen before, and never saw again. As far as the eye could reach, in a fairly open country, there was nothing but elephants (Oswell, 1894, p. 129)

When Livingstone returned to the same spot three years later, he noted that more than 900 elephants had been killed and he worried what the increasing trade of ivory in exchange for more efficient firearms might mean for the safety of the colonists (Livingstone, 1852). Though *dikgosi* in the area objected to hunting by outsiders, European hunters killed elephants in large numbers for their ivory (A. Campbell, 1990), and by the end of 19th century, elephant herds were greatly reduced to a few thousand individuals, which led to significant changes to the woodland ecosystem (Vandewalle & Alexander, 2014).

By the 1870s, missionaries had settled the area and diamond-mining operations in South Africa provided wage jobs for men from the region and facilitated their movement across the broader Southern Africa region (Schapera, 1970b). In 1885, under threat from encroachment by the Boers in South Africa, Scottish missionary John Mackenzie campaigned for the British Crown to protect the region, which came to be called Bechuanaland Protectorate. Originally excluded from the Protectorate, the Ngamiland region, where this research is based, became a part of the Protectorate in 1890 (Schapera, 1970b). Although people living around the Delta came from multiple different tribes, early scholars generally regarded people as governed by one of eight ruling groups that came to power through colonialism (Schapera, 1970b; Wilmsen, 1989). In Ngamiland, this meant that the BaTawana people were granted de jure powers, though they were slow to settle throughout the Okavango Region (Tlou, 1972).

Until independence in 1966, the British ruled Bechuanaland from afar, investing minimally into the development of the then-colony (Schapera, 1970b). British Administrators imposed a series of changes, including depriving local chiefs of power in 1891, establishing an annual hut tax payable by all male household heads in 1899, designating tribal reserves in 1899, establishing local British officials who could govern the region more closely, and, starting in 1905, allowing European farmers to settle areas outside of the tribal reserves (Schapera, 1970b). These changes in governance systems had lasting effects, rooting themselves into the government structures of the newly independent state of Botswana. Most notably, while local headmen had previously governed land informally, the British enacted the development of arguably the most

powerful of structures—the Land Boards. The twelve Land Boards currently administer publicly available land, providing leases for residential, arable, and other land use types on behalf of the central government. Today they still bear the names of the ruling tribes from each region, including the Tawana Land Board of the Ngamiland region, named for the Tawana tribe, where the Okavango Delta is located.

Serious ecological changes were simultaneously underway during the 20th century. With the introduction of increasingly efficient firearms and the outbreak of rinderpest that decimated cattle populations, acacia, mopane, and riverine woodlands, and other soft-barked trees were released from browsing pressure and could regenerate (Skarpe et al., 2004). By the late 1940s a tsetse fly invasion further reduced cattle populations. The reduction of cattle is credited with allowing a subsequent growth of elephant populations (Junker et al., 2008), which is thought to have, in turn, increased pressure on the woodlands as elephants browsed, uprooted, and knocked over trees (Skarpe et al., 2004).

Tsetse fly not only impacted cattle, but forced many people to relocate from within the Delta to unaffected areas. Entire communities that had been settled in the Delta moved many kilometers to villages on the Western Panhandle, walking across the dry floodplains and using *mekoro* to cross water. Many of those households relocated several more times, eventually settling back in the Eastern Panhandle where they found good grazing areas with access to resources and away from dangerous wildlife and disease. These households form two groups of resettled peoples that are central to this dissertation, with the large majority of Bayeyi and BaHamukushu families having left

Sedjwara, a series of Delta islands where people raised cattle, farmed, and harvested wild foods, around the mid or late 1940s. By contrast, Sedjwara today is a wildlife tourist destination in a Wildlife Management Area, visited exclusively by wealthy foreigners on safari. Today, no sign remains of the people who lived, gave birth, and died there. Even the old baobab tree used as a marker for all the neighboring settlements and referred to by one former resident, an elder in his 80s who now lives in Mokgacha and agreed to take me to his childhood home, was gone when we visited in 2017. It had recycled back to the earth, much like the bodies of the ancestors of still-living former Sedjwara residents and their former huts that once scattered the landscape.

In summary, throughout early human history, people depended on meat from elephants and other mammoths, learning to hunt cooperatively and developing culture. At the onset of early globalization, Africans entered the global market trade by exchanging ivory for chickens and other products from Asia. Ivory eventually became a major currency during the colonial era and led to the colonization of the interior of southern Africa. During the hardest drought years in the mid-1700s, a herd of elephants showed a group of BaHambukushu the way to the Okavango, leading to their settlement in the area and ultimately influencing livelihoods, such as rain-fed agriculture, and culture, including taboos and totems that intimately shaped historical and current HEI.

Today the landscape is, as in the past, socially, politically, and ecologically produced, though many questions remain about the nature of HEI. Like other social-ecological systems, rural residents navigate space in ways that are mediated by resource needs and socio-cultural relations, as well as by policies and practice of the post-colonial

government of Botswana that mediate conservation policy and planning as well as land use and where people can settle. Because elephants, too, are important forces that shape how rural residents perceive their vulnerability to elephants as they navigate space and resources, it is critical to develop an understanding of perceived risk, vulnerability, and adaptation in the era of elephants. Using the conceptual model below (Figure 4) as my guiding framework, I argue that HEI can only be understood when top-down forces, like state policy, as well as bottom-up forces, like natural resource use, are taken into account within the broader socio-economic, cultural and historical context. HEI occur both directly and indirectly, with interactions mediated from the top-down by the state and the bottom-up through natural resources and subsistence-based livelihoods. Individuals are influenced by their household, family and neighbors, as well as the broader community. Perceived risk, vulnerability, and adaptation influence how people act in response to HEI across social scales, in turn changing the system.

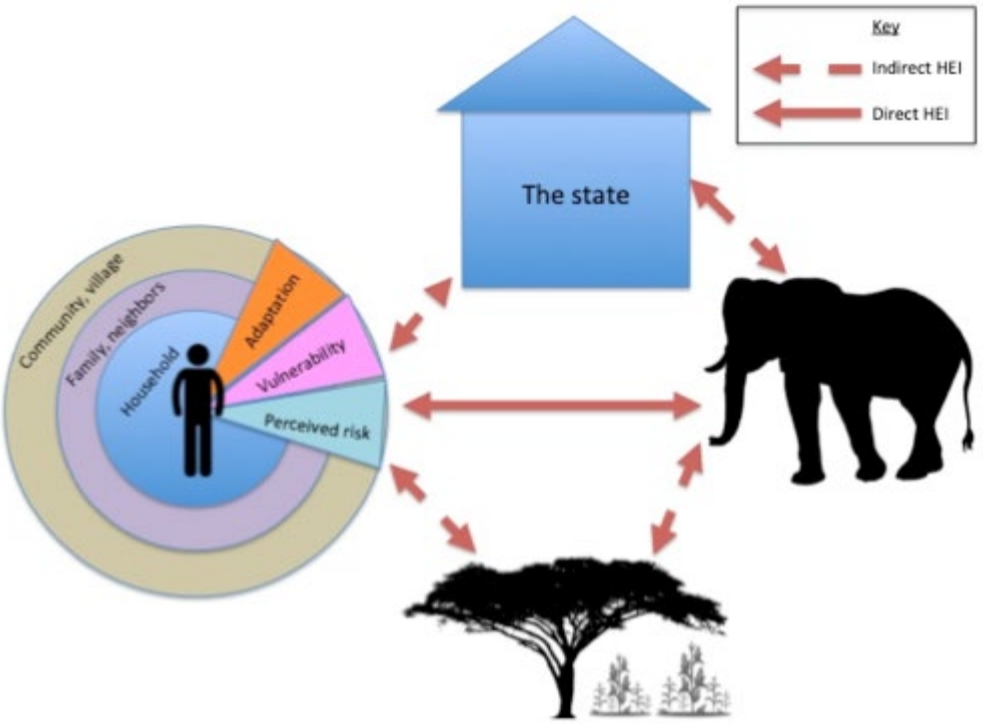

Figure 4. Guiding conceptual model for this research.

1.4. HEI through a perceived risk, vulnerability and adaptation lens

For millennia, people have inhabited landscapes that are simultaneously rich for livelihood activities despite the inherent risks associated with the vary factors that make those landscapes rich (Cannon et al., 2014). For example, people have long inhabited islands with rich volcanic soil due to still-active volcanoes. Others have settled places with abundant freshwater resources that allow for diverse livelihood options but also attract malaria-infected mosquitoes. Cannon (1994) very wisely pointed out that "hazards are natural, but that in general disasters are not" (p. 13). By this, he meant that social systems mediate both the distribution of productive resources and exposure to risks. Hazards become disasters when they impact vulnerable people.

Despite the role of political and economic forces in creating and mitigating vulnerability (Cannon, 1994), people can adapt to solve the problems associated with their environment (Lewontin, 1978). In some cases, people have physically adapted to the risk, including through technological advancement, while socio-cultural adaptations have also helped people reduce their risks, for example warning tales that keep people away from mosquito-infested waters when people are more likely to be infected with malaria (Brown, 1981). Oliver-Smith (1996) highlighted the role of traditional environmental adaptation, often facilitated by cultural norms, as important sources for vulnerability mitigation. Heyd and Brooks (2009) argue that culture must be considered as integral to environment in order to better understand adaptations or maladaptations, and this perspective can further an understanding of HEI in the era of elephants.

Disaster and development are intricately connected (Faas & Barrios, 2015), and since the 1960s researchers have brought focus to the study of humans in the environment with the development of the field of natural hazards research. Seminal work by Burton and Kates (1964) brought to light how people are never far from nature, even when they live in a built environment. They argue that in extracting value from the natural environment, people come into contact with environmental variation. Natural hazards are, therefore, "those elements in the physical environment, harmful to man and caused by forces extraneous to him" (Burton & Kates, 1964, p. 413). They argue that few hazards are preventable, though the degree that they harm people depend on the actions that people and institutions are willing to take to reduce the harm.

Starting from the 1990s, research on natural hazards began to shift away from technologically-oriented solutions towards a more human-oriented understanding of "social," extending beyond individuals' demographic characteristics and into their social and environmental relationships (Cutter, 1996). The impact the event will have on individuals, households, and communities, what scholars call 'vulnerability,' became a key component of that research, encapsulating both what is external to the person, called "risk", and what is internal to the person, being their ability to cope with potential losses and adapt to reduce those potential losses (Cannon, 1994; Chambers, 1989). Since vulnerability, perceived risk, and adaptation are central components of HEI, they require greater theoretical exploration.

1.4.1. Perceived risk, vulnerability and adaptation

Perceived risk has recently emerged as a critical factor influencing human-wildlife interactions for several major reasons. Environmental and social conditions are constantly in flux, due, in part, to the ways in which people perceive their risk differently and adopt different risk-mitigating techniques (Slovic, 2000). People may have a wide array of perceived risks that vary greatly based on socio-economic differences, while actual risks structure social-environmental interactions across a landscape, creating barriers or opportunities for people (Muller-Mahn, 2012). Perceived risks do not always accurately reflect actual risks, though perceived risks matter a great deal since social beings uniquely have the capacity to perceive and respond to risk in ways that can change both their environment and society (Slovic, 2000).

The acceptability of risk to people and society is influenced by whether risk is involuntary or voluntary (Starr, 1969). This may help to explain why people's perceived risk of living with wildlife is often greater than the actual damage they inflict on or threat they pose to people or property (Naughton-Treves and Treves, 2005). Risk is not exclusively perceived through an individual's personal values system (Starr, 1969), but can be shaped by social networks, in particular where people share space with wildlife (Wojcik, 2011).

Influencing and being influenced by perceived risk is vulnerability. Vulnerability differs across individuals, households, communities, and societies (Cannon, 1994). Vulnerability is defined in many different ways, and can focus on aspects that are physical, economic, organizational, institutional, and cultural, among others (Parker & Tapsell, 2009). Cannon (2008) presents a model for how vulnerability is comprised of five key elements. Key among them are: i) livelihoods which impact ii) well-being and iii) self-protection. Governance (v) determines investment into iv) social protections afforded to those who need assistance as well as the allocation of resources, ultimately shaping livelihoods. Livelihoods are the most important component of vulnerability because they can help prevent disasters (ibid). People who lack means for livelihoods depend heavily on social protections in order to achieve an adequate level of self-protection against the hazard (ibid).

Increasingly, scholars look to social vulnerability to understand outcomes for people who face natural hazards. Social vulnerability includes livelihood, social identities, norms and customs, and institutions, both formal and informal (Parker &

Tapsell, 2009). Social vulnerability is considered as a moving target because people may move into and out of vulnerable conditions irrespective of any disaster event, and due to the impacts of natural hazards that may make some people even more vulnerable in what scholars refer to as a downward spiral (Sultana, 2010; Few, 2003). This is the reasoning for Wisner and colleagues (2004) to refer to vulnerable situations rather than vulnerable groups. Social vulnerability is influenced by factors such as resource access, information access, power, social capital and social networks, ableness and mobility, beliefs and customs, and changes in the population (Cutter, 2001; Cutter et al., 2003; Tapsell et al., 2010).

Socio-economic variables are important components of social vulnerability because of the nature of social systems and inequity. Race and ethnicity influence vulnerability of communities to disasters because of the nature of disaster communication, housing and building practices, among other factors (Fothergill et al., 1999). Poverty makes people more vulnerable to the impact of hazards, and because women are disproportionately poor they tend to be impacted the most (Morrow & Enarson, 1996). In addition, women tend to lack mobility and strong extra-familial social networks which compounds their vulnerability when they also care for the young or sick (Fothergill, 1996). In the United States, gender and race play a role in how people perceive both their risks to hazards and what they deem as acceptable hazard risks, with white men tolerating highest risk levels potentially due to historical and continuing societal power imbalance (Flynn et al., 1994). Less explored are the difficult to quantify aspects of identity, for example the influences of broader historical and cultural aspects

on modern aspects of social vulnerability. History shapes how people interact with the environment and each other (Bankoff, 2003), while kinship networks are important because of the role of reciprocity in reducing pre- and post-disaster impacts (Drabek & Boggs, 1968; Morrow, 1999).

Increasingly, because it is not enough to simply point out how people are vulnerable, scholars of natural hazards look to understand how people are able to withstand disaster. Seminal work by Blaikie, Cannon, Davis, and Wisner (2005) explicitly connected risk to vulnerability and capacity to cope with the hazard. The ways that people cope with hazards are influenced by social trust and people are vulnerable to hazards when there is a progressive build up of root causes of disaster, dynamic social-ecological pressures, and unsafe conditions that may result in disaster (Blaikie et al., 2005). Both short-term coping and long-term adaptation are important to consider due to the fact that people are able to move in and out of vulnerability when their life circumstances change (Kelly & Adger, 2000).

The *"adaptation spectrum"* explains the relationships across coping, adaptive, and transformative capacities (Marshall et al., 2012; Moser & Ekstrom, 2010). Types of adaptation are embedded, whereby coping is embedded within adaptive capacity, which is embedded in transformative capacity. Coping and adaptation are mechanisms to reduce vulnerability. Specifically, individuals or households have coping capacity when they make local-level social or environmental changes that allow them to meet immediate needs that challenge their daily survival. Individuals, households or communities have adaptive capacity when they make local or landscape level social or

environmental changes that enable them to meet their immediate to future needs (Davies & Hossain, 1997).

Adaptations are systemic changes that make a system better able to deal with threats and vulnerabilities (Preston & Stafford-Smith, 2009). Adaptations are facilitated through four key processes, specifically what are people adapting to, who is adapting and how, and what is the goal of adaptation (ibid). In social systems, human agency can lead to vastly different adaptation outcomes for individuals within a group, rendering the comparisons between social and natural components of a system less parsimonious (Davidson, 2010). Adaptations can be positive or negative, whereby positive adaptations are choices taken to reduce risk and improve livelihoods, while negative adaptations are necessary actions taken when livelihoods are no longer viable and people no longer have a choice (Davies & Hossain, 1997).

Coping capacity is the ability for households and individuals to deal with immediate threats to their survival. When people begin to feel especially vulnerable to risk, they engage in any number of coping strategies. These may include preventative strategies, impact minimizing strategies, building up of food and saleable assets, diversifying production and/or income sources, development of social support networks, and post-event coping including through the collection of wild foods (D.J. Campbell, 1990; Cashdan, 1985; Chambers, 1989; Dercon, 2002; Paumgarten & Shackleton, 2011). Coping strategies help to maintain the family and retain dignity and self-respect (Blaikie et al., 2005).

Reciprocity networks are important forms of insurance to protect against crop failures that result from low rainfall or crop raiding by cattle and wildlife (Adger, 2000; Cashdan, 1985). Conversely, kinship ties likely carry their own risk, in particular as farmers must balance between privately paid risk mitigation adaptation strategies and kinship sharing obligations that can be costly when relatives do not reciprocate (Di Falco & Bulte, 2013). When humans and elephants interact, people demonstrate negative coping capacity through reducing their exposure to elephants, largely through restricting their time spent in outdoor livelihood activities (Ogra, 2008), as well as by consuming alcohol (Jadhav & Barua, 2012).

While coping capacity indicates adaptation to threats on the immediate and local scale, scholars agree that adaptive capacity is the ability for households and communities to address longer-term threats. Adaptive capacity is often facilitated through access to outside resources. Because adaptation often requires fundamental changes to the structure of society, scholars recognize that some groups may adapt at the expense of others, creating winners and losers in the long term unless otherwise corrected for (Bernier & Meinzen-Dick, 2014). Much of the literature on adaptation to external threats has been demonstrated through the study of climate change, however adaptive capacity is a critical component of people's ability to live with landscape-scale threats, such as fire (Tedim & Leone, 2017) and wildlife (Carter & Linnell, 2016). Studies show that people adapt to life with dangerous wildlife, including through behavior change and increasing tolerance (Carter & Linnell, 2016), and this may have consequences for how people and elephants share space and resources.

1.5. Connecting the era of elephants, HEI, and vulnerability and adaptation

The era of elephants can serve as a frame of reference for understanding HEI in the Delta where elephants and people have a long and shared history. Elephants nourished early human ancestors who learned to hunt cooperatively; abundant elephant populations facilitated the expansion of people across the continent in the pre and early-colonial era; elephant movement to the Okavango during a drought led to the settlement of the Okavango by Bantu groups; the booming ivory market abroad led to the decimation of elephant numbers and the emergence of global market economies. Today, there are so many elephants that people struggle to harvest crops, leading scholars to characterize modern HEI as conflict over food despite evidence that elephants continue to shape settlement decisions, and facilitate the harvest of other resources, like firewood.

HEI, like other human-wildlife interactions, are dynamic and rooted in history and culture (Goldman et al., 2010). A look into the past, therefore, is essential to understand HEI today. HEI are not ahistorical, static snapshots in time, but they are ever-changing relationships rooted in culture and history, mediated through the environment and stories parents tell their children (Table 2). The Okavango system, comprised of both its perennial river and seasonally flooded alluvial fan, support a diversity of plant and animal life. These are the very biological factors that make the area habitable for people and elephants and shapes vulnerability to HEI in this new era.

Table 2. Comparisons between perspectives of HEC and HEI, examining theoretical approach, types of interactions, and assumptions about people within system.

Characteristics	HEC	HEI
Theoretical approach	Builds from a pest management perspective whereby material-centered approaches can reduce spatial overlap	Builds from natural hazards perspective, incorporating elements of vulnerability but also integrating cultural and historical relations
Types of interactions	Assumes human-elephant interactions are inherently conflict-driven	Assumes human-elephant interactions include positive, negative, and neutral interactions
Assumptions about people within system	People are thought to be stable and external intervention is required to reduce interactions	People are presumed capable of adapting to change and can make decisions that reduce unwanted interactions

The river presents year-round opportunities for people to carry out life-sustaining activities in an otherwise very arid environment (Tlou, 1972), while ever-present signs of elephants, both recent and old, influence how people perceive their risk and create ever-changing livelihood barriers and opportunities. In this way, people of differential vulnerability make potentially life-altering decisions every day. However, people are capable of responding and adapting to environmental and social change to reduce their perceived risk and vulnerability (Adger, 2000), and their identities as individuals also mediate their capacity to cope and adapt to life with elephants.

In the era of elephants, people and elephants are both at risk to potentially deadly interactions with the other. HEC, as a lens, stops at conflict, sometimes experienced through crop consumption and the subsequent food insecurity experienced by rural residents, but elephants facilitate other life ways of people. By using HEI instead of HEC as a lens, and by incorporating time and culture as critical elements that mediate

HEI, a more dynamic view of interactions emerges. For example, because of shared use of natural resources in the woodlands, people now can more readily harvest important materials, such as baobab bark and firewood (Buchholtz et al., 2019). However, there is evidence of increasing conflict over wild fruits. In human settlements, elephants eat from the trees planted outside of people's homes, and the fear of unwanted interactions mixes with people's desires to live a good life, causing some people to resettle in more population-dense villages (Witter, 2013). Similarly, policies and institutions are at the heart of HEI, and scholars must incorporate them to develop a full understanding of what it means to live with so many elephants (Gupta, 2013).

Because HEC builds an understanding of human-wildlife interactions through a cost/benefit "Western axis of calibration" (Barua, 2014, p. 928), HEC as a concept, alone, cannot explain the depth of these often-complex "more-than-human" relationships (Whatmore, 2006). If HEC as a lens relies on short-term data, pulled from a pest management perspective with a focus on keeping people and elephants separate through material interventions, than HEI can be a bridge to incorporate socio-culturally and historically aware vulnerability and adaptations to understand how people and elephants have mutually shaped the other.

1.6. Dissertation organization

In this dissertation, I use ethnography to understand how individuals and households in the Eastern Panhandle of the Okavango Delta make decisions concerning land and resource use in the era of elephants. By exploring long-term settlement

decisions using evidence from one particular settlement, as well as examining short-term livelihood decisions, specifically concerning firewood harvest, my research asks how are individuals, households, and communities vulnerable to elephants? How do they adapt to life with elephants?

This dissertation is organized into five chapters. In this first chapter, I argue that HEC as a lens overlooks the historical and socio-cultural context that has long mediated human-elephant interactions. By building from the theoretical approach of elephants as natural hazard and extending into theories of risk perception, vulnerability and adaptive capacity, I offer a frame for modern HEI in the Okavango Delta as the era of elephants, shaped by culture and historical context.

In chapter two, I frame this research around my ontological and epistemological approaches. I consider my role in the research, and introduce the social and ecological context of the study site. I describe the Eastern Panhandle of the Okavango Delta, both ecologically and culturally. I provide more detailed information about my study site, Mokgacha Village, where I lived for nine months from 2017 to 2018. I overview all of the research methods I used throughout the study, including participant observation, a census, participatory mapping, firewood harvest focal follows, among others. I detail my data analysis approach and provide an overview of my study limitations.

Chapters three and four are the meat of this dissertation, based on empirical findings. I build these chapters around the conceptual model guiding this dissertation, examining natural resources and cross-scalar institutions guiding rural resident firewood harvest and resettlement practice. Chapter three looks at how people harvest firewood

around elephants, and how they perceive risks, are vulnerable and how they adapt to HEI. Chapter four examines the intersection of state policy with resettlement decisions, and how settlement practice influences vulnerability to HEI. In these chapters, I grapple with questions of identity and belonging, livelihoods, and resource use and explore HEI with a focus on institutions, decision-making and rural change. In the fifth chapter, I conclude this dissertation with an overview of this research, integrating ideas for future directions of research on HEI with a call for strengthening local governing institutions in the era of elephants, and present a set of principles for understanding human-elephant coexistence to help guide conservation practitioners and researchers.

2. STUDY SITE AND METHODS

2.1. Ontological, epistemological, and methodological approach

Ontology and epistemology are critical foundations of social science research because of the ways that they shape both the underlying assumptions about social reality and methodological approaches used by researchers (Crotty, 1998). Ontological positions explore what exists in the world while epistemological positions are concerned with how knowledge is produced and acquired (Crotty, 1998; Moon & Blackman, 2014).

For my dissertation, I adopt Hammersley's (2002) "subtle realism" for my ontological approach, recognizing that I can only be confident, never certain, in my claims of knowledge and interpretation. I am unable to make predictions of what will happen in the future as it is likely I have been unable to account for the influence of other powerful factors, and the aim of my research is to integrate diverse perspectives to represent one version of reality. I used a constructionist epistemology because I assumed that people will have their own unique understanding of what it means to live with elephants and that meaning is created between people, elephants, and space (Crotty, 1998; Moon et al., 2017; Moon & Blackman, 2014). I rely on ethnography as my methodology for its ability to illuminate an emic perspective on life (Hammersley, 2002; O'Reilly, 2005), though I recognize that I analyze and interpret findings from an etic perspective that has been shaped by my life experiences. I also bring a pragmatic, mixed methods approach because I believe that the problem of ensuring long term capacity for people and elephants to successfully share space and resources is *most* important, that

research occurs in social, cultural, and historical contexts, and that research should seek to achieve social and political justice (Creswell, 2003). I used a sequential procedure for research methods, elaborating and expanding on the findings of one research methods with another, as described below following my reflexivity statement (Creswell, 2003).

2.2. Ecoexist Project

I conducted this research as a fellow with the Ecoexist Trust, a non-governmental organization working to reduce negative human-elephant interactions in the Eastern Panhandle (Panhandle) of the Okavango Delta, Botswana (www.ecoexistproject.org). The Panhandle is a dry savanna woodland ecosystem where 18,000 elephants live with 16,000 people across 14 different villages and sparsely populated *meraka* in an area the size of Yellowstone National Park (Central Statistics Office [CSO], 2011; Pozo et al., 2017). In this social-ecological system, the population of elephants has tripled in the past 20 years, and negative HEI is widely seen by scholars and conservation organizations as one of the biggest threats to goals of sustainable development and wildlife conservation in the area (Mbaiwa, 2018).

Ecoexist was started in 2012 and was developed, in part, from the doctoral research of Anna Songhurst who studied landscape-scale elephant movements and HEC concerning farmers and their food crops in the area (Songhurst, 2012). Ecoexist works in all 14 permanent villages of the Eastern Panhandle, employing a local community member as an ECO who serves as a bridge between Ecoexist and the community. The aim of Ecoexist is to reduce the impacts of HEI by working with local communities to

improve farming practices through adoption of improved farming techniques and elephant-deterrent systems, to develop an elephant economy whereby community members directly access the tourism industry and international markets, to track elephant migration, and to improve land allocation policy in a way that equitably benefits people and elephants alike (Songhurst et al., 2015).

As an Ecoexist Fellow and a student of Dr. Amanda Stronza, co-director of Ecoexist in Botswana and the Applied Biodiversity Sciences Program at Texas A&M, my aim for my doctoral research was to uncover socio-cultural aspects of human-elephant interactions. In particular, I was focused on contributing to the growing body of evidence that culture mediates both drivers and outcomes of human-elephant interactions. I hope that this dissertation will illuminate meaningful interventions to improve the well being of individuals, families, and communities who live side-by-side with elephants in rural Botswana.

2.3. Botswana and the Okavango Delta

Botswana is a landlocked southern African nation, located north of South Africa. Botswana was long viewed as the darling of conservation, widely known by governments, scholars, and popular media, alike, for its highly transparent government and strong commitment to wildlife conservation (Bearak, 2019; Holechek & Valdez, 2018; U. S. Department of State, 2019). However, the country has some of the highest levels of inequality, in particular between urban and rural areas (Hillbom, 2011). It is

this severe inequality between urban and rural that struck me when I first arrived in country.

Botswana has a relatively undiversified economy. Since independence, agriculture has proportionally contributed less to the national economy over time, while diamond mining has increased dramatically (Hillbom, 2008). Currently, tourism is one of the principle national economies along with diamond mining and international beef export (DeMotts et al., 2009). Tourism is an important economy, in large part due to the abundance of elephants (Mbaiwa, 2003). Specifically, while elephant populations across the continent of Africa are threatened, elephant populations in Botswana are now upwards of 142,043 elephants, accounting for one third of Africa's savanna elephant population (Chase, 2011; Chase et al., 2016). Safari hunting in Botswana dates back to the late 1850s (Tlou, 1985), and in 2014, Botswana placed a moratorium on hunting, including every type of safari hunting. That nationwide ban was lifted by mid-2019, after this fieldwork was conducted and well as this dissertation was underway. As such, this research is framed entirely within the context of the hunting moratorium.

The Okavango Delta in Botswana is a natural inland delta known best for iconic wildlife and year-round water. It is seen as an oasis in the otherwise harsh Kalahari desert (Hamandawana et al., 2007). At 5,537,400 hectares, the Delta is one of the largest intact wetlands in the world and, since 1996, a wetland of global significance under the Convention on Wetlands, also known as the Ramsar Convention, which seeks to protect internationally important wetlands and their resources (Trouwborst, 2019). In 2014, Botswana successfully rebranded the Delta from a swamp (Tlou, 1972) to a UN World

Heritage Site, famed for the wildlife that frequent or inhabit the area. Tourists visit the Delta for the diverse array of wildlife, in particular the elephant, and the fame of the Delta has helped drive the development of tourism.

The Delta is comprised of the Okavango River that drains into an alluvial fan almost 40,000 km^2 in size that floods in winter, generally from May through September, with maximum floods beginning in July (McCarthy et al., 2003). Although the Delta has varying flood patterns based on rainfall in Angola, floods can reach between 2450 km^2 and 11400 km^2 each year (ibid). The changing water levels of the Delta lead to dramatic variations in water availability of the permanent and seasonal wetlands and result in fluctuations in the composition of plant and animal species (Yurco, King, Young, & Crews, 2017). Vegetation is a critical component of the environment, providing food, resources, and habitat year-round for wildlife and people, alike. This is especially important considering the ebbs and flows of the Delta and the varying rainfall that in some years results in flood while in other years results in drought (McCarthy et al., 2003).

Herbivory by wildlife and domestic livestock can have a dramatic impact on the ecosystem (Dudley, 1999; Rutina et al., 2005; Skarpe et al., 2004). For elephants in particular, their impact on vegetation and trees is often dramatic. Some scholars refer to the tendency of elephants to destroy trees and damage habitats as the “elephant problem” (Ben-Shahar, 1993). Beginning in the 1950s, ecologists began to sound the alarm over destabilization of forest-elephant ecosystems due to tree herbivory and damage by elephants (Caughley, 1976). Concerns over tree damage by elephants are rooted in older

scientific thought that theoretically approached ecosystems as stable systems. In more recent years, ecologists tend to study how ecosystems are resilient, existing across multiple stable states (Holling, 1973). While researchers now recognize that these ecosystems have long been in flux due to complex factors, including cattle, disease, and wildlife (Skarpe et al., 2004), this research brings people into the equation as part of a dynamic human-elephant-woodland system.

2.4. Reflexivity statement

2.4.1. Arriving in Botswana

My first visit to Botswana in June 2016 was in many ways a major shock to my preconceived expectations. I had spent over six years of my life, most of them in my twenties, living in sub-Saharan Africa. My first experience in Africa was following a post-Bachelor's degree internship collecting seeds in southern New Mexico when I was 22-years old. I decided to spend three months living with my father, who had moved to Nairobi, Kenya, a few years earlier. I spent my first few weeks there looking for any opportunity I could to volunteer, before settling in to volunteering at a rehabilitation center for boys who by their own will or that of their families left their homes, often in smaller towns or the rural countryside, for the metropolis of Nairobi. Many came from desperate situations, seeking work to make some money to send home to their families. Others came for the adventure, to find a new life free from the responsibility of a large extended family.

In those early days, I crossed town in a private taxi to get to the center, eventually making friends with the professional social workers. I shadowed them, unsure of what I was doing, and learned the rhythm of life at the center. They taught me how to navigate the bus system, and I eventually grew to feel comfortable despite everything my father and his foreign friends told me about the city. Looking back at it now, I know that I was, in fact, a 'voluntourist'—a tourist who participates in volunteer work—regardless of how at home my new friends made me feel.

I met Jakob, a Polish missionary for a Catholic Mission in Nairobi. Unlike the other missionaries I had met, he never spoke of God, only of kindness, and he allowed me to come with him to the dispersed households where he conducted home visits. Some of those home visits were with the families of the boys who were preparing to care for the return of their kids. Those visits were often bittersweet, as parents, aunts and uncles, shared their desires and fears for welcoming back home their children who had learned some very tough lessons on the streets. Sometimes we met with the kids who were back with family for the first time, to provide words of encouragement and report back to the center any expressed concerns or requests for support.

Our other visits were eye opening in different ways. During those visits, we wandered the streets of some of the toughest slums of Nairobi where gangs of street kids formed their own families of sorts. We tried to find the boys who had left the center to remind them that they were missed and to try to counsel them in the event they wanted to return to the center. On one occasion, I met the Mother, as she was called. She both cared for and exploited the street kids who wandered around the streets, high from

sniffing cheap glue that helped them to forget their hunger, thirst, and pain. For years after, I was fascinated with the Mother's perverse relationship with the kids, and I was left with so many questions: what were the kids lives like back home? What are their hopes and dreams? Why did they leave their families and what did they hope to find on the streets? Jakob, experienced already with the world of street kids from his missions across Africa, taught me what it meant to bring passion to try to resolve "wicked" problems, the kind of intricate, complex problems in planning written about by Rittel and Webber (1973) that are never solved, only momentarily resolved. He showed me how to be an applied ethnographer.

I ultimately arrived in Botswana by way of Cameroon. Inspired by what I had experienced in Kenya and driven by what I was learning about forestry social science in my masters program at Oregon State University, I began my application to the US Peace Corps, seeing it as my only real option to return to Africa in a meaningful way. The application process was long and it took about a year before I finally learned I would be moving to Cameroon for what was going to be a long 27 months time. I was going to put my forestry degree to use as an agroforestry volunteer.

I finished three months of training in the West Region of Cameroon and was placed in my site in the South Region of Cameroon, just outside of the regional capital of Ebolowa. The South Region was forested and rich with wildlife, trees and fruits, and water. I spent my first year at site getting a grip on the language, learning enough French to get around in the world of agriculture and forestry, and just enough Bulu to learn when someone was insulting me. By the time my second year was halfway over, I felt

that I was just beginning to understand how to work in Cameroon and was happy to extend for a third year position working with the Worldwide Fund for Nature in Campo, a beach town across the river from Equatorial Guinea.

While there, I grew my professional skills to work in-situ on conservation projects, spending most of my time in rural villages meeting key players and figuring out how to support them in ways that matched our conservation goals. By the time my third year with the Peace Corps was over, I was a full time social scientist with the Zoological Society of London in Yaoundé, Cameroon. I began managing projects, writing grants, and reporting. I stayed in Cameroon, moving from work in the East Region to work in the Littoral Region. I wanted to leave Cameroon, expand my skills set outside of the country, but was having a hard time finding other opportunities. A Ph.D., it seemed, was the basic requirement for most jobs I was interested in, and I decided it was time to go back to school.

By the time I left Cameroon, it was with a mixture of relief and sadness. I looked to Texas as my chance to get a foothold on my life back in America, and I looked to the opportunity to conduct research in Botswana to help me develop my understanding of conservation outside of Cameroon. Like that, I started my Ph.D. with uncountable expectations, but with little idea of how different of a world I would find in Botswana. In many ways, my understanding of life in Botswana was shaped by how unlike it is from Cameroon, both for better and for worse.

2.4.2. Learning to live in Botswana

My first trip to Botswana in 2016 lasted just over two months. I spent the entire flight from Johannesburg, South Africa, to Maun, Botswana, the "Gateway to the Okavango", in awe of the vastness of the scrubby plains. It was my first time looking at a landscape and seeing little more than nothing—just a sea of sand punctuated by scrub—though as we approached the Okavango Delta a new landscape of crystal blue water and tall trees emerged. After landing in Maun, I was surprised at the brisk winter air and the winds that threw dust in my face. The combination would later cause my lips to chap for weeks. I was amazed at the wildlife in the city—both crocodiles and hippos, and all kinds of new songbirds. I was a novice in this new world and it was exciting. The Delta waters looked bright, reflecting the clear sky, a perfect Botswana blue like the national flag. I spent my first fieldwork season with my mouth agape at how different Botswana was compared to Cameroon. Here people were calm, composed, disinterested in me, while in Cameroon I experienced stress of being the center of attention every time I left my home.

Since I did not have a vehicle for my first field season, I waited for a ride from Erin Buchholtz, then a student with Ecoexist working to understand patterns of elephant movement across the Western Panhandle of the Okavango Delta. We drove up to her home in Samochima along the Delta's edge and I sat in on one of her team meetings with her research assistants and asked her main research assistant, Sam, some questions about his perspective on HEI and how life is changing now that elephants are a common problem for people. A few days later, I got a ride to the Ecoexist camp with Dr. Amanda

Stronza. We waited in the vehicle line for an hour until we loaded up onto the four-vehicle ferry to cross the Okavango River. I was surprised at how short the distance was across the river and yet how long the line of cars was waiting to cross from Mohembo West to Mohembo East.

On that first drive to the Ecoexist researcher camp, where I would live those first few months, I kept thinking I saw elephants. It was dusk by the time we began the two-hour drive to camp. The dust kicked up by vehicles on the road obscured the trees in the distance. I had never seen an elephant outside of a zoo or a park and I spent the ride in anticipation. Though we did not see any elephants on the ride, their signs were everywhere. Trees were completely coppiced down in some locations, knocked over in others, and there were numerous wide trails crossing the road.

During this time, I lived at the Ecoexist research camp and traveled a few days a week to several different villages to meet people, to conduct preliminary interviews, and to observe social life and structure. I was allowed to assist as part of a survey team, which was conducted by Ecoexist as reporting for a USAID grant. I travelled to several different settlements around Gunotshoga and Mogotho and sat with people outside their compounds, asking pre-determined survey questions about livelihoods. This opportunity to travel to different settlements, sit with people, and ask questions about their agricultural production was informative and helped me find my feet in those first few weeks.

Beginning in late June and into July, Ecoexist held a series of cultural fairs where Ecoexist sponsored a contest in each village to showcase “Life with Elephants”,

told through the medium of art, poetry, song, and crafts. Individuals and groups pre-registered and, on the day of the event, presented their work to the Ecoexist team. I served as a judge which put me very literally front and center at each village kgotla shelter, and I was seen in this way as a team member of Ecoexist, though someone people had never seen before.

The cultural fair allowed me the experience of visiting each village and spending time in each place, getting to meet some people and getting a sense of what each community looked like. It was during this time that I had my first in-depth look at Mokgacha. At that time Mokgacha was a village I had driven past several times to get to Mogotho, and I knew it then only as a small community just beyond a long stretch road through an expanse of woodlands obviously frequented by elephants, replete with knocked over logs and branches strewn across the road.

In Mokgacha, we held the cultural fair in the afternoon, showing up first for a group lunch with people affiliated with Ecoexist held at the VDC office under the shade of a false Mopane tree. Following lunch, there was a good turnout at the cultural fair, and children and adults alike looked delighted to be there. Later in the evening when it was dark, Ecoexist showed a film about their work to the village in the VDC office. Perhaps because this was the one village that did not have electricity, the film was well attended compared to the other villages and I felt welcomed in ways that I didn't feel elsewhere.

Following the cultural fair visits in all of the villages, I became intrigued by Mokgacha above all of the other villages. It was situated between two significant

elephant pathways, according to the research conducted by Songhurst (2012), and was equidistant from both Seronga and Mogotho, both villages that by comparison made Mokgacha seem like it barely existed on the map. Here there was no electricity, no running water, no telephone network, no clinic, and no school. Yet when I asked, I learned that Mokgacha had recently been gazetted as a village, and the population had grown rapidly in recent years. What was driving this population growth when, from my outsider perspective, there seemed to be little draw in terms of basic infrastructure and employment? I was intrigued that, when given the choice, people seeking development would choose to move to Mokgacha over Seronga or Mogotho, and yet continue to send their children to school with relatives, often for many years at a time, in one of these other villages.

Compared to Mokgacha, Seronga seemed like a vibrant city with a population size of ten times Mokgacha (CSO, 2011). There was running water, electricity, shops and bakeries and butchers, a fancy new post office, and people everywhere. While it would have been easier to find a home for rent and conduct research in English in Seronga, I was intrigued by the rapid growth of Mokgacha and decided to pursue the possibility of extended fieldwork in Mokgacha. I began making visits to the village and neighboring *meraka* to meet people, ask questions, and generally get a sense for whether this would be a good choice of a study village. Lethatha, the ECO from Mokgacha, helped facilitate my preliminary research (described below), and was pivotal for interpreting language and helping me find key stakeholders. I knew after a few days of

preliminary research, and after gaining approval from the *kgosi* to come back later to live there, that this would be my study village.

2.4.3. Positionality in Mokgacha

When I returned the following year, I first lived in the Ecoexist research camp until I could locate a place to live and hire an interpreter in Mokgacha. I worked with the VDC to identify a handful of people who could speak English, and conducted interviews. I preferred to work with a woman given that much of the work would require firewood identification and harvest, work done most often by women. It was ultimately through Mathatha, an Ecoexist supervisor, that I contacted and came to hire Ipolokeng (IP). IP was widely loved across the village, given, in part, her friendship and family connections. However, my decision to hire IP was not without consequence given that I also interviewed the *kgosi*'s daughter-in-law. I do not know what my research would have turned up had I hired her instead.

With IP's help, I found a secure cement house where I felt safe and where I had privacy to write and reflect during the long, dark evenings alone in my house. I had neighbors, including one 17-year-old boy who lived on the plot, and his extended family all around me, and was able to have a host family yet maintain my independence. The house needed some important repairs. A large window was missing glass and was covered instead with a cloth drape, and the front door wouldn't close all the way. When I inquired about these issues, my landlady simply replied, "Here in Mokgacha there are no thieves." I negotiated for repair reimbursement and with help from Georges, a friend and

Ecoexist handyman, I replaced a missing window, put in a good lock on the door, and moved in as soon as I could to get started. I was driven by a sense of urgency to move into the village as quickly as possible because I knew living there would facilitate both my ability to collect data and my integration into the community.

While beginning my introductions in the village, I learned that the Ecoexist team was well known for their specific interest in elephants. In those early days when I would ask questions to which the answer was elephants, people would often respond to tell me that *my* elephants destroyed the farm, incited people to resettle, or charged their neighbor. This association with Ecoexist, I realized, would shape how people responded to me given Ecoexist's focus on elephants and farming. Because I wanted to allow for the emergence of surprise findings, I made the decision to emphasize my interest in issues of rural change and use of trees and other resources over elephants.

I began work with a household census (described below) conducted in the village and affiliated *meraka*. Although I introduced myself as a student with Ecoexist, I did not begin by asking questions about elephants. I chose instead to ask about family settlement history and firewood harvest practices, expecting that issues of elephants would emerge organically during these early conversations or later on as my methods narrowed. I expected that issues of rural development would be just as, if not more, salient than HEI and I wanted to first discover the big picture before focusing in on where elephants come into play.

I spoke a handful of words in Setswana and there were a handful of people who spoke English. Creating relationships in this context would be difficult, and therefore

render my dissertation research and enjoyment of my time in the field very difficult. I decided that my time in Mokgacha was short, just under nine months remaining by the time I arrived. Although in an ideal world I would have spoken at the very least Setswana by the time I arrived, people were multi-lingual and sometimes preferred their mother tongue for communicating complex thoughts and emotions. Instead of investing into learning the language, I decided to lean into my relationship with IP. Her mastery of both the language and every resident of the village due to her past work with the VDC meant that working through her gave me a leg up on orienting myself into a new social world, though I recognize that her prior relationships with people may have biased results in unexpected ways.

I walked around the village every day, learning a little bit more in conversational Sembukushu, Seyeyi, and Sersarwa, but I conducted my research in English. This, I knew, would be a major downfall of my research. By relying on an interpreter, I would lose a lot of the richness in the stories, experiences, and the freedom to ask questions whenever I wanted. What I gained by relying on an interpreter was an insider perspective of village dynamics, and much of this research is shaped around my relationship with IP, her expressed hopes and fears, and her relationships with others.

Through my slow work integrating into the community by collecting firewood with people, engaging in everyday activities like baking *borotho* or washing clothes at the river, and eventually convincing the *kgosi* that it was ok that I participate in public *kgotla* meetings seated with the other women in the sand instead of with the elders and elected officials on the concrete stage, I developed a reputation as a person interested in

participating in people's lives and community events. It did not take long for me to begin to receive invitations for family wedding meetings, church services, funerals, and the like.

In my time in Botswana, I came to occupy a liminal space, the kind written about by many past ethnographers (e.g., Enosh & Ben-Ari, 2016; Plump & Geist-Martin, 2013) when you are neither of the community, nor a complete outsider; neither a man, nor a woman; neither young, nor old. I was invited to milk cows with the men and boys, attended church where I sat with women, and was served to eat first with the elder men at funerals. Kids who were initially excited by the presence of a *lagoah* soon grew bored of me. People who ignored me at first, thinking I would leave after a short time, came to trust me when I stayed for a while longer.

For residents of Mokgacha, my role was unclear and confusing. I was a phone charging station with my solar panel and battery set-up. I was a person who would give ground coffee beans when my neighbors were out of coffee at home. I sought out elders to learn about the history of their families and the contested history of the village. I had a car, but wanted to carry firewood on foot. I was associated with the "elephant people," meaning Ecoexist, but was only occasionally interested in asking about elephants. I tried to explain to everyone why I was there, but not everyone cared.

My association with Ecoexist activities throughout my second season of fieldwork was minor. During the time I lived in Mokgacha, Ecoexist organized just one event focused on safety around elephants in December, led by two men from neighboring villages and supported by Ecoexist staff. Ecoexist's work on mitigating the

impacts of HEI influenced my approach to work in that elephant conservation was both a framing reality and an idealized goal of my research. Elephant conservation was a framing reality because increasing elephant populations was the reason I was there in the first place. Conservation was effective here and impacted how people lived. Elephant conservation was an idealized goal of my research because I wanted to contribute to the ability of people to continue to share space and resources with elephants.

Elephants were central to my dissertation because of the circumstances of my affiliation with Ecoexist and my research agreement with the Ministry of Environment. However I wanted to allow for the existence of conflict between conservation and development, and I intentionally cast a wide net in my participant observation activities. When the farming season began, I walked miles through deep sand to the fields during work parties, guiding plowing oxen and planting seeds and sharing in *borotho* and tea after returning for the evening. I sat with residents while they guarded their fields from birds, throwing sticks into the air in their direction and clapping and shouting whenever they landed in a tree on the farm. I learned how to mend fishing nets and spoke of work in the South African mines in years past. I drove the village DWNP representative, the husband of a woman who became my friend, and Lethatha to the fields that had been raided by elephants to help them with their work in calculating damage by elephants, and I yelled in frustration when the fields I had helped to sow and weed had been damaged first by elephants and subsequently by cows.

On several instances, I learned about elephant-damaged fields before Lethatha, Mokgacha's ECO, did. One 63-year-old farmer who had just lost some crops to

elephants asked me in earnest while we sat in her smoky reed-walled kitchen next to a fire what the point of reporting to Ecoexist is when they are not the ones who compensate for crop damage. Although this research fatigue seemed common when I first began my research, with one household outright refusing to participate and others responding apathetically to my presence, I used genuine curiosity and participant observation as my main method of entrance into village life, eventually inviting people over for dinner to watch movies and sharing American treats with neighbors. Over the course of the nine months living there, I never became at home, per se, but I did grow to develop friendships and trust.

One day, I drove an elder man to our neighboring village so he could go to the health clinic for services. It was just the two of us in the car for a twenty-minute ride, and although he spoke little English and I spoke little Setswana, I understood that he was recounting to me the ways that people appreciated my presence in the village. He told me that I carry firewood, bring firewood to the elders, fetch water, and assist people with transport. I knew that because he was blind and had only heard these stories second-hand, I had been accepted as part of the story of Mokgacha. In the same way that people still remembered the nurses who first came to establish a medicine dispensary in Mokgacha in the late 1970s, I am certain that people would later recount that a white woman once lived in the village, before there was running water or electricity, and carried bundles of firewood on her head with the other women. In that same spirit, I use this dissertation to share my interpretation of the rich and complex lives of the people of Mokgacha. I have changed the names of all participants to protect their confidentiality,

but I have retained names of places and situational context for reasons of accuracy and description.

2.5. Study site and research methods

This study was conducted in the village of Mokgacha (Figure 5). Mokgacha is 12 miles equidistant to both Seronga village to the south and Mogotho village to the north. Mokgacha was officially designated a village in January 2014, and of the different villages across the Panhandle, it was the most recent to be designated a village. As of the most recent national census conducted in 2011, Mokgacha had a population of 354 people (CSO, 2011). At the time of fieldwork, Mokgacha's population was growing despite having no electricity, potable water, or other basic infrastructure like a health clinic, fully established primary school, or police office. For some residents access to drinking, bathing, and washing water at the Delta was very difficult when the annual floods receded, drying up the last of the remaining pools of water that people shared with wildlife, cattle, horses, goats, and dogs, alike. I wanted to understand why residents would choose to settle in Mokgacha with limited access to infrastructure or development amenities when they could settle in either Mogotho or Seronga and access a full suite of amenities.

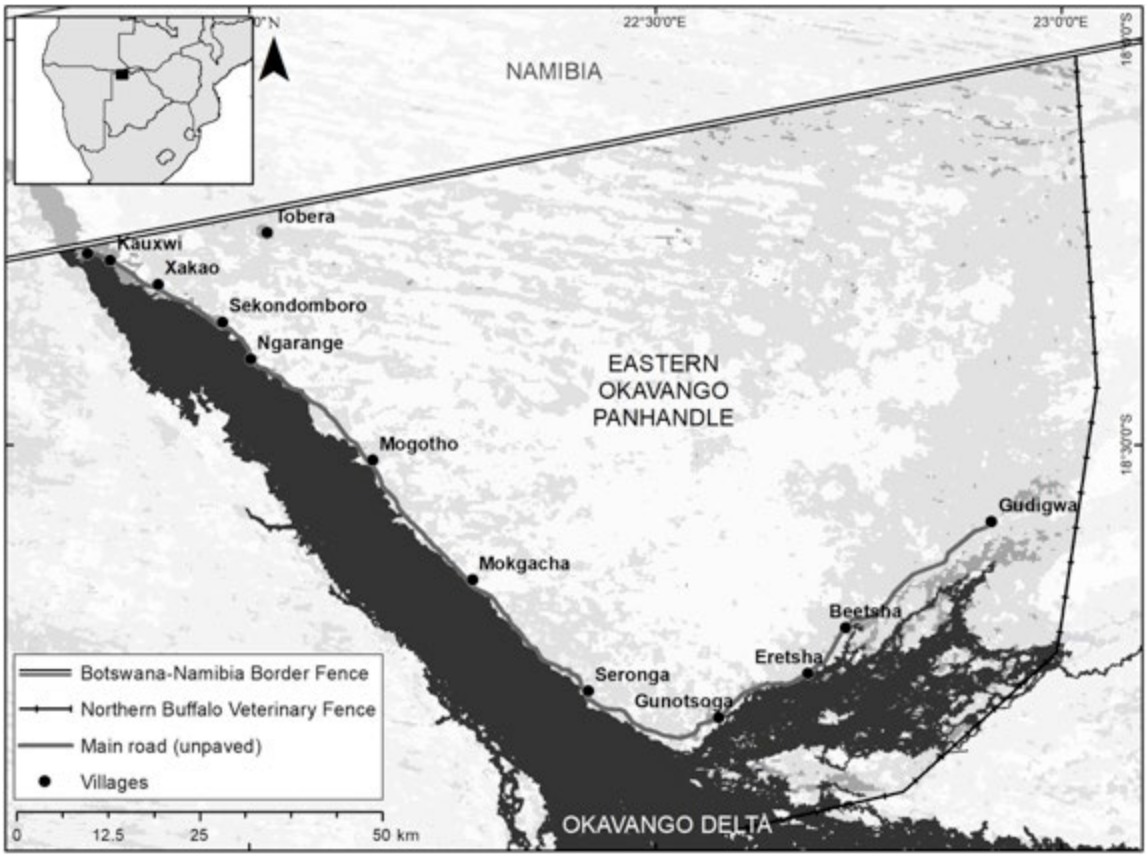

Figure 5. A map of the study area, with the study site, Mokgacha village between Seronga and Mogotho villages (Buchholtz et al., 2019).

The lack of development amenities meant that most residents spent a large part of their day conducting a variety of everyday livelihood activities, including washing clothes at the Delta, fetching water at the Delta, finding something to eat, tending to livestock in the mornings and evenings, watching over children, cooking food and cleaning dishes, and collecting firewood. Although other seasonal livelihoods were central to the rhythm of life, including farming, reed harvest, fishing, etc., it was firewood harvest that became central to my dissertation following preliminary fieldwork in Botswana in 2016. Residents depended exclusively on firewood harvest for energy,

including to cook food, to heat up water for bathing, for light in the evening, and, when the rains brought an unbearable presence of biting mosquitoes, to reduce exposure to malaria through the fire's smoke. Firewood was an interesting focal point to explore natural resource harvest due to the shared demands by elephants and people for trees.

2.6. Fieldwork

2.6.1. First phase (May-July, 2016)

This research was developed from preliminary fieldwork, conducted in June and July 2016. During this time, I lived in Ecoexist's research camp located close to Eretsha village, and visited all of the villages of the Eastern Panhandle during Ecoexist's 'Life with Elephants' themed competition where community members competed in arts and crafts, performances, and choirs. Visiting the villages gave me an idea of the different sizes of community, the basic infrastructure, and the geographic proximity to elephant pathways. In addition, I met with local government officials and researchers, and conducted interviews focused on natural resource use and the impact of elephants on people's lives.

I conducted semi-structured interviews (Bernard, 2006) with 22 rural residents from the villages of Gunotshoga, Beetsha, and Mokgacha, as well as four *meraka* associated with these villages. I used a semi-structured interview guide and relied on the help of the ECOs from each of the three villages to assist with identification of key informants, cultural interpretation and language translation. I sought out participants who engaged in diverse livelihoods, including grass and reed harvesting, firewood

harvest, basket weaving, cattle rearing, fishing, carpentry, and blacksmithing, as well as those who were unemployed or retired. 15 participants were women and 7 participants were men. Interviews focused on resource use throughout the calendar year, resettlement, and perceptions of elephants. I began broadly to explore the different kinds of resources used by residents, asking questions about gender roles, age, and ethnicity, as well as conflict with elephants and people over those resources.

Following guidance provided by Bernard (2006), I conducted open-ended interviews with two ECOs from Gunotshoga and Mokgacha, as well as the *kgosi* of Mokgacha. These expert interviews focused on resource use and activity calendars for men, women, and children, issues related to human-elephant interaction, concerns of development, and the history of the villages and their respective settlements. Finally, I conducted open-ended interviews with six government and organizational representatives from the Okavango Delta Management Plan, The Permanent Okavango River Basic Water Commission, Okavango Research Institute, DWNP Maun and Seronga offices, and the Tawana sub-Land Board Secretary in Seronga. These interviews focused on land and resource use, resettlement, human-elephant conflict, and rural development.

After gaining verbal consent from all participants, interviews were all hand written. Interviews were conducted in the language of the participant's choice, with interpretation assistance provided by the ECOs of Gunotshoga, Mokgacha, and Beetsha. Interviews lasted no more than an hour. In addition to interviews, I conducted participant observation during my visits to the villages and settlements, taking notes on the

organization of rural life, livelihoods, and the daily routine for residents. I noticed that entire settlements were left abandoned, and I spoke with the residents who left their former settlements to understand why.

Through this preliminary research, and after two HEI events that ended in the trampling of a person in the woodlands and the killing of an elephant in the village described in chapter one, I narrowed down my study site and research questions. Because of the impact of elephants on the trees that left many of the woodlands looking like well-coppiced orchards, I began to ask people if elephants make firewood harvest easier. Resoundingly the answer was yes, and this opened up many new questions to pursue: Is it more dangerous than in the past now that there are so many elephants? Is it more dangerous to harvest firewood while living in the village or a settlement? How do people mitigate that danger?

Through these interviews and observations, I narrowed down my study site to focus on the village of Mokgacha and its associated *meraka*, with an interest in firewood as a resource that is made more accessible through elephant browse and movement (Buchholtz et al., 2019). *Meraka* are settlements governed under different regulations than villages. Their populations are generally small and in the case of Mokgacha, the largest *meraka*, Danga, was spread out across three different settlement areas with no more than a handful of household compounds in each settlement area. Families living in the *moraka* often but not always own or manage cattle, may have agricultural fields nearby, and can resettle at will without government permission, sometimes moving to a different *moraka* entirely, establishing a new *moraka*, or even relocating just a short

distance away. Homes and other buildings must be built from natural materials and the government does not compensate for damaged property since they are living outside of government-sanctioned settlements. In contrast, the village is comprised of residential plots, all a standardized 40 meters by 40 meters in size, where people can build permanent buildings in cement if they so choose. More details of guiding development policies and practice are provided in chapter four.

I chose Mokgacha because it was the settlement that was most recently upgraded to a village, meaning that the population of people in the village had reached the critical population size of 500 people (Table 3) and had petitioned the government successfully following Botswana's 1998 National Settlement Policy (Republic of Botswana, 1998). While Mokgacha had a whole suite of government-facilitated livelihood and development opportunities [Appendix B], there was no electricity in the village at the time, meaning that firewood was the sole source of energy for the entire village, with the exception of a few solar panels capable of charging a few phones a day.

Table 3. Changes in population of Mokgacha village according to Central Statistics Office data (CSO, 2011) and this study.

Year	Population of Mokgacha village
1971	129
1981	94
1991	103
2001	132
2011	354
This study	477

2.6.2. Second phase (October 2017-June 2018)

I returned to Botswana to conduct the majority of my fieldwork from October 2017 through June 2018. At this time, I lived in Mokgacha village in order to maximize my data collected through participant observation and the lived experience of a rural resident of Mokgacha village. Below is a summary table of research conducted from October 2017 through June 2018 (Table 4). Categories were not mutually exclusive, and sometimes one person participated in more than one method.

Table 4. A list of methods used throughout the second field season, including the number of participants from Mokgacha, from Mokgacha's *meraka*, or from other locations.

	Residence location and number			
Method	Mokgacha	Associated *meraka*	Other	Total
Participant observation	-	-	-	-
Household census	108	14	-	122
Group firewood mapping activity	4	-	-	4
Resident interviews	22	8	-	30
Historical and cultural interviews	17	10	2	29
Officials/representatives (Government and nongovernment)	-	-	14	14
Cultural salience free listing	20	-	-	20
Firewood focal follows	32	22	-	54
Rapid firewood harvest surveys	82	-	-	82

I moved to Mokgacha village in early November 2017 and identified a linguistic and cultural interpreter, IP, who was able to communicate in all of the local languages (Sembukushu, Seyeyi, //ani Khwe, and Boga Khwe) in addition to Setswana and English. Additionally, and perhaps most important to this fieldwork, she had recently

moved from one of Mokgacha's associated *moraka*, Danga, to the village, occupying her father's house while he remained in Danga. She provided insight into the experiences of resettlement in the village. Because of her former work as a volunteer with the VDC of Mokgacha in charge of administering entitlements programs and facilitating communication between the government and the village, IP was a huge asset to my research. She brought extensive knowledge of the locality and knew all the residents in my study site. Her insight and personal life experiences proved to be hugely beneficial to my research, ultimately shaping my research questions and informing my findings and interpretation of results.

2.6.2.1. Participant observation

From November 2017 through June 2018, I lived in Mokgacha. Life in the village provided me with an insider perspective whereby I became a resident of the village, experiencing and recording through careful observation the everyday nuances of life. Social scientists commonly employ this technique, known as participant observation, to increase the validity of a study (Emerson & Pollner, 2001). Participant observation involves the researcher taking on the role of someone who is at once within and outside of the culture of interest (Bernard, 2006). It was first elaborated by Malinowski in his 1922 study of Trobriand Island cultures (Malinowski, 2013), but has since been used extensively to uncover otherwise hidden aspects of life by many scholars across the social sciences, especially to reveal social and material dynamics

(McCabe, 2010; Ortner, 2001; Tsing, 1993; Whyte, 2012) which are central to this research.

Ethnographers generally recommend using a "jottings" notebook to record the minutia of day-to-day life (Emerson & Pollner, 2001; Wolcott, 2005). I wanted to avoid any possible suspicion that residents might have felt towards me and decided to instead write extensive field notes each night. I would meet with my assistant the following morning to confirm whether or not I accurately interpreted events from the day before. By building from my embedded experience as a participant observer, I was able to verify the accuracy of what people say they do and what people actually do. Participant observation also allowed me to gain a deeper understanding of what it means to live with elephants while relying on the surrounding environment for everyday resources, like water and firewood.

Using participant observation as a central method not only increased the validity of my findings, it allowed me to be flexible going into the research, and to build authenticity into my work due to the relationships I built with my participants (Denzin, 1978; Rubin & Rubin, 1995). Participant observation allowed for the emergence of the unexpected (Bernard, 2006), enabling me to incorporate new research tools as necessary. Although I did not incorporate all of the research methods described below into subsequent chapters, the findings helped me to build knowledge and inform the research methods I used throughout this dissertation.

2.6.2.2. Household census, survey, and mapping

Upon arrival in Mokgacha, I first conducted a household census. I used the opportunity to walk door-to-door, to introduce myself as a student living in Mokgacha village, and to explain the purpose of my research and obtain informed consent. The primary aim of the census was to establish a database of residents and livelihoods. In addition, I included survey questions on decisions for resettlement by families, and use of tree species for firewood as well as firewood taboos, which emerged as relevant only after I had begun (Van de Walle & Gaye, 2006) [Appendix C]. Similarly to Colson (1971) and Yurco (2018), the household census provided a critical database of all community members and household composition, though it was challenging to conduct due to the fluid nature of residence and family. I started the census in the *meraka* (Figure 6; Table 5), identifying households initially by fenced-in yards, and by asking who they eat from the same pot with, following census guidelines used by the Central Statistics Office of Botswana (CSO, 2001).

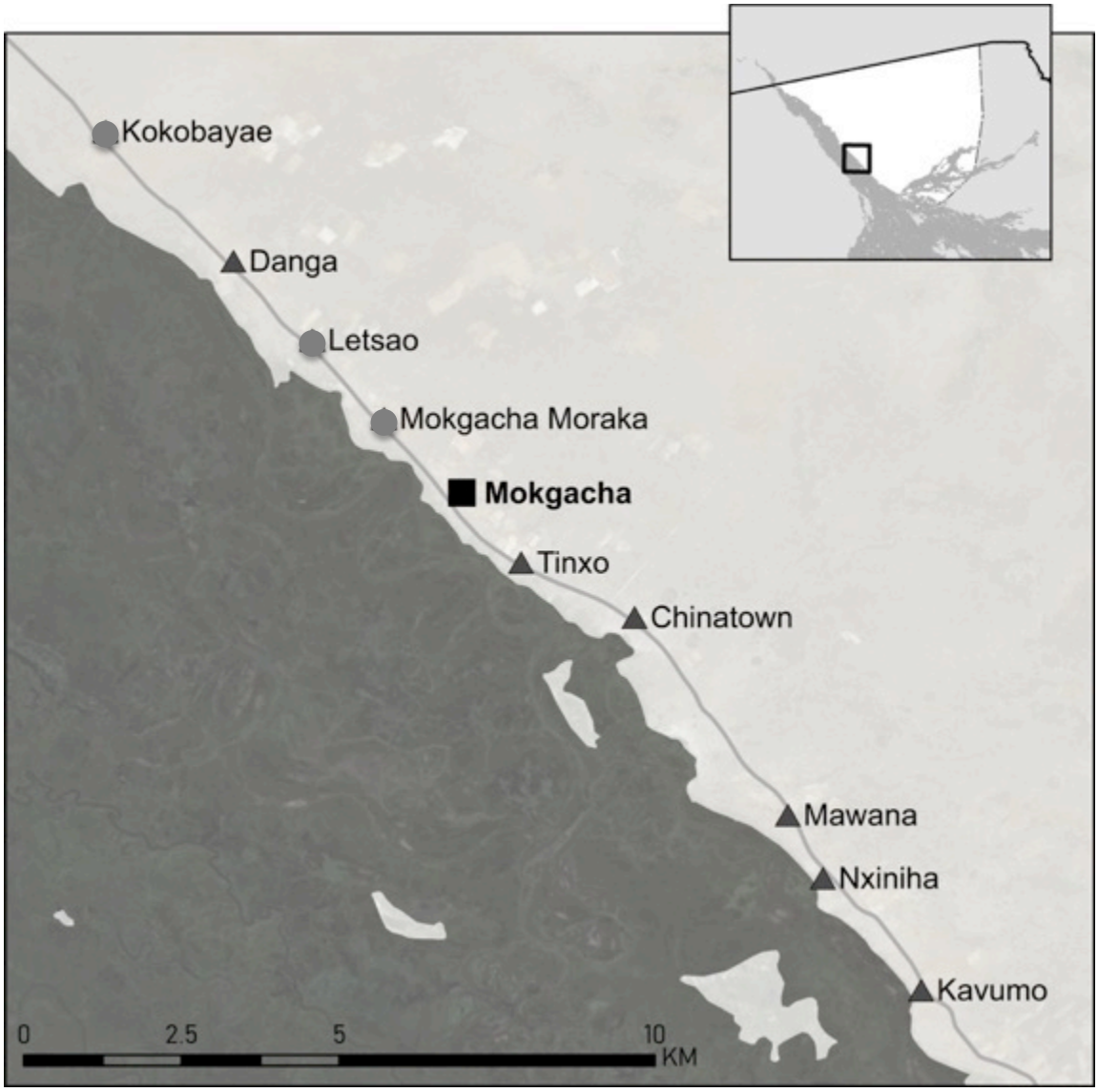

Figure 6. Map of study site showing the main village, Mokgacha (■), with current *meraka* (▲) and abandoned *meraka* (●).

Table 5. The *meraka* associated with Mokgacha village, including Mokgacha, according to estimated population, reasons for abandonment, and predominant resident ethnicity.

Settlement	Estimated resident population	Reasons for abandonment	Predominant resident ethnicity
Kokoae	-	Lions	BaHambukushu
Danga	51	*Currently occupied*	BaHambukushu Bayeyi
Letsao	-	Elephants and to build Mokgacha	BaHambukushu
Mokgacha *moraka*	-	Elephants and to build Mokgacha	BaHambukushu
Mokgacha Village	387 full-time; plus 90 at least part-time from all settlements except Kavumo	*Currently occupied*	BaHambukushu Bayeyi Boga Khwe //ani Khwe
Tinxo	17	*Currently occupied*	Bayeyi Boga Khwe BaHambukushu
Chinatown (considered part of Mawana)	23	*Currently occupied*	Boga Khwe
Mawana	22	*Currently occupied*	Bayeyi/Boga Khwe
Nxinina	49	*Currently occupied*	Bayeyi
Kavumo	12	Relocated .5km due to elephants	Bayeyi

Meraka were often comprised of different settlements, or groupings of households. Each settlement within each *moraka* was given a code (ie. 1Nxinihe, 3Danga) in order to allow me to distinguish settlements from each other. I finished the census in Mokgacha, walking in straight lines up and down the village, first from the road to the Delta, and then from the road to the edge of the village away from the Delta and into the dry woodlands. Households were approached at least two times if an adult

from the household was unavailable the first time. Missing households were noted by name of household head and location in order to revisit at a later date.

In total, 122 households were counted in the census across all five *meraka* (n=14) and the village (n=108). The census and survey was conducted in November, and any households that were not available for the initial census were approached again at the end of May in an attempt to capture a more complete picture of the community. At that time, I learned that the majority of households that were not captured in the census (n=36) were people who lived alone and were away from their homes each time (n=6), maintain a building in Mokgacha but reside most of the year in a different locality due to work or other circumstances (n=25), and two households refused to participate. Others households comprised of just a few people and were not counted (n=3) because all members of the household were unavailable both in November and May. Additionally, I learned about taboos concerning firewood species after beginning data collection, so I only asked 88% of all households about firewood taboos that restrict the species people harvest for firewood.

During the census process as I walked through the village I heard a distinct geographic transition of languages that I used to greet each household and I noticed a pattern in the household head ethnic identity. Through this process, I learned that the village was settled according to three main linguistic groups, creating a distinct geographic pattern of settlement. I used a GPS to walk around the three main linguistic groupings of the village, and with the help of my colleague, Dr. Erin Buchholtz,

generated a map to show where each family settled in the village. This settlement pattern provides the basis for key findings in chapter four.

2.6.2.3. Group firewood harvest and HEI hotspot mapping

After the census, I led group-mapping sessions (Delgado-Aguilar et al., 2017; Ramirez-Gomez et al., 2015, 2016) to build from local resident's experience in firewood harvest to identify potential ways to focus the research (Chambers, 1994). With help from IP and Lethatha, I identified key groups, six to eight participants for each groups, and conducted four group-mapping sessions in total. I focused questions towards exploring human use of the landscape and tree resources, as well as perceptions of elephant use of resources, overlap of resource demands, and potential hotspots of interaction with elephants. The key groups identified were: farmers, reed harvesters, men with donkey carts, and *borotho* makers. I identified these four key groups for their exceptional contact with the environment, specifically with trees because of their knowledge of firewood and places where people are likely to harvest preferred firewood. Within these categories, I identified six to eight key stakeholders for their local knowledge and expertise in their respective crafts and for their diverse geographic and cultural/ethnic representations.

Group mapping sessions were conducted in mid-December over the course of two days. They were held at the temporary elementary school shelters built at the VDC offices. In each of the mapping sessions, I asked all of the participants to identify a group artist who could interpret input from all participants. Because many participants

were unsure of what group mapping meant and many expressed uncertainty with the idea of creating a map, I held up an example from the first group to give an idea of what I expected the final product to look like. This helped people to feel more confident in their ability to convey information in a map-like format, but greatly reduced my ability to explore the maps as cognitive representations of space and resources.

Throughout the mapping exercise I asked participants a series of guiding questions concerning species of trees most or least preferred by elephants and people, places where people are most or least likely to encounter elephants, and routes taken by people during firewood harvest [Appendix D)]. Although the information gleaned from group mapping exercises was not directly used in any of the subsequent chapters, the results did inform my overall understanding of firewood harvest practices and locations.

2.6.2.4. Residence interviews

Following the mapping sessions, I used results from the census and participant observation to develop a semi-structured questionnaire to better understand how people from Mokgacha, both the associated *meraka* and the village, make decisions about where to live and how to share resources [Appendix E]. I created four target categories for participants from Mokgacha, including those who live in the village, those who live out of the village, those who have a plot in Mokgacha, and those who do not have a plot in Mokgacha (Table 6).

Table 6. Semi-structured interviews with participants from Mokgacha who live in or outside of the village

	With a plot in the village	Without a plot in the village
Residing in the village	9	6
Residing out of the village	4	11

I worked with IP to identify potential participants, ensuring a relatively even distribution of participants across all categories. I used a purposive sampling strategy, selecting participants for their diversity in ethnicity, age group, and residence experiences instead of their representativeness (Zyzanski et al., 1992). I used a loosely structured interview guide because of the flexibility it allowed to explore relevant aspects of people's lives (Rubin & Rubin, 1995). Interview questions focused on conceptions of development, motivations and barriers for living in or outside of Mokgacha, whether they perceive that life is getting better or worse and why, and the role of village leaders in village life. I stopped after 30 interviews when I felt I adequately understood the themes associated with residence choice (Guest et al., 2006).

2.6.2.5. Cultural and historical interviews

I conducted unstructured interviews with 29 cultural representatives concerning historical and recent movement of groups of people, perceived changes in elephant populations and movement, and origin stories of elephants (Table 7). In unstructured, open-ended interviews, the researcher relies on an interview plan, but is more conversational in nature since participants are allowed to guide the interview in different directions (Bernard, 2006). Because I wanted to understand perceptions on longitudinal change, I targeted people who were over the age of 50 when possible. In cases where the

interview content was extensive, in particular for developing an understanding of cultural totems and historical understanding, I conducted more than one interview with a person. In a few cases where I was unable to identify a Mokgacha resident with sufficient in-depth cultural knowledge, in particular for Bayeyi, Boga Khwe and //ani Khwe tribes, I interviewed representatives who reside outside of my study area. In these cases, I extended my interviews to representatives living in the nearest neighboring villages, specifically Mogotho and Seronga.

Table 7. Interviews conducted according to content, based on participants and their tribal identity. Total number of participants was 29, and some participants contributed to multiple different interviews.

Content	Tribe	# Participants
Early settlement (until around 1985)		
Movement and livelihoods	Bayeyi	3
Movement and livelihoods	BaHambukushu	2
Movement and livelihoods and group organization	Boga Khwe	3
Late settlement (1985-2017)		
Settlement of Mokgacha	Bayeyi	2
Settlement of Mokgacha	Boga Khwe	2
Building of Mokgacha	General	11
Land allocation process	General	2
General culture and livelihoods, totems, and changes in elephant populations, movement, and behavior		
Culture and livelihoods, totems, and elephants	Bayeyi	4
Culture and livelihoods, totems, and elephants	BaHambukushu	6
Culture and livelihoods, totems, and elephants	Boga Khwe	5
Culture and livelihoods, totems, and elephants	//ani Khwe	2

2.6.2.6. Cultural salience free listing

To better understand concerns of residents of Mokgacha, I conducted a cultural salience free listing (Bernard, 2006; Smith & Borgatti, 1997) with 20 representatives of Mokgacha, including church leaders, government representatives, model farmers, and others. After testing the question, "What are the major concerns in life for a person of Mokgacha," I found that respondents struggled with the concept of a free list, and I modified the question with a pre-cursor command, "Please list for me the names of cattleposts." Following this directive, people were then asked to free-list concerns for a person in Mokgacha. After they finished free listing, I confirmed with them that they had nothing else to add and in some cases asked follow-up questions about the order of things or why they may have left out certain responses.

2.6.2.7. Firewood harvest focal follows

Throughout the course of this field work, from December 5, 2017 through June 15, 2018, I conducted a series of firewood harvest focal follows (Alvard, 1993) whereby I identified 14 households of diverse geographic locations across all five associated *meraka* and across the village (Table 8) and followed them between 2 and 5 times total during firewood harvest. Most of the focal follows were with women (n=44) due to the gendered nature of firewood harvest. However, in order to better understand the diverse experience of firewood harvest, four focal participants were men who harvested either on foot (n=5) or with a donkey cart (n=5).

Table 8. Summary table of firewood focal harvests according to household location, date, and mode of transport. ^ harvests were on foot conducted entirely by walking, + means a *mokoro* through the Delta was involved for some aspects of transport, and * means that a donkey cart was used for transport.

Household location	Date	Date	Date	Date	Date
Mokgacha North	12/17/17^	2/4/18^	2/23/18^	6/6/18^	-
Mokgacha North	12/5/17^	2/7/18^	4/5/18^	5/29/18^	-
Mokgacha North	2/9/18*	5/31/18*	6/15/18*	6/15/18^	-
Mokgacha North	2/9/18^	5/27/18^	6/8/18^	6/12/18^	-
Mokgacha North	12/25/17*	5/30/18^	6/1/18*	6/13/18^	-
Mokgacha Central	12/22/17+	3/1/18^	5/31/18^	6/11/18^	-
Mokgacha South	12/8/18^	4/2/18^	-	-	-
Mokgacha South	2/5/18^	3/7/18^	5/26/18^	6/9/18^	-
Danga	2/13/18^	2/23/18^	3/5/18^	3/22/18^	5/30/18^
Danga	2/13/18^	6/10/18^	-	-	-
Tinxo	2/15/18^	2/28/18^	3/7/18^	3/21/18^	-
Kavumo	2/16/18^	3/2/18^	4/6/18^	5/30/18^	6/12/18^
Mawana	2/16/18^	3/2/18^	4/7/18^	5/25/18^	-
Nxiniha	3/2/18^	3/28/18^	4/6/18^	6/8/18^	-

I first sought informed consent with household heads I was developing a closer relationship with. I asked for permission to join them as they harvest firewood, agreeing that any firewood harvested by IP and myself would be delivered to their household following each focal follow. Once household heads agreed to participate, I agreed on a day and time to meet with the individual responsible for firewood harvest at their house. In some instances where the individual was unavailable to harvest firewood, I requested a replacement participant from the same household. For two participating households, I was only able to conduct two focal follows each. In one household, the primary harvester of firewood had a miscarriage, rendering her unable to collect firewood for several weeks. For another household, the primary harvester of firewood first expressed

disbelief that the results of the study would not be co-opted by the government to develop restrictive harvest rules. She then expressed that she would be too preoccupied caring for her daughter who had just given birth a baby. Both of these circumstances rendered the primary firewood harvester unable to conduct regular livelihood activities, but revealed interesting dimensions about firewood and culture.

I used a data collection sheet to record notes from the day, including weather, location, other firewood harvest participants, mode of transport (foot, *mokoro*, or donkey cart), tools brought (including headstraps, headwraps for cushion, and axes), and the most recent sign of elephants (including likely age of the sign and what kind of sign-dung, browse, footprints, etc.) [Appendix F]. Building from the methodological techniques used to quantify and categorize fish catches (e.g., Maunder & Punt, 2004), I quantified the firewood harvest, noting each species harvested according to three categories: "likely elephant-felled wood", "likely human-felled wood", and "other/unknown". With IP and in some cases the participant, we identified and separated each origin of wood felling and I used a 50lbs hand-held fishing scale to weigh each wood-felling origin category. The data collection sheet was refined over time to ensure that the categories I was asking about were relevant and to ensure that I was collecting data that would be useful later on. For instance, I first included just two categories for firewood origin (likely human-felled, and likely elephant-felled), but realized that it would be necessary to include a third category for other cases that were due to insects, rot, or other unidentifiable origins.

In most cases, it was easy to classify the origin of the firewood harvested. For example, a participant went to an abandoned agricultural field to harvest the remains of the now degraded wooden fence (origin: 'likely human-felled wood'). In other instances, we traveled by foot to the dry woodlands behind the village where elephants felled many of the large trees and people harvested smaller trees for construction poles, leaving behind tops of trees and branches. When I harvested with men with donkey carts, we often rode on their donkey carts out to denuded elephant pathways where large trees were broken at the stem or pushed over by elephants (Figure 7). In some instances, the origin of felling was extremely difficult to tell due to conflicting signs of evidence. In these cases, IP, the participant, and myself would discuss in detail all of the signs of felling and, using deduction, carefully classify each piece of contested wood before weighing [Appendix G]. Following our return to Mokgacha, I typed up notes from the harvest, ensuring to capture details of the harvest experience in narrative form, in addition to the quantified measures related to firewood species, weights, and time of harvest.

Figure 7. Harvesting firewood with a donkey cart in an elephant pathway.

2.6.2.8. Firewood harvest rapid survey

Throughout the course of the firewood focal follows and through participant observation, I learned the importance of firewood sharing practices and expectations, as well as the many ways that people modify their firewood collection behavior because of the presence of elephants. This led me to ask how widespread firewood sharing is, and whether some people are more likely than others to share firewood with others, or to be given firewood by others. Specifically, I wanted to understand the role of kinship and proximity in guiding firewood sharing practices. I hypothesized that people are more

likely to share firewood with their family who live nearby and are least likely to share with non-related family who live further away in the same village. In addition, I wanted to find out what time people harvest and why, expecting that elephants would be a dominant reason why people harvest firewood at the time they prefer.

To understand how widespread these firewood harvest and sharing practices are, I developed a rapid survey with a total of four questions [Appendix H]. Using the census results for people residing in Mokgacha, I stratified the population by gender and age (18-64, 65+) and randomly selected a list of men and women between the ages of 18 and 64 and men and women over the age of 65. I set 65 years old as the cutoff because it is the age of the pension, and also it was the lowest age in the range of people over 18 years old who do not collect firewood according to results from the census. I used a stratified sampling approach to ensure that key subpopulations were represented in the survey (Bernard, 2006).

I assigned each man and woman between the ages of 18 and 64 and over the age of 65 a random number and generated a list of participants, aiming for at least 50% of men and women 18-64 years old, and 100% of men and women over the age of 65. Sometimes multiple people from the same household were selected. People who were known to be currently residing out of town were removed from the list and replaced with other randomly selected names. I stopped when I reached over 25% of 18-64 year olds and 50% of 65+ (Table 9). In total, 14 people were unavailable to participate in the survey, though no one withheld consent for participation.

Table 9. Breakdown of firewood harvest rapid survey sample by population of Mokgacha.

Age group	Men	Women
18-64	n=21 (27% of 78 individuals)	n=32 (27% of 117 individuals)
65+	n=10 (52% of 19 individuals)	n=19 (61% of 31 individuals)

I approached participants in their homes or when I saw them around the village. I asked them if they had 5 minutes to answer questions about firewood harvest. Once they consented, I asked people about the last person who gave them firewood. If they could not think of anything, I asked the probing question, "Even when you're sick?" to try to elicit a response. I asked people about the last person they gave firewood to. If they could not think of anyone, I asked the probing question, "Even people who are sick?" to try to elicit a response.

I created four different cards to show the different kinds of relations between people: related neighbors, non-related neighbors, related family who lives on the other side of the village, and non-related people who live on the other side of the village (Figure 8). To ensure that each participant understood prior to beginning, I explained the different kinds of relationships on each card and encouraged participants to ask clarifying questions if they did not understand. The participant was asked to put the cards in order of relationships that are most likely to those who are least likely to share firewood with each other. In some instances, participants were blind and an oral explanation was given instead of showing the cards. They were asked, "What are the kinds of relations where people are most likely to share firewood?"

Figure 8. Conducting a firewood harvest survey.

In addition to asking about firewood sharing, I asked participants what time they collect firewood and why. If two times were given (ie. “9 or 10 am”, or “9am or 3pm”), I recorded the first reported time and followed up with the question “Why?” I also asked them if they go with other someone else to collect, who that person is, and why they go with that person. In some instances for the final question of “why do you go with someone else,” people used their personal relationship with the person they harvest with (ie. “Because she’s my wife”). In this case, I asked a follow up to clarify why they go with anyone at all and used that answer. I grouped all answers into nominal categories to facilitate analysis, but retained original responses for qualitative integration.

I disregarded the responses from the first six participants because I was testing the best ways to ask the questions, and I refined the survey instrument throughout the

first six respondents in order to be sure that I was asking what I thought I was asking and that they had understood the questions and that the answers reflected what I was hoping. For instance, I began by framing questions of who last shared firewood with you and who you last shared firewood with around "family" and I refined the question to ask about "relatives" instead since family can be expansive while relatives refers to people who are more closely related.

2.6.2.9. Government and other representative interviews

I conducted open-ended interviews with 14 government and nongovernment representatives to ask about perceived vulnerability and resiliency of residents to elephants in my study area. I used an open-ended approach because of the different domains of interest and expertise of the representatives (Bernard, 2006). Participants included government representatives from the Tawana sub-Land Board, Department of Forestry and Rangeland Resources, Department of Wildlife and National Parks, the Seronga Health Clinic, among others, as well as official representatives who are partly or not affiliated with the government, including the Okavango Community Trust, the village land overseer, the village *kgosi*, etc. In some instances, I conducted follow-up interviews in order to gather further information, in particular as my findings revealing key information concerning residential land allocation policy. These interviews were conducted in English, with exception of the *kgosi* and land overseer which were conducted in Setswana, and were carried out over the course of the entire second field season, from October 2017 through June 2018. Interviews that were conducted towards

the end of my research after April focused on my findings in order to understand how government officials and other representatives responded to my findings (Table 10).

Table 10. Summary table of interviews conducted with government and Mokgacha village representatives.

#	Title of participant	Location	Interview dates
1	Land overseer	Mokgacha	Dec. 21, 2017; May 29, 2018
2	Department of Forestry	Shakawe	Feb. 2, 2018
3	Senior Wildlife Warden, DWNP	Maun	Jan. 29, 2018
4	Principle physical planner (RAC)	Gumare	Mar. 13, 2018
5	Senior Wildlife Warden, DWNP	Seronga	Feb. 12, 2018
6	Social Services	Seronga	April 11, 2018
7	Kgosi Seronga	Seronga	Mar. 19, 2018
8	Tawana Land Board Representative	Seronga	Mar. 20, 2018; June 5, 2018
9	Okavango Community Trust (OCT) Mokgacha representative	Mokgacha	Mar. 29, 2018
10	Ministry of Youth, Sports, and Culture	Gumare	Mar. 12, 2018
11	Seronga Health Clinic	Seronga	Mar. 19, 2018
12	Department of Forestry	Maun	May 21, 2018
13	ODMP Principle Resources Officer	Maun	May 22, 2018
14	Kgosi Mokgacha	Mokgacha	Feb. 3, 2018; April 23, 2018; June 13, 2018

2.7. Data analysis

All data were collected using hand written notes only and typed up immediately into Microsoft Word or Excel files as soon as possible following data collection. This allowed me to determine if I had clearly recorded and understood everything, and provided me time to ask IP for clarification on responses or the meaning of words used. Additionally, this allowed me to fill in any additional details that I neglected to capture in my hand written notes. I relied on detailed descriptions of context and culture,

recording nuances of everyday interactions through participant observation, and I build thick description into the findings through the use of real-life vignettes to increase transferability of findings (Guba, 1981).

Data collected are a combination of quantitative and qualitative data. For qualitative data, I first transcribed field notes and interviews into Microsoft Word documents immediately following each interview or day. Since theory and data are inherently linked in a dialectical conversation (Ezzy, 2002), I analyzed all data over the course of the research process using an inductive and iterative approach to coding (O'Reilly, 2005). Throughout the data collection process, I created memos, reflecting on findings and the data collection process, to assist in the data interpretation process (Bernard, 2006; Gibbs, 2018). I integrated emergent results with methods, using a building, sequential approach to narrow in over time on theoretical and practical findings (O'Reilly, 2005). Using an ethnography-as-art combined with an ethnography-as-science approach (O'Reilly, 2005; Wolcott, 2005), upon returning from the field I coded transcripts and documents for key emergent themes related to vulnerability, adaptation, resource sharing, and settlement decisions that are reflected in the findings of subsequent chapters (Chowdhury, 2015). All reported names are pseudonyms to protect the identity of my participants.

Because of the nature of ethnographic studies and the small sample size of a single population, I relied largely on summary statistics as the main analysis for quantitative data. Summary statistics allowed me to show community and household composition, reveal patterns of village settlement, and describe firewood harvest

practices (Bernard, 2006). I similarly conducted chi-square tests of independence to test to for difference between sample populations in firewood harvest behaviors. I also used a Smith's Salience test to analyze cultural salience freelisting data (Quinlan, 2005).

2.8. Validating findings

I increased the credibility, trustworthiness, and rigor of my research in several ways. Primarily, throughout the research process I relied on peer debriefing to increase the credibility of my study, writing about emergent findings and sharing them with Ecoexist directors, committee members, and other colleagues to solicit feedback about the research process and to check interpretation (Moon et al., 2016; Wolcott, 1994). I ensured that the study design, participant selection, and amount of data collected were flexible as appropriate to allow for the refinement of theory and approach based on findings, increasing trustworthiness (Schensul & LeCompte, 2013).

I also relied on member checking towards the end of the data collection period to improve credibility and rigor of my findings. Member checking is a technique used to validate research findings with community members to ensure that the researcher has accurately understood the phenomena at hand (Janesick, 1994). Beginning from April 2018, when I felt I had begun to understand what was happening, in particular concerning issues related to resettlement and vulnerability, I would end formal interviews by retelling participants what I was finding and asking them when they thought about my findings. In this way, I was able to solicit their feedback and refine further my understanding of the factors influencing life with elephants. Before the end of

my time in Mokgacha, I gave a brief overview of my research to the community during one of their biggest *kgotla* meetings, held by the VDC in order to organize *ipelegeng* work opportunities for residents. I gave an overview of my research findings and opened up the floor to questions and comments about my work and findings. During this meeting, I received no questions or comments.

Because of the extended nature of my time spent in the village and associated *meraka*, the number of firewood harvests I participated in and observed, I ensured credibility and dependability of both qualitative and quantitative findings concerning firewood harvest behaviors and practice (Moon et al., 2016). I increased credibility and dependability of the data by relying on multiple methods and data sources over long periods of time, a strength of the ethnographic approach (Schensul & LeCompte, 2013). I built quantitative methods from qualitative findings, increasing the validity of quantitative research results (Sale et al., 2002). I also triangulated findings, relying on complementary sources when possible, for instance policy documents and village development plans, to reveal convergent and confirmatory data (Guest et al., 2012).

Due to IP's cultural and situated knowledge, I increased internal validity by ensuring that my selected methods for data collection, for example semi-structured interviews regarding settlement decisions taking place in someone's household compound, were appropriate for use to answer a particular research question. Her situated knowledge of the community of Mokgacha also helped me to ensure that key participants were knowledgeable about a particular topic because they met certain criteria (Schensul and LeCompte, 2013). I increased construct validity by testing semi-

structured questionnaires with IP initially, and by refining questions throughout the interview process (ibid).

2.9. Limitations

Because of the nature of ethnographic research and my extended work over nine months in a single village, I did not seek to generate a representative sample of participants or to demonstrate that findings from my study are applicable in a different context. As a result of my focus on identifying and explaining a poorly understood phenomena, I am unable to extend the results of this study to other communities or even to make generalizations about life in Mokgacha village as a whole (O'Reilly, 2005). My study is therefore limited to key areas around vulnerability to elephants, firewood harvest and sharing and settlement patterns of Mokgacha village residents.

Furthermore, a serious limitation of this research is that I did not live in the village for a longer period of time due to the duration of the school year and the Fulbright grant, in addition to the expiration of my research permit that at the time was not renewable due to ongoing dialogue within the Government of Botswana. In particular, given that I did not stay in Mokgacha past June, I was only able to capture some of the seasonal dynamics that are critical to understanding HEI due to the proximity of elephants to Delta-proximate villages during the winter months, from May through November (Songhurst et al., 2016). I was able to get a glimpse of what HEI might look like during those months in January when the rain-fed water holes in the savanna dried up and elephants came right through the village, though that period only

lasted for a few days. Certainly, I would have learned about more types of HEI had my tenure in Mokgacha lasted through August instead.

Although I lived in the village and worked through a local interpreter, both of these approaches may have impacted my results. First, I lived in a house of my own, which limited my capacity to truly understand household dynamics, gender relations, and the like. I reduced this threat by engaging as often as possible in household activities and maximizing the types of activities in which I participated. Second, the choice of my house in North Mokgacha was an inherently political decision given that it made me, by nature, closer to BaHambukushu culture, and geopolitically furthest away from South Mokgacha and, by consequence, Boga Khwe culture. I tried to reduce this threat by intentionally selecting key participants from all sections of the village and all tribes. Undoubtedly, some of the closest friendships I developed were with Boga Khwe and Bayeyi women who lived in South and Central Mokgacha, and by spending time with them and their families in diverse activities, I ensured that my study speaks to diverse cultures and geographical aspects of life in Mokgacha.

Second, working through IP and relying on her to assist with language and cultural translation was a significant limitation. Because I was unable to communicate with most people in their language, interviews were likely shorter and less informative than had I been able to communicate directly with participants. Because the flow of conversations was interrupted and choppy, I struggled to ask follow-up and clarifying questions where I would have liked. Similarly, I was unable to understand much of what was happening around me in day-to-day conversation. I often had to request for

translation when we were sitting around within a family, and this limited the types of conversations I was privy to. This limited the extent to which I was able to integrate within the culture of the village and understand the various forces at play that remained both unspoken and invisible to me.

3. WHERE ELEPHANTS ROAM: RISK, VULNERABILITY, AND ADAPTATION DURING FIREWOOD HARVEST

3.1. Introduction

Mashe walked in the cattle tracks to reduce the effort needed to trudge through the deep Kalahari sands. She wore her black canvas flats, popular with the women in the village, worn through at the big toe. The path Mashe took passed behind her house and soon merged with a wide path cleared from frequent use by donkey carts and cattle. She stopped at her neighbor's house and waited for her cousin, Kabo, to join her. Kabo stopped what she was doing, ran inside her house to grab straps, and quickly joined behind her. They talked and laughed on their walk into the woodlands, passing by still-warm piles of elephant dung without comment. When they arrived at a site suitable for firewood harvest, Mashe dropped the rags for tying and cushioning the weight of bundles of firewood. She declared, "Let's collect," and began to push against a fallen log with her foot as the fulcrum, pulling back on an attached branch with her hands. For thorny species, she used a smaller branch to beat thorns off of the branches. After piling up enough wood, Mashe tied the bundle tightly with rag straps and hoisted the bundle onto her head. She made the return journey home, chatting with Kabo about the weather and their children to pass the time. This bundle she delivered to her elder mother's house, returning to her own home next door with nothing more in hand than the same rags she left with.

In social-ecological systems around the world people who are able to recognize and adapt to ecological or social change are thought to be less vulnerable to external threats (Maru et al., 2014; Miller et al., 2010; Smit & Wandel, 2006; Turner et al., 2003). People's ability to adapt to threats depends highly on local factors, including resource access, formal institutions, and cultural norms. External, top-down factors, including state policies and interventions like land reform, farming subsidies or social welfare entitlements, have mixed results for people's adaption to changing systems (Adger et al., 2013; Bryan et al., 2009; Stringer et al., 2009). Facets of identities of individuals, households, and communities, such as age, gender, ethnicity, and class, also play important, though often overlooked, roles in how people adapt to threats based on how they carry out livelihoods and interact with governing institutions (Carr & Thompson, 2014; Demetriades & Esplen, 2009).

For many people who live with dangerous wildlife, the chances of interaction with wildlife intimately shape how people behave, collaborate, and negotiate their environment. Human-wildlife interactions and their outcomes are thought to influence the successful adaptation of people and wildlife to each other. Mutual adaptation is the key to coexistence, long-term survival of wildlife, and improved societal wellbeing for people who live with dangerous wildlife (Carter & Linnell, 2016; Naughton-Treves, 1997; Redpath et al., 2015).

One crucial area of focus within human-wildlife interactions is that of humans and elephants. Negative HEI are problematic for both people and elephants. While much

of the literature on the human impact of HEI focuses on crop consumption and subsequent food insecurity of rural residents, elephants have been known to trample people to death. HEI threaten the lives and livelihoods of people and are an existential threat to the long-term survival of elephants in social-ecological systems (Mariki et al., 2015; Nelson et al., 2003; Oswin Perera, 2009).

Elephants, much like people, are long-lived and socially complex mammals, capable of collective knowledge building (Sukumar, 2003). Elephants respond to human presence, avoiding population dense areas (Pozo et al., 2017) and groups of people who historically hunted elephants (McComb et al., 2014). Elephants are more likely to approach rural villages at night when people are settled in their homes (Buchholtz et al., 2019). People, similarly, modify their livelihood activities and settlement decisions when elephants are likely to be present. For example, people may resettle in part due to the presence of elephants (Witter, 2013), and may reduce the time they spend in the outdoor environment collecting natural resources (Mayberry et al., 2017; Ogra, 2008).

Botswana, whose elephant population has tripled in the past twenty years to between 130,000 and 142,000 elephants, accounts for 37% of Africa's savanna elephant population (Chase, 2011; Chase et al., 2016). In northern Botswana, many people had never seen a live elephant prior to 20 years ago; now they are so ubiquitous that stories of direct human-elephant encounters are commonplace and life is shaped by the ever-present possibility of interactions between humans and elephants.

In southern Africa, trees are long-lived resources that reflect changes in social and ecological systems (Gillson & Lindsay, 2003) and are a central focus of this

research. Elephants depend on trees during the driest months, as their metabolism allows them to survive on leaves, bark, and roots (Owen-Smith, 1988). Elephants fell trees as they move through wooded landscapes, creating dried wood that men, women, and children can harvest readily for firewood (Buchholtz et al., 2019). Harvesting firewood where elephants may appear at any moment is risky and scholars have documented the invisible, emotional costs for people who harvest firewood where there are elephants, especially psychological trauma (e.g., Mayberry et al., 2017; Ogra, 2008). However people are not passive victims, as they perceive risk and can adapt to changing realities in order to reduce unwanted interactions.

The goal of this research was to explore how men and women safely access firewood in the presence of many elephants. Specifically, I asked:

1) During firewood harvest, how do facets of people's identities, specifically gender, ethnicity, and age, influence a) perceived risk to HEI, and b) ability to adapt to elephants?

2) Who is least likely to adapt to elephants during firewood harvest and how do gender, ethnicity, and age influence resulting vulnerability?

3.1.1. Perceived risk, adaptation and vulnerability to elephants

Scholars of HEI, including HEC, often focus on interactions around farming and crops. Elephants, likewise, are viewed as pests to be controlled. By shifting the gaze from HEC around crops towards HEI around other aspects of life, I suggest that it is possible to view elephants as a naturally occurring part of the landscape that is also an

environmental threat to people. Drawing from the natural hazards literature that focuses on lives and livelihoods vulnerability (Blaikie et al., 2005), HEI explores how social conditions and perceived risk mediate human response and vulnerability to elephants.

3.1.1.1. Perceived risk

Risk perceptions are the judgments that people make about the likelihood of harm negotiated through internal ideas of risk and through interaction with information (Lute & Gore, 2019). Risk perceptions are both emotional (e.g. fear, dread) and experiential (e.g., actual contact with the risk source) (ibid). However, risk is not exclusively perceived through an individual's personal values system (Starr, 1969), but can be shaped by social networks, in particular where people share space with wildlife (Wojcik, 2011). Because perceived risk is cross-scalar, influenced by broader culture (Boholm, 2003), institutional trust, communications, real and perceived benefits (Slovic et al., 2000), perceived risk is also thought to be a moral threat to society that serves to reinforce cultural borders (Lupton, 2006). By changing the way that society is organized, then, it is possible to change risk selection and perception (Douglas & Wildavsky, 1982).

Perceived risk has recently emerged as a critical factor influencing human-wildlife interactions for several major reasons (Dickman, 2010). First, perceived risk influences the sense of antagonism people feel towards wildlife and government authorities since perceived risk is not necessarily equal to actual risk of wildlife-related threats (Hill, 2004; Naughton□Treves, 1997; Naughton-Treves & Treves, 2005). Scholars explain this phenomenon in part by whether or not individuals feel they have

volunteered to engage with the risk factor (Starr, 1969). On the ground, this means that people's perceived risk from dangerous wildlife is often greater than the actual impact posed by dangerous wildlife to people or property (Naughton-Treves & Treves, 2005). In the same way that people may perceive more danger from large visible wildlife than small or politically invisible species, like mice or birds, people also perceive more threat from diurnal instead of nocturnal species (Hill, 2004). Additionally, people may perceive rare and devastating events to be most risky as compared to more frequent, small impact events (Naughton-Treves, 2001).

Taken together, HEI are just one important perceived risk for people in the Panhandle for some of the reasons explained above, and as explained in the first chapter of this dissertation, elephants are the second most salient problem for residents of Mokgacha, following unemployment. Because people perceive their risk differently and adopt different risk-mitigating strategies (Slovic, 1987), environmental and social conditions are constantly in flux. People may have a wide array of perceived risks that vary greatly based on socio-economic differences, including age, gender, and class, and they widely structure social-ecological interactions across a risky landscape, creating barriers and opportunities (Müller-Mahn, 2012). Although perceived risk does not always accurately reflect actual risk, perceived risk matters a great deal since social beings uniquely have the capacity to perceive and respond to risk in ways that can change both their environment and society (Slovic, 2000).

3.1.1.2. Vulnerability

Vulnerability to hazards is a progressive build up of root causes, dynamic pressures, and unsafe conditions, resulting in disaster when the hazard impacts people (Blaikie et al., 2005). Vulnerability is defined as the degree to which a system or part of a system can be harmed by a stress or threat (Turner et al., 2003) or when a system or part of a system is unable to cope with or adapt to negative socio-environmental changes (Pelling, 2011). In assessing vulnerability it is important to uncover why a system can be harmed in order to determine how to reduce vulnerability (Luers et al., 2003).

Vulnerability is thought to be comprised of five components: Livelihoods, wellbeing, self-protection, social protection, and governance (Cannon, 2008). Because individual identity mediates various aspects of these five components, individual identities are therefore central to conceptions of vulnerability. While women were largely kept hidden in research on conservation and development until Ester Boserup's seminal 1970's work (Boserup, 1970), they are now widely characterized by scholars as more vulnerable than men, resulting in broad (mis)characterizations of how men and women interact with each other and their surrounding social structures (Elmhirst, 2015; Mollett & Faria, 2013). In reality, men and women are impacted by development and conservation in different, but meaningful ways (Elmhirst, 2011), and a focus on the diversity of identities, including gender, guides us "to locate [human] responses in gender, race and class relations (Pease, 2016, p. 27).

In reality, facets of individual's identities intersect to influence the ways that they are vulnerable to environmental threats (MacGregor, 2009), and a focus on women's

vulnerability as part of a man/woman binary reduces complexity of identity in human-environment interactions, minimizing human agency and power (Djoudi et al., 2016). In addition, people can mobilize agency and power for change, sometimes through invisible adaptations (Cannon, 2008; Weisser et al., 2014). As a result, facets of people's identities intimately shape livelihoods, social roles and relations, and the flexibility afforded to people that helps them cope and adapt to life with elephants.

3.1.1.3. Adaptation

By employing a natural hazards lens to understand HEI, it is possible to explore how people adapt to the threat of elephants. People adapt when they reduce the chance of future harm and take advantage of possible opportunities caused by social or environmental change (IPCC, 2014). Scholars recognize that adaptation occurs across the social scale, from individuals, to households, and communities (Smit & Wandel, 2006). While people have been adapting to their environment for millennia, progressive and impactful adaptation is not always possible when change is uncertain and comes rapidly (Pelling, 2011). Because adaptation often requires fundamental changes to the structure of society, scholars recognize that some groups may adapt at the expense of others, creating winners and losers in the long term unless otherwise corrected for (Bernier & Meinzen-Dick, 2014).

At the local level, adaptations are carried out not just through material culture, like improved technology, but through social relations, practices, and values (Pelling, 2011). People who seek out external resources, such as long-term government support,

may be able to better adapt to new threats (Agrawal, 2008). However, given that government-provided support is often inequitable in distribution and local level adaptations depend on capacity and resources, facets of people's identities, including gender, age, ethnicity, and class, are central to shaping how they adapt to environmental or social threats (e.g., Rocheleau & Edmunds, 1997; Shinn et al., 2014). Adaptations may be unintentional and the result of other actions or stimuli, further confusing the question, "Who is adapting to what threat and how are they adapting" (Smit et al., 2000). Where people are unable or unwilling to adapt when exposed to perceived risk, people will continue to be vulnerable to that risk (Pelling, 2011). In this way, perceived risk, adaptation, and vulnerability are interconnected.

Much of our understanding of how people adapt to external threats has come from the study of climate change. However, people who more readily adapt can better coexist with landscape-scale threats, such as fire (Tedim & Leone, 2017) and wildlife (Treves & Bruskotter, 2014). Studies show that humans adapt to life with dangerous wildlife through behavior change and increasing tolerance (Carter & Linnell, 2016). No studies to date that have demonstrated how people adapt to life where elephants are an ever-present hazard.

In contrast to the dearth of literature on adaptation to elephants, a large body of literature explores how farmers *cope* with agricultural loss by elephants, for example by farming more fields, implementing novel protection techniques, diversifying crop production, or sharing food with relatives (Anuradha et al., 2019; Fairet, 2012; Naughton-Treves & Treves, 2005; Pozo et al., 2017). For people seeking government

compensation to cope with crop loss by elephants, gender of household head and household composition were influential factors for indirect reasons (DeMotts & Hoon, 2012). Other scholars have explored dimensions of coping with HEI external to farming systems. For instance, people negatively cope with HEI by restricting their time spent in outdoor livelihood activities with consequences for the quality of life of entire households (Mayberry et al., 2017; Ogra, 2008). Jadhav and Barua (2012) found that men cope with life with elephants by using alcohol and alcohol consumption by both people and elephants, in turn, can shape outcomes of HEI. Significant research is needed to understand if and how people adapt to their perceived risk of elephants to reduce vulnerability.

3.1.2. Firewood harvest and gender

Firewood is one of the most critical resources for rural, resource-dependent households around the world. Up to 89% of the population in sub-Saharan Africa still relies on firewood, dung, or charcoal for energy (Gaye, 2007). Firewood collection is labor intensive and the frequency with which it needs to be collected depends on numerous factors, including availability of wood, household size, and the season in places where cold winters may require additional firewood to heat homes (ibid).

Deforestation restricts firewood availability with serious consequences to household wellbeing (Sekhwela, 1997) since firewood scarcity can mean a reduction in the number of prepared meals or the kinds of meals prepared, increased time spent on firewood collection, and/or switching to less preferred species of firewood (Arntzen &

Kgathi, 1984; Kgathi & Mlotshwa, 1997). Firewood scarcity, therefore, has implications for household labor demands and food security.

In Botswana, firewood is the primary source of energy for rural households (Tietema et al., 1991) who account for over 50% of total firewood consumption (Sekhwela, 1997). In the Okavango Delta, people prefer some wood species for how they burn (Mmopelwa et al., 2009); however species used for firewood are largely a function of availability rather than preference (Kgathi & Mlotshwa, 1997; Tietema, 1993; Tietema et al., 1991). In rural villages around the Delta, firewood is often the sole source of energy and is infrequently purchased (Mmopelwa et al., 2009). When firewood harvest is combined with other livelihood activities, people may collect near agricultural homes (Kgathi & Mlotshwa, 1997) or *meraka*. Households in the Okavango Delta reported collecting only dead wood (Mmopelwa et al., 2009).

Men most often collect firewood alone while women most often collect in groups with male children (Kgathi & Mlotshwa, 1997). Previous studies show that women and children typically gather firewood into bundles of about 12kg to be carried on top of their heads, though some men may use donkey carts to carry heavier loads of up to 29 bundles weighing around 350kg (Arntzen & Kgathi, 1984; Mmopelwa et al., 2009). Small branches and twigs are less preferred to logs or larger branches, which burn for longer periods of time, and tend to be stockpiled instead of intentionally collected (Kgathi & Mlotshwa, 1997). One study found that a bundle of fuelwood lasts up to three days, except in the winter when the rate of use may rise up to 30% more (Mmopelwa et

al., 2009). It is usually women who make decisions concerning firewood management (Kgathi & Mlotshwa, 1997).

Because firewood is central to life for rural, resource dependent people, including people who share space with elephants, much remains to be seen about how people are vulnerable to elephants during firewood harvest. I seek to fill that gap and, by extension, explore how people adapt to elephants during firewood harvest.

3.2. Results

The pickup truck cabin was full by the time Mokoya arrived to collect firewood, so he rode in the back with a handkerchief tied around his mouth and nose because of the dust. It was 11 am and getting hot, but there were over a hundred guests attending his aunt's funeral, many visiting from out of town and they needed water, food, and more firewood to prepare food for all of the guests. They drove out to where Danga moraka used to be located, before the lions began to pick off the cattle. There used to be trees here−a tall woodland as far as the eye could see. Then the elephants started coming back, and now this is one of their most heavily used paths in the Panhandle. Big trees were pushed over, leafing out from likely dying trunks. Smaller trees were neatly pruned until only a few feet of stump remained. Mokoya and the other men in the cabin jumped out of the truck, landing in a sea of elephant footprints. It would be easy to see elephants approaching in the distance because there was no tree canopy left anymore, only a stump land. Mokoya pulled his ax out of the bed of the truck and he and the other men began to work on the abundance of dead wood, standing and fallen. In just an hour, they

had collected another pickup truck full of hundreds of pounds of just three species of high value firewood. Mokoya jumped onto the load of firewood, and they slowly returned to Danga where people were beginning to set up their tents for the weekend of funeral-related activities.

3.2.1. Firewood harvest in Mokgacha village

Firewood is a critical resource, not only as a raw material necessary for daily life, but also for its contribution to social and cultural reproduction. As a raw material, people in Mokgacha relied on firewood for every basic energy need. School-aged children and adults taking literacy or math classes relied on the light produced by fires to study at night. The smoke produced by fires also helped to keep mosquitos away, and families would often sit around the fire long after dark, telling stories and sharing jokes.

As a social and cultural resource, firewood proved to be necessary for funerals and weddings. Often family members and friends would visit from all around the country to pay tribute to the deceased or to celebrate the joining of two family members, camping for up to weeks at a time at the residence of the host household. A significant amount of firewood is needed to prepare the food, but also attendees sit around fires at night to share in the memory of the deceased and times past with others. Although there was no way to quantify the weight of firewood harvested for these events, the amount harvested for one funeral surpassed three pickup truck loads of mainly two high-quality firewood species (*Dichrostachys cinerea* and *Combretum collinum*) (Figure 9). In general, people were not concerned about restricting firewood management because they

did not perceive it as a highly limited resource, and it is unclear of what, if any role, elephant coppicing of trees may play in that perception.

Figure 9. Truck loads of firewood harvested for a funeral in a *moraka*.

Even when different species of wood were available, people did not harvest certain tree species for various reasons. These included old and new taboos, family custom, the physical properties and availability of the wood, and whether the wood can be used for higher value purposes. Taboos of all kinds were very common and impacted a wide range of social activities, from prohibiting a woman from attending church service during her menstruation, to foods that should not be consumed based on one's family totem. For firewood, seventy three percent of households reported not harvesting 36 different species of firewood due to taboos (n=73 of 101 households asked).

The most commonly reported taboo was for *Lonchocarpus capassa* (Setswana: Mopororo), for which 49 households from all ethnic backgrounds believe that something bad will happen to their cattle, even if their own household was not in direct ownership

of livestock. Consequences for breaking taboos by burning different species mainly centered around the health of livestock, themselves, or their family and friends. Two Boga Khwe households reported that burning of *Boscia albitrunca* (Setswana: Motopi) would bring lions to your house, while one BaHambukushu household reported that burning of *Ximenia caffra* (Setswana: Morokolo) would bring elephants to your house. I found one instance of the creation of a new taboo following a lightening strike that hit an *Acacia erioloba* (Setswana: Mogotho) tree and also killed four goats. The caregiver of the livestock, a young Hambukushu man, consulted his elders and they advised him to never again burn Mogotho wood. While one 42-year-old Boga Khwe man reported that Boga Khwe do not believe in taboos, I found that they were generally ubiquitous across ethnic groups.

One quarter of households (25 out of 101) were unable to recall why they are not supposed to burn certain tree species, reporting only that their elders told them not to (16% of reports of species not used for firewood). Ten households (10%) reported that they would not harvest from *Croton megalobotrys* (Setswana: Motsibi) because the smoke causes eyes to itch. In total, 29 households (29%) reported that 20% of unharvested species have a physical property that prevents them from harvesting from the species, including thorns on high value wood, or poor burn quality of low value wood. Finally, 27 households (27%) reported that they would not burn wood from species that provided alternative uses, including shade, fruit, fiber, and carving wood, representing 17% of reports of unused species of tree. One household head explained

that, “We don’t use fire to the food,” even when asked if they would collect from already-felled branches.

3.2.2. Risk perception, adaptation, and vulnerability in the era of elephants

Many key informants from the Panhandle believe that everyone who lives in the area is equally vulnerable to HEI. Even one government officer from the Seronga sub-Land Board told us that his chance of HEI was equal to everyone else’s, despite having a personal vehicle and government salary that allowed him to purchase food and fuel. This might be in part due to the common perception that, due to the work by government and NGOs on HEC focusing around food security, HEI is synonymous with crop consumption by elephants. As one older, well-to-do female resident of Seronga whose farm had recently been destroyed by elephants reported that, “Here everyone has a vulnerable life. For example, today I have nothing at my field. I’ll die from hunger. No one will look out for me.” Indeed, during the second field season, only two people out of dozens of people I knew who farmed were able to successfully harvest without any elephant problems. However, HEI comprise more than just agricultural outcomes and influence decisions that people make in everyday life.

The intersection of perceived risk, adaptation, and vulnerability play out throughout the year for activities such as firewood harvest. One day in June, a group of three women—neighbors who are distant relatives—went out to harvest firewood around 9 am. As one of the women, a 65-year-old farmer with cataracts setting in, excused herself to go to the bathroom, she saw an elephant camouflaged in the nearby brush.

"We were collecting and I saw something big like a shadow. I asked myself what it was, and until I saw something like tusks, that's when I realized what it was." She quietly and quickly ran to tell the other women. They all dropped their firewood and rushed back to safety of the village.

They returned to the spot an hour later to gather the wood they had left in piles, knowing that their chances of running into the elephant again in the same location would be reduced. I asked, as we sat in the sand outside of her home, "How will this change how you collect firewood?" I squinted into the bright mid-day sun as she explained, "We will just wait until the sun rises up, like noon. But we won't change our place." "Why not?" I pressed. She responded, "We're used to collecting there and there's plenty of firewood." She told me that what makes the location great is that elephants use the area often, generating a lot of easily accessible firewood. Her story was not unusual, and I explain how residents perceive their risk, adapt, and remain vulnerable to HEI during firewood harvest below.

3.2.2.1. Men and women have adapted to harvest elephant-felled firewood

The ways that elephants modify trees and woodlands provides new opportunities and challenges for Mokgacha residents. For example, elephants use their tusks to shred the bark of baobab trees in order to access the liquid-filled trunks of the trees. Women harvest this shredded bark and turn it into rope that they use to weave papyrus mats. In other instances, people reported increased conflict with elephants as they both compete for natural resources, especially wild-growing foods. One resident reported that, "The

elephants eat all these wild fruits and they uproot these wild fruits and trees. They push over the Mukuchum [*Diospyrus mespiliformus*] trees, and they even eat the tswii [water lily roots] in the water." However, for all Mokgacha residents, the shift towards harvesting elephant-felled firewood represents an overall reduction in the effort needed to collect firewood.

In 50% of firewood harvest focal follows (n=27), people collected exclusively elephant-felled firewood. In only 15% of firewood harvest focal follows (n=8), less than 50% of the harvested firewood was felled by elephants with the rest being sourced from human activity or other natural causes like insects (Figure 10). Between 90% and 100% of harvested firewood was generated by elephants in 33 out of 54 focal follows, and in 45 out of 54 focal follows more than 50% of firewood harvested was generated by elephants. Taken together, this indicates that in the majority of cases people are harvesting mostly elephant-felled wood. Human-felled wood was generally waste wood from trees harvested as construction poles, trees cleared from agricultural fields, or old fencing from agricultural fields. In no instances did people fell trees for the purpose of generating firewood. People did, however, on a few instances carry axes with them to make harvest easier. These situations were limited to men who harvested larger logs using a donkey cart, and a few women who used logs to bake *borotho*.

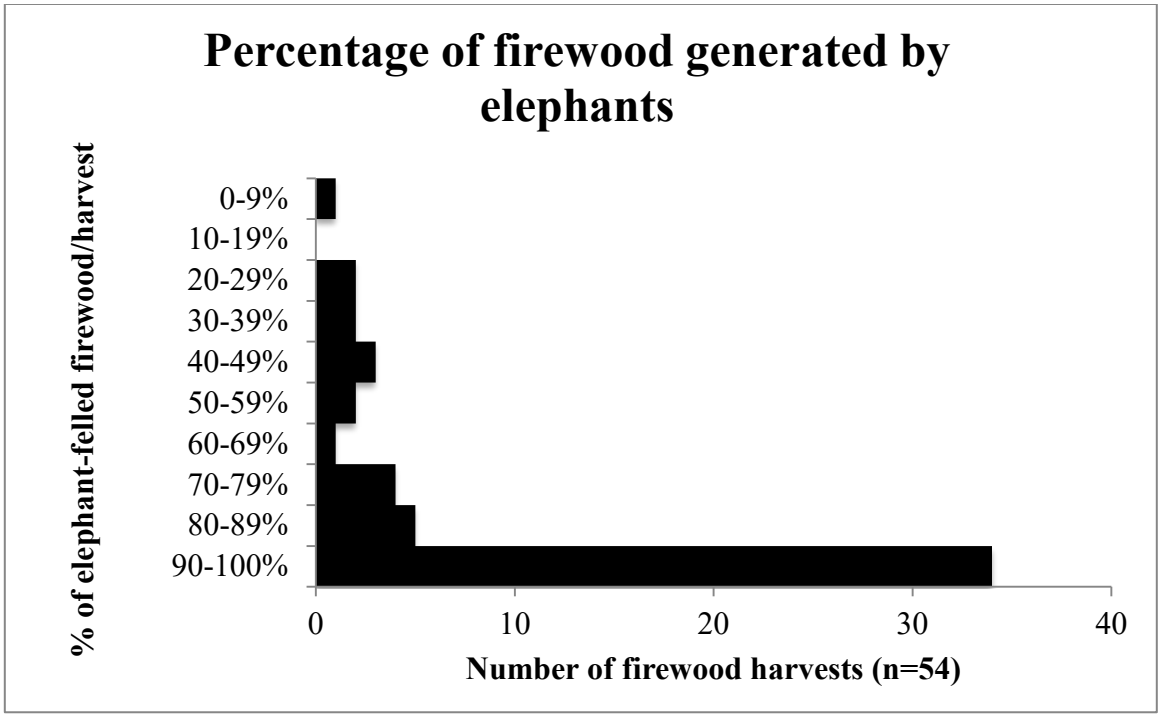

Figure 10. The percentage of firewood harvested from elephant-felled wood during firewood harvest focal follows.

It was so common for people to harvest elephant-felled firewood that they would often report that they harvest intentionally in elephant pathways. People were not referring to the most heavily elephant-trafficked paths where Ecoexist had placed signs along the road to indicate where people need to be most careful, but referring instead to places where elephants generally frequent, marked by elephant footprints, browse, and dung. With few exceptions, people used the term "elephant pathways" as a synonym for places outside of human development with obvious frequent use by elephants, symbolizing a binary separating people and elephants. The intention of harvesting elephant-felled firewood in elephant-trafficked areas illustrates how perceived risk is, in some ways, complemented by opportunity. By referring to how they harvest in elephant

pathways, people meant that they use resources left behind by elephants, ultimately making the most of a bad situation.

While everyone harvested significant amounts of elephant-felled firewood, gender, similarly, played a role in how men and women interact with their environment. Men harvested much more weight in firewood per trip than women (Table 11), due to harvests with donkey carts that, in one instance, allowed a man to harvest 300kgs with a single trip. One male participant from Mawana *moraka* carried firewood on his shoulders, making the short trip 3-minute to the *Colophospermum mopane* (Setswana: mopane) woodlands surrounding his home, collecting as much as 40.5kg of long *mopane* branches at any time.

Table 11. The average weight in kilograms and the average number of species of firewood harvested, by origin of firewood, according to gender of participants

	Average weight (kgs) of firewood harvested per focal follow			**Average number of species harvested per focal follow**		
Gender	**Elephant-felled**	**Human-felled**	**Other**	**Elephant-felled**	**Human-felled**	**Other**
Women (n=44)	18.4	4.1	0.3	4	1	0.2
Men (n=10)	92.5	1.75	0	2.4	0.2	0

Although women, who carry bundles of firewood back home on their heads, generally cannot carry as much firewood as men, one female participant harvested up to 39.25 kg at once with a 20-minute walk from the woodlands back to her house. This participant, a 42-year-old single mother, often shared firewood with her elder mother and was harvesting a lot of firewood to reduce the number of times she needs to harvest

during the week. Theoretically, people can reduce their risk to HEI is by reducing the time they spend outside of human settlements. It's possible, therefore, that people increase the quantity of wood they harvest each trip as a way to decrease their exposure to elephants, however we were unable to draw conclusions as all other women harvested less encumbering bundles, weighing between 7.5kg (min.) and 33.75kg.

In addition, women tend to interact with more species of trees than men, harvesting on average from 4 different tree species of elephant-felled wood as compared to men who harvested on average from just 2.4 different tree species of elephant-felled wood. In that regard, elephants facilitated the interaction of men and women with different tree species. Because women rely exclusively on walking as their mode of transport during firewood harvest, they are more likely to harvest with less discrimination in terms of size of firewood, harvesting smaller branches from diverse woodland species. Men, in contrast, tend to be more particular in seeking out locations where they are sure to find the heaviest and largest firewood, often from just a few species of high-quality trees.

3.2.2.2. Perceived risk influences when and with whom people harvest firewood

Gender and age were both important facets of people's identities that influenced both perceived risk and adaptations, cutting across time and company. As has been shown by previous studies on HEI, some people reduce the time they spend in the outdoors to avoid unwanted HEI. As one man from Nxiniha explained at the beginning of the winter season, "We are coming to a season where we'll interact with wild animals

and at that time you'll just stay where you are." However, staying put is not an option for most people who rely on the environment for a diversity of life-sustaining resources. In Mokgacha, most able-bodied household members collect firewood, including children as young as three years of age.

When people are left to cope following unwanted HEI, they may reduce their use of firewood in order to spend less time outside. For instance, a 61-year old woman from Mokgacha told me about an encounter she had with an elephant during firewood harvest. When asked how she was impacted by her experience, she told me that she momentarily reduced her firewood consumption. It took her three days to find the courage to go back out again, and now she only collects firewood with her sister. Because firewood is a basic necessity of life, she has teamed up with her sister to reduce the risk of unwanted HEI. People in Mokgacha perceive risk to HEI as both a temporal issue and one related to self-protection through groups, and I explain these below.

Elephant movement varies temporally, both seasonally and daily, and Mokgacha residents are very aware of safer times to conduct livelihood activities. When the December rains ceased and brought a hot and dry January, elephants came closer to human developments, walking right through the village and cattle kraals as late as 8 am and as early as 5 pm. People responded to this risk accordingly, checking with other residents about elephant movement and shifting their firewood harvest time closer to the middle of the day when necessary. This practice was more pronounced when elephants were moving close to the village, in particular during the winter months. On at least two occasions, a firewood harvest focal follow participant asked a fellow Mokgacha resident

if they had come from the direction we were heading and if they had seen the elephants we could hear rumbling in the distance. On both occasions, the fellow residents responded "no," and we carried out our firewood harvest on high alert for elephants.

Perceived risk shaped the times of day people regularly carried out firewood harvest. Most survey participants (95%) preferred to harvest between 8 am and before 5 pm, though a chi-square test of independence showed a significant difference between gender and preferred harvest times (X^2 (10, N=76)=26.07, p=.003) (**Error! Reference source not found.**). In practice, women tend to harvest firewood closer to the middle of the day, while men tend to harvest earlier in the morning and later in the afternoon.

Four men reported that they prefer to harvest at the tails ends of the day, including at 7:30 am, and after 5 pm, and none of those men incorporated perceived risk into their decisions for their firewood harvest times. The three men who preferred to harvest in the evening explained that they go at those times because it is on their way home from the kraal, so they can have firewood for the evening, while the 54-year-old man who prefers to harvest in the morning proclaimed, "I'm a man and I'm not afraid of elephants." In this way, gender also influenced whether people selected their firewood harvest time due to perceived risk to elephants. Using a chi-square test of independence, women are more likely than men to factor elephant movement into their decision-making (X^2 (1, N=77)=6.89, p=.0086) (Figure 12).

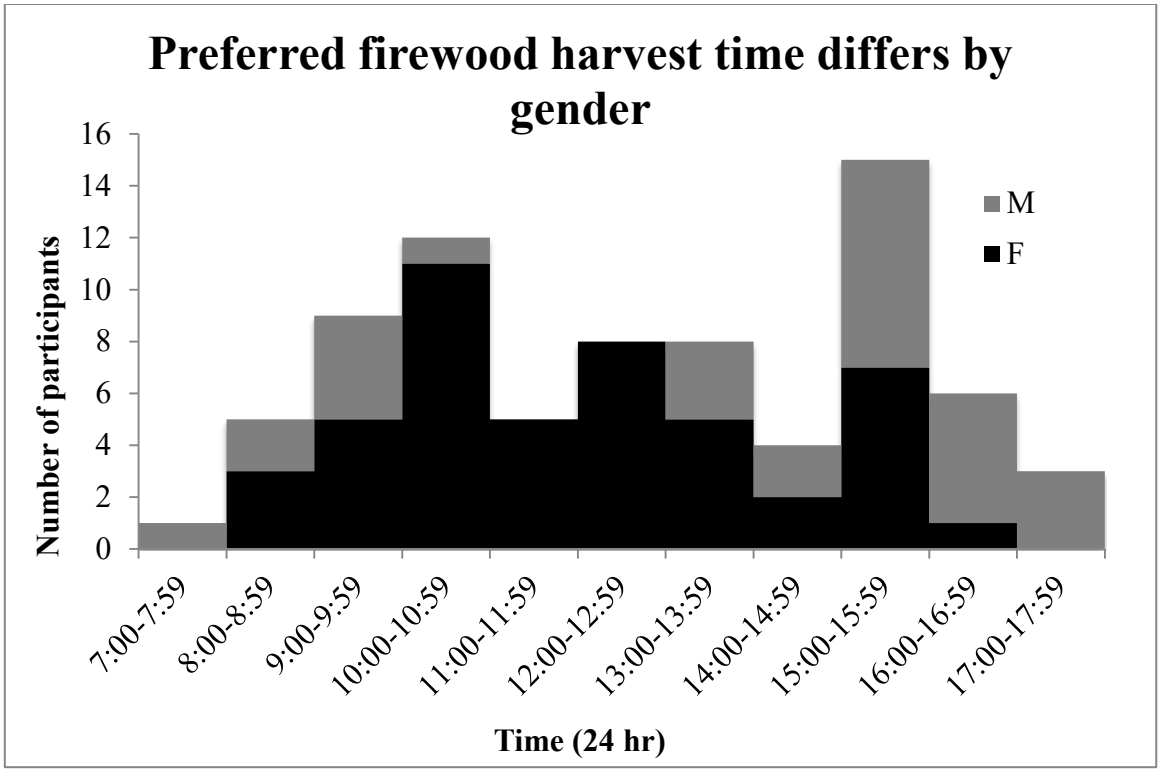

Figure 11. There is a significant difference between men and women for preferred firewood harvest times, X^2 (10, N=76)=26.07, p=.0036.

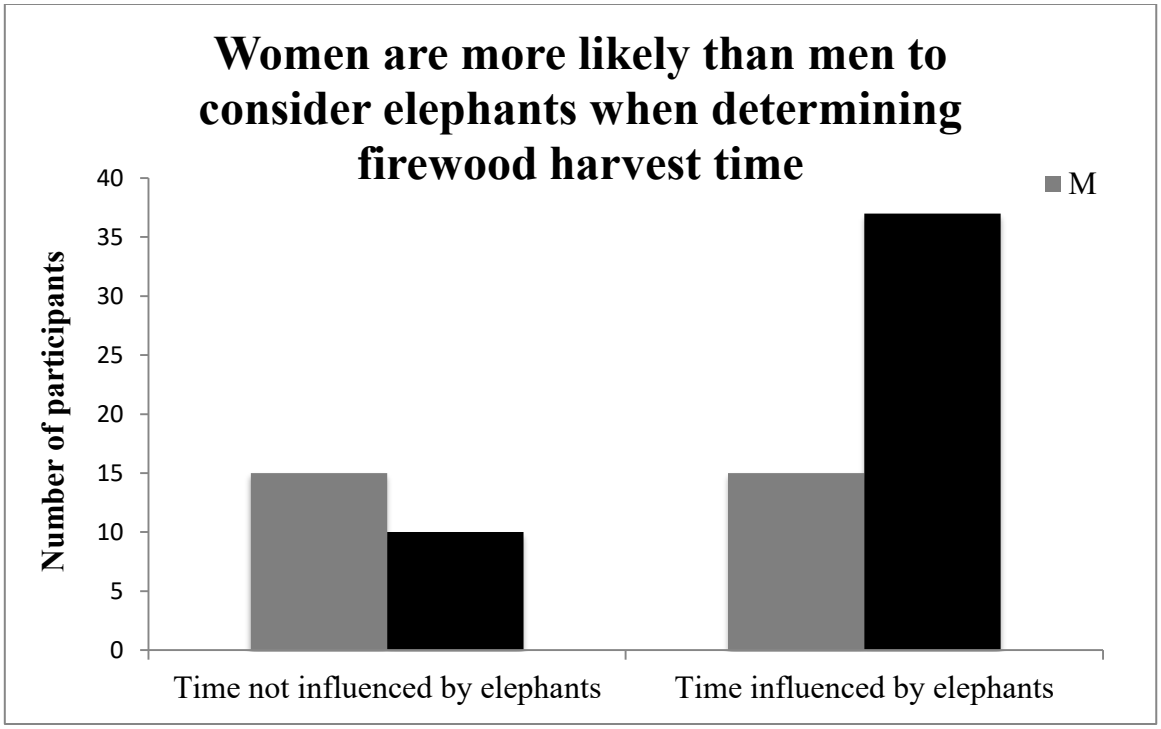

Figure 12. Women are more likely than men to cite perceived risk to elephants as the reason they harvest firewood at their preferred time, X^2 (1, N=77)=6.89, p=.0086.

Beyond perceiving risk to HEI through time, one practice widely used to reduce perceived risk to HEI was collecting firewood with others. Harvesting in groups allowed people to keep an eye out for danger, in particular elephants. Looking across the population, I found that age matters in whether one harvests alone or with others. In total, 71% (n=55) of participants harvest with others, and using a chi-square test of independence, I found that the elderly (71+ years of age) are more likely than other adults (18-70 years of age) to harvest alone (X^2 (1, N=77)=10.69, p=.011) (Figure 13). Although people across the ages stated that they simply had no one to harvest with, including a 21-year-old woman, this phenomenon impacts the elderly the most.

Although one 69-year-old woman explained that she collects with others because "I can't see properly and can encounter an elephant if I'm alone," another 76-year-old woman explained that, "I have no one to go with and am not strong enough to go long distances." For some elderly residents, age and ableness combine in this way to alienate them from the security of carrying out firewood harvest with others.

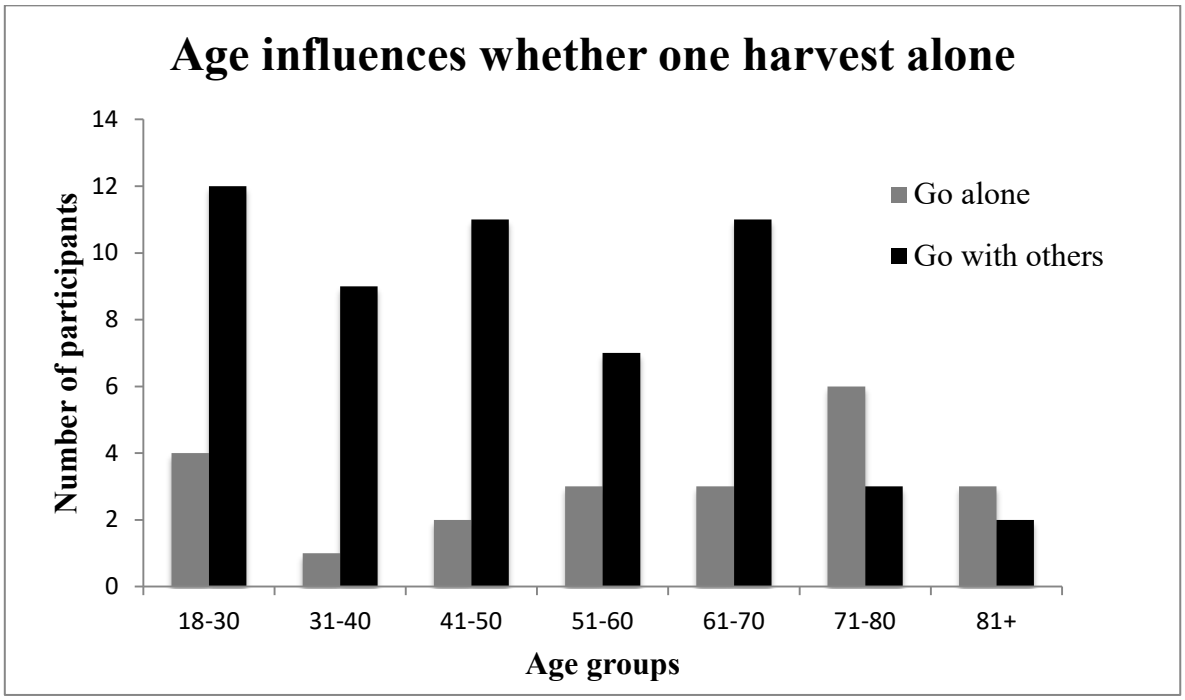

Figure 13. There is a significant relationship between age and whether one harvests alone or with others, with men and women 71+ years of age harvesting alone more often than men and women 18-70 years of age, X^2 (1, N=77)=10.69, p=.011.

In the same way that perceived risk influences the time that men and women harvest firewood, so does one's reasoning behind the decision to harvest alone or with others. For instance, one of the men, a 57-year-old, who collects firewood at 5 pm on his

way home from the kraal explained that he tries to go with his wife “to accompany each other because my wife has good vision and can see if elephants are coming.” In contrast, a 44-year-old woman who collects firewood at noon “to let the elephants go into the bush” explained that she harvests with others “to accompany each other because there are murderers.” It is the cultural norm for women to harvest all kinds of resources in groups, including reeds, papyrus, and wild fruits, though this practice may, at least in part, be related to general safety concerns for women. In fact, eight women out of 47 cited fear of murderers as one reason they harvest in groups, something that I overheard in conversations several times during firewood harvest focal follows. For some women, fear of other people, perhaps men, was a very salient issue, though this may also relate to the sometimes-unknowable circumstances around people’s tragic encounters with wildlife.

Of those who perceived risks from harvesting alone (41 out of 77), stated risks varied, and included those related to elephants specifically (61%), wild animals in general (17%), and to keep an eye out for danger in general (17%). Reasons given that did not related to risk included distances, being that some people went too far or not far enough and therefore could not find anyone to join them, to help with work in general, and the proximity of kraals with people allowing them to harvest with others. People, mostly women due to the fact that they relied on walking as their mode of transport, often harvested with neighbors, including family and friends. During firewood harvest focal follows, neighbors would often join, sometimes leaving with us from the village, but other times meeting up with us in the woodlands after finishing other chores at

home. In the same way that gender influences whether people consider elephants when deciding what time to harvest firewood, women are more likely than men to consider risk of elephants when deciding whether to harvest with others (X^2 (2, N=77)=10.25, p=.0059) (Figure 14).

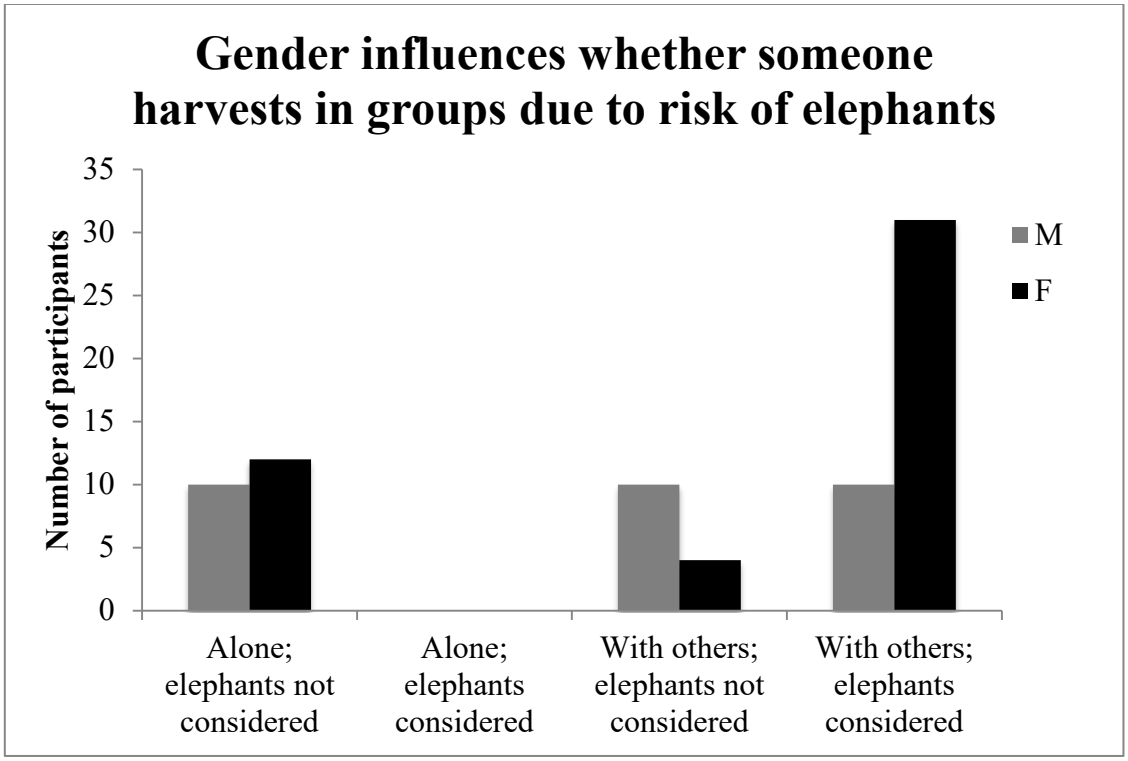

Figure 14. Women are more likely to consider risk of elephants when deciding whether to harvest alone or with others, X^2 (2, N=77)=10.25, p=.0059.

3.2.3. Vulnerability is influenced by age/ableness, ethnicity, and gender

3.2.3.1. Extended families reduce vulnerability for the elderly and disabled

Despite people's efforts to adapt to life with elephants by modifying the time of day they harvest, by going with others, and by reducing the effort needed to harvest by

collecting elephant-felled firewood, age and ableness remain critical factors influencing vulnerability to HEI (Table 12). As a DWNP officer from Seronga explained, "…most young people aren't having problems with elephants as compared to old people who can't see or hear well." Vision impairments, in particular, impacted a significant percentage of the population over 65 years of age. Six out of 29 people (20%) surveyed over the age of 65 were significantly visually impaired, often with cataracts. This meant that they did not carry out natural resource harvest activities, depending instead on others to share resources with them, effectively reducing their vulnerability to HEI.

The sharing of resources with those who may otherwise be unable to care for themselves, either temporarily or permanently, proved to be a lifeline for many. Resource sharing, in particular with nearby relatives, emerged as a critical theme throughout fieldwork. Predictably, survey participants ranked nearby relatives as the most likely to share firewood with each other, followed by nearby nonrelatives, far away relatives, and far away nonrelatives (Table 13).

The most vulnerable members of society often depended on nearby family for all kinds of resources, and firewood was no different. When asked who was the last person to give them firewood, 65% (n=53) of firewood survey participants (n=81) received firewood from a relative, while only two people received firewood from a non-relative, and 21 people couldn't recall anyone giving them firewood. In addition, the majority of firewood sharing occurred between households that either lived on the same compound or were immediate neighbors (Table 14), indicating that nearby family are the most reliable for resource sharing.

Table 12. Key findings showing how facets of identity play a role in livelihood dynamics, as well as how identities shape both vulnerability and adaptation to HEI.

	Gender	Ethnicity	Age and ableness
Key livelihood dynamics	-Women more frequently responsible for firewood harvest -Men care for cattle, especially at dawn and dusk in low population-density areas -Women concerned with all household maintenance chores	-Land use, including settlement patterns and agriculture, influence woodlands access -Traditional livelihoods associated with different ethnic groups influence access to different ecosystems	-Elders may have difficulty walking long distances and carrying heavy loads, though meet livelihood demands by collecting lower quality firewood -People with impaired vision and hearing often still contribute to firewood harvest for household
Key findings for how facets of identity shape vulnerability to HEI	-Men who care for cattle are more vulnerable due to visitation to HEI-prone areas at dawn and dusk -Men are more vulnerable to HEI because they are less likely to travel with others due to scattered nature of cattle *kraals* and ideals of masculinity	-Boga Khwe households more vulnerable due to settlement location with little access to open canopy woodlands -Boga Khwe households more vulnerable due to lack of access to high-visibility Delta islands because of traditional livelihoods	-Elders may harvest low-quality firewood from around the village and may be less vulnerable as a consequence -Visually or audibly-impaired individuals more vulnerable when harvesting in woodlands because they will not be able to readily identify elephant signs
Key findings for how facets of identity shape adaptation to HEI	-Women are more likely to collect firewood in groups to help with visibility -Women are more likely to harvest firewood in the middle of the day -All residents harvest elephant-felled firewood due to abundance	-None found	-Family members from neighboring households share firewood with elderly or impaired family members to reduce their exposure

Table 13. Rank order analysis according to what kind of relationship residents think is most likely to share firewood with one another (n=81).

	Rank 1	Rank 2	Rank 3	Rank 4	Rank value	Final rank
Nearby relatives	71	10	0	0	314	**1**
Nearby nonrelatives	8	45	25	3	220	**2**
Far away relatives	2	25	47	7	184	**3**
Far away nonrelatives	0	1	9	71	92	**4**

Table 14. The household distance between survey participant and the last person that gave them firewood, according to the number of survey participants, excluding those responding with >10 households' distance.

# Households distance	# of survey participants
Same compound	27
Direct neighbors	10
2	6
3	2
4	4
5	3
6	1
7	0
8	1
9	1
10	1

Although it is unclear whether people are sharing with relatives because they often live nearby or they are sharing with neighbors who happen to be relatives, family relations remain critical for resource sharing across generations. For example, a 30-year-old woman who lives with her own young children on the same compound as her elderly mother explained that, "When I have a head load of firewood, I separate it in half and

give my mom one half. She is old and she cannot go out to collect firewood alone. She just goes near the village." She clarified that her mother cannot walk long distances due to health problems, and were it not for her and her sister's provisioning of firewood to their mother, she would instead collect small twigs and branches from around the village. She did not specify that her mother would collect small twigs and branches because of elephants, per se, but because of the physical burden of carrying high quality firewood. Instead of going out to collect on her own, her daughters provisioned her with firewood right at home. This was an obligation shared between them.

Similarly, one 76-year-old Boga Khwe woman with vision impairments often depended on firewood delivered by her older daughter's boyfriend who lived in a nearby *moraka*. During one firewood harvest focal follow, I collected a headload of firewood with her 25-year-old daughter only to return to see that he had delivered an entire pick-up truckload, piling it up inside the compound outside of the kitchen fence. What we brought on our heads paled in comparison to the quantity that had just been delivered by pick-up truck, and it would likely last the family a week or more.

Other residents did specify that elderly family members would be more likely to interact with elephants if they had to collect firewood for themselves. As one 25-year-old woman living in Mogotho village claimed, "It will be difficult for old people to get their own firewood, or to fetch water like at Mokgacha where there are no standpipes. They'll be forced to go to the river. For young people, it's easy because they can see and hear [elephants] quickly, and older people have a harder time seeing or hearing [elephants]." By provisioning firewood to their elder parents, younger residents reduced

the need for elders to go out to harvest on their own. This reduced both the physical burden placed on elders and potential for risky HEI in the woodlands. Sharing of firewood with the elderly or people who are otherwise disabled, whether due to temporary or permanent circumstances, is an important informal, and currently unrecognized, social protection to reduce vulnerability to HEI.

3.2.3.2. Boga Khwe are more vulnerable than other ethnicities due to access

Where people harvest firewood also influences their vulnerability to HEI. This is ultimately influenced by where people have settled since people try to harvest as close to their home as possible. Firewood bundles can be heavy, sometimes over 30kg, and people strategically plan their harvest around where they are likely to find the best quality wood with the least amount of effort. For example, in the dry woodlands to the east of the village trees are less dense and the woodlands offer more of an open canopy, as compared to the wet forest-type that lines the Delta. There, wet soils permit lianas to grow over trees, significantly reducing visibility where elephants may be moving to access water.

Due to socio-political factors influencing land use through settlement patterns and agricultural development, ethnicity plays a role in vulnerability to HEI (Figure 15). North Mokgacha residents are predominately BaHambukushu (84.7% of households are BaHambukushu-headed) and they have significant access to open canopy dry woodlands to the north and east of the village. Central Mokgacha residents are predominantly Bayeyi (83.3% of households are Bayeyi-headed) and they have access to open canopy

woodlands to the east of the village. South Mokgacha residents are predominately Boga Khwe (57.1% of households are Boga Khwe-headed) and they were relatively unable to harvest in the open canopy woodlands to the east of the village due to a high concentration of agricultural fields surrounding their residence locations. Instead, they harvest in the closed canopy wetland forest that lines the Delta where visibility is low.

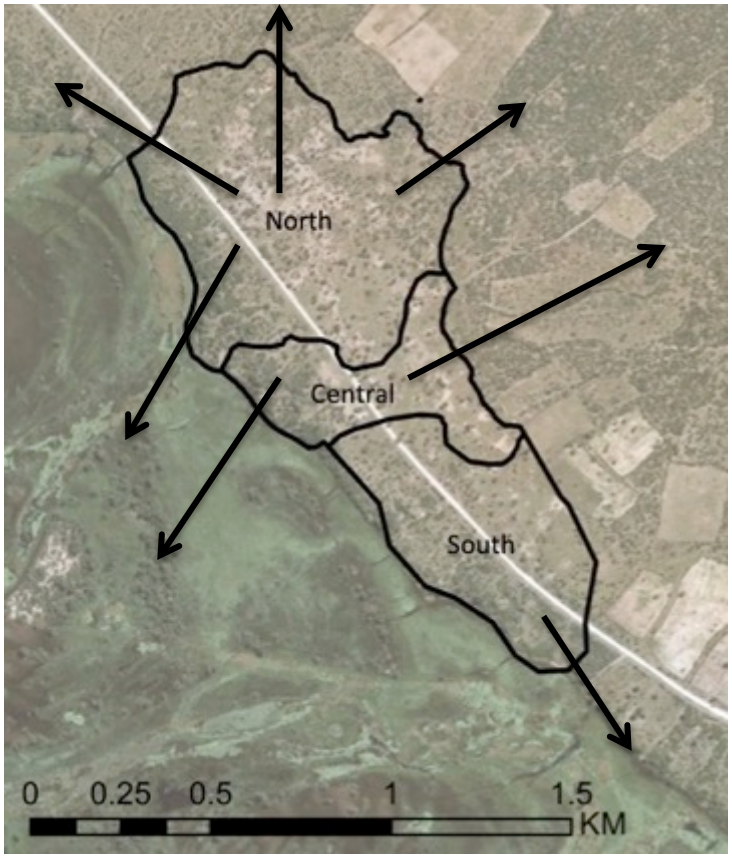

Figure 15. Traditional settlement of the village by ethnicity influences access to firewood harvest locations based on historical settlement patterns and ethnically-divided livelihoods.

Ethnicity did not just influence vulnerability due to limited access driven by settlement patterns, but also through livelihoods. Although most livelihoods are generally common across all residents regardless of ethnicity, net fishing is not a traditional livelihood of the Boga Khwe and only one Boga Khwe resident that I was aware of was able to use a *mokoro*. This restricted the ability of Boga Khwe residents to access Delta islands during high flood season where visibility is high across the floodplain and vulnerability to HEI low. This issue was not as critical for BaHambukushu and Bayeyi women who were known to harvest in the Delta islands, borrowing canoes from relatives to cross deep water channels. In both of these ways, through settlement patterns and livelihoods, ethnicity influences woodland access and therefore vulnerability to HEI even for people of different ethnicities living in the same village who might otherwise have a similar profile.

3.2.3.3. Men, livelihoods, and conceptions of masculinity

Gender plays a critical role in perpetuating vulnerability to HEI in two key ways. First, people often combine firewood harvest with other livelihood activities. For example, women walk into the dry floodplains to cut thatching grass and reeds during the dry season from August through November. Many women walk out into the floodplains each day to cut, leaving their grasses and reeds to dry and only bringing their bundles home once all of the harvest has been finished at the end of the season. Instead of returning home empty handed each evening, they often harvest firewood in the Delta islands on their way home. In addition, as one DWNP officer explained, “At the end of

winter, towards summer, people will [illegally] burn grasses in the Delta, which helps give them access to the islands, but it helps them with visibility to see any dangers around them." Because of the visibility across the Delta's floodplains, in particular after people have burned the grasses, women can usually see elephants in the distance and change their path to reduce any unwanted interactions.

In a similar way, men who care for cattle will leave their homes before sunrise each morning to make their way to their kraal where the cattle they care for, either for themselves or for local elites under the *mafisa* system, are penned up each night. They may go alone, with neighbors who have nearby kraals, or with their male children to teach them how to care for livestock. Usually they walk, but sometimes they may ride horses or donkeys. While at their kraals, men have any number of responsibilities. For example, first thing in the morning men separate nursing cows from their calves. Using a rope to tie the back legs of the cows tight, they will milk the cows' swollen udders. Each evening before sunset, men head back to their kraals to pen up their cattle. Men may combine firewood harvest at these tail ends of the day with tending to livestock. Because elephants tend to approach settlements in the night and due to poor visibility when the light is low, men who tend to cattle are vulnerable to HEI because they are often outside of their homes when it is still dark outside (Figure 16). This has important consequences given that in the winter months of 2018 shortly following the conclusion of fieldwork, at least two men and one young boy were trampled to death by elephants moving between the *moraka* and Seronga village in the early hours of the day.

Figure 16. Often men tend to cattle at 6 am when it is still very dark outside.

For men, traditional cattle-based livelihoods combine with their tendency to travel through the woodlands alone, as one DWNP officer in Seronga told me:

> Going out alone poses the biggest threat, and we get reports of missing people, but no one can say where they were or what they were doing. Actually, men are at greater risk [to dangerous wildlife] because they think they're brave and they go alone, while women go in groups.

Often, men did recognize that it is safer to go out in groups. For example, as one male participant explained, "For firewood, we just go into the bush and collect. But before you go you tell your neighbor, 'my friend, let's go and collect firewood.' And you go and share with your neighbors who don't have." Similarly, a 65-year-old man and a 24-year-old man, alike, both mentioned that they collect firewood on their way back home from the kraal. Both men travel in the company of family and friends with neighboring kraals, reducing their vulnerability to HEI. In contrast, one 21-year-old man

explained that he collects by himself on his way home from the kraal because, "People are busy with their own work at home." Taken together, the dispersed nature of cattle kraals means that men are very likely to travel alone at dawn and dusk when they are more exposed to HEI.

Instead of relying on other people to help keep an eye out for elephants, men instead sometimes carry long-barreled guns when they go out into the woodlands or Delta, which, as the DWNP officer pointed out, may or may not be licensed for personal protection. However, he noted, they are generally not the correct caliber for killing elephants, and "it puts them actually at greater risk because of aggravated injury to animals which means only that they [wildlife] get angry and can kill people." Combined with exposure to HEI due to cattle-based livelihoods, conceptions of masculinity and ideals of how men are "supposed" to act brave, as exemplified by the 54-year-old man who declared himself to be "a man" and therefore "not afraid of elephants," may exacerbate gender-specific vulnerabilities to HEI, with potential implications for long-term support for elephant conservation.

3.3. Discussion

Omphile finished patching the inner tubes for his donkey cart by 9 am. He needed now to track down his donkeys. He first located their most recent hoof prints in the sand, and then tracked them down to a weedy open space in the village not far from his house. Once the donkeys were harnessed, he jumped into the cart and sped away, telling his blind mother-in-law that he would return home shortly. Using only a stick held over the

heads of the donkeys and an occasional call to keep his donkeys moving, Omphile pulled out onto the main dusty road, and turned south. He passed one moraka, greeting his friends, and at the start of the next moraka, pulled off the main road into deep sand, the donkeys straining at their harnesses. He skillfully navigated his donkeys around downed trees and branches, ultimately stopping halfway to the Delta. Elephant footprints surrounded him everywhere in the sand. This was without a doubt an elephant highway. Just a few trees were left with their canopy, while most of the trees had been knocked down, left to resprout at cattle browsing height. Omphile took out an ax and began cutting larger logs into smaller, more manageable sizes. Here there were only three species of trees, and he collected over 100 kilos from all three. After the wood was loaded up, he pulled hard on the donkeys' mouth bits, eventually succeeding in turning them to the road. He drove back to the village, stopping first at his mother's house to give her half of the harvest. Back at his house, Omphile unloaded the cart next to the mango tree outside of his compound. Eyeing the harvest, he estimated that it would take them a week to finish this supply of firewood. Since he will begin his monthly rotation as a security guard at the VDC compound this week, his wife will be solely responsible for collecting firewood for the rest of the month. Her harvests will not last as long, maybe two or three days, since she will harvest on foot in the woodlands behind their house and take what she can carry on her head.

Firewood harvest is an understudied component of HEI. Elephants both facilitate the availability of downed wood and represent an unpredictable hazard for people as they navigate the environment. People's identities play a role in how they perceive risk

to HEI and are vulnerable to unwanted interactions that have the possibility to end tragically. Gender plays a critical role in shaping risk perception for two reasons: time of day that men and women harvest firewood, and gender norms that shape whether people harvest firewood alone or in groups. Men are more vulnerable than women due to cattle-based livelihoods that require men to leave the safety of the village at dawn and dusk. Men also are less likely to harvest firewood in groups, due to ideals of masculinity concerning how men are supposed to 'be' and the nature of cattle-based livelihoods.

Gender is not the only identity that impacts vulnerability to HEI. Ethnicity mediated the ways that people interact with the environment, both due to settlement patterns that dictate woodland access from one's house as well as in the overlapping of traditional livelihoods that can allow people to access varied ecosystems that are either preferred by elephants or reduce visibility. Similarly, age influenced vulnerability. The elderly and those with hearing or vision impairment may be less likely to see or hear elephants but are also less likely to find someone with whom to harvest firewood. However, due to cultural values that encourage resource sharing, family members are able to buffer the vulnerability of elders. Kinship networks remain critical lifelines for those who live with elephants.

Vulnerability, however, is not necessarily a permanent condition. People may be vulnerable because of temporary circumstances that render them unable to continue the regular care of their household. Vulnerability to HEI is temporal, both seasonal and daily, and is exacerbated by compounding livelihood demands, and broader ecosystem changes that influence how people make decisions around firewood harvest.

In this regard, we found that people are actively employing a suite of adaptation strategies in order to reduce their vulnerability to HEI, and identities are central to their strategies. Like numerous other studies on firewood harvest, we found that women are most frequently responsible for maintaining household firewood supplies (e.g., Agarwal, 1986; Kgathi & Mlotshwa, 1997). Women have adapted in a number of ways that help protect them against HEI, including harvesting in groups with other women, but also changing the time of day they harvest. Although men harvest firewood less frequently than women, they are less likely than women to employ advantageous self-protection measures, like going in groups or shifting their livelihoods towards the middle of the day. This is also the first study I am aware of that shows that people are adapting to life with elephants by collecting elephant-felled firewood. Both men and women targeted places where they knew they would find elephant-felled firewood. Without elephant-felled wood, firewood harvest likely would require more tools and time, meaning that people would be more vulnerable to elephants in the woodlands.

Although I did not explicitly examine the role of class in mediating vulnerability to HEI, future research should incorporate additional elements of intersectional identities to understand how people navigate HEI under different economic circumstances. For instance, some people harvest firewood with pickup trucks, and in the neighboring village of Seronga, a handful of industrious individuals have developed an informal firewood market. Additionally, future research should continue to deepen our understanding of the many different facets of HEI that surmount the cost/benefit approach for understanding how rural residents share space with elephants. Cost-based

approaches simplify how HEI are understood and shape the kinds of solutions presented for mitigating the impacts.

3.4. Conclusions

Xere lay on a thin foam mattress in a makeshift shelter next to her mother's home. Xere, 25 years old, was the pre-kindergarten teacher in the village. Ever since her miscarriage, she was impacted by the numerous fertility taboos believed by all tribes, not just Boga Khwe: she was unable to touch even her own young child, unable to eat the sour milk and porridge that the rest of her family eats, and obligated to remain in this outdoor shelter for two weeks. Even though the walls of this shelter are almost non-existent, built into the compound wall on one side and carefully stacked bundles of reeds on the other, she slept outside for two weeks in the cold winter nights. If she could stay in her mud hut, she would be able to stay warm at night without fire, but here she needed a constant burning small fire by her bed to brave the cold nights alone. Here Xere stayed with little more than some adult literacy coursework to keep her mind off of the loss of her anticipated child, receiving only occasional guests. Her blind elder mother, young daughter, and close family all relied on the firewood provided by her older sister's boyfriend who lived at the moraka and visited with a pickup truck a few times a week. He delivered large loads of elephant-felled firewood collected near his home.

Conceptually, risk perception, vulnerability, and adaptation are useful to understand how people reduce unwanted interactions with elephants and wildlife more generally. More research is needed to understand how diverse dimensions of livelihoods,

in particular those that vary across space and time, are impacted by wildlife. Agencies that work on various aspects of human-wildlife interactions should identify, support, and promote local and effective adaptations, including resource sharing and collective resource harvest groups given the importance of collective efforts at reducing HEI.

Practically, two key interventions may be worth exploring, including energy diversification and traveling medical clinics to target vision and hearing loss. First, more work is needed in the sustainable rural development and energy diversification field. Alternative energy options may help reduce people's vulnerability to elephants in particular during the winter months when human-elephant interactions tend to peak. Secondly, issues of vision loss from cataracts and general hearing loss are common health problems with big consequences where people live with elephants. Simple medical interventions, like cataracts surgery or the provision of hearing aids, may help the elderly age better despite other challenges accompanying rural life in Botswana.

More broadly, by exploring mediating factors in vulnerability to HEI, I show that identities, including ethnicity, age and ableness, and gender, can shape perceived risk to and potential for HEI. Of particular interest to me is how scholars often characterize women as the most vulnerable to natural hazards, and similarly, previous studies reveal incalculable costs born by women during livelihood activities in an elephant landscape (DeMotts & Hoon, 2012; Mayberry et al., 2017; Ogra, 2008). However, this study shows that women are less vulnerable to HEI because they have adapted in gender-normative ways, due both to group-oriented livelihood strategies and general flexibility of their natural resource-based livelihoods. Men, by and large, have been overlooked in the

literature on vulnerability to HEI, but this is a promising avenue of research given that the continued ability for local communities to live with elephants *necessitates* co-adaptation by the entire community.

More attention is needed to understand how gender dynamics play out in wildlife-rich and hazardous social-ecological landscapes. Beyond gender, studies that explore vulnerability through intersectionality have the potential to offer important insights to understand how people may experience layers of vulnerability. Scholars currently understand very little about how facets of identities interact to create vulnerability "double jeopardy". Future research should seek to build an intersectional approach to understanding social dynamics in wildlife-rich landscapes to improve our understanding of vulnerability and adaptation. Extending beyond vulnerability and adaptation, future research should test the linkages between people's ability to adapt and their tolerance for sharing space and resources with wildlife.

Following this research, there have been several instances of people being trampled to death by elephants in the Eastern Panhandle. Most of those instances were men who were walking between the *moraka* and the village in the early morning hours. Elephants are quickly becoming the most dangerous animal for people who live in the Panhandle, and this may further threaten public support for elephants in Botswana. Even a single HEI event that ends in injury or death has the potential to amplify the sense of insecurity for people who share the landscape with elephants. This may result in the amplification of perceived risk (Kasperson et al., 1988) to elephants by Delta residents, and may ultimately reduce tolerance for sharing space with wildlife (Carter et al., 2012).

Messaging in rural villages should be clear about what is meant by vulnerability so that vulnerability is not equated with weakness. Governmental and nongovernmental organizations should aim to find novel ways to promote safety, in particular around cattle-based livelihoods, and rethink top-down approaches to livelihood development, and land use and settlement policy. Conservation interests should focus their efforts on developing a better understanding of the often-hidden dimensions of vulnerability and build solutions that reinforce culturally relevant adaptations.

4. THE STATE, THE VILLAGE, AND THE ELEPHANT: DRIVERS OF RURAL RESETTLEMENT AND VULNERABILITY

"When the elephants come, if your neighbor isn't there and you need help, it can mean you're alone with the elephants. You might have to walk a long distance to ask for things from your family and that can be hard."

- Seronga Deputy sub-Land Board Secretary

4.1. Introduction

Since the 1970s, researchers of human-environment interactions have increasingly looked at the drivers and effects of rural migration, including rural-rural and rural-urban movement, both permanent and temporary and within national and cross-national borders (Adamo & Izazola, 2010; Qin, 2010). Movement across large and short distances is intricately linked to changing social and environmental conditions and has long been a human strategy for survival of difficult times (McCabe, 2010). Changing climatic and weather events, demographic pressure and international economic changes are thought to trigger the movement of people between cities and rural areas in search of opportunity, driving agrarian and environmental change in dynamic ways (Barrios et al., 2006; Carr, 2009; Greiner & Sakdapolrak, 2013).

People who are historically mobile or live outside of state-supported settlements may resettle as development and conservation programs and policies reach them, pushing and pulling people into "desirable" locations (Hitchcock & Ebert, 1989;

Milgroom & Spierenburg, 2008; Witter, 2013). Effects of rural resettlement are wide-ranging, spanning the breakdown of social order, what Cernea (2000) calls social disarticulation, changes in access to land and natural resources (e.g., Artur & Hilhorst, 2014; Hoole & Berkes, 2010; Woodhouse & McCabe, 2018), and changes in risk to environmental hazards or threats (e.g., McLeman & Hunter, 2010; Warner et al., 2010), among others.

Researchers of HEI who study elephant movement in social-ecological landscapes have revealed numerous ways elephants modify their behavior when people are present. Elephants alter their speed of movement across human-dominated landscapes and modify the time of day they visit certain areas where HEI is more likely to occur (Graham et al., 2010). Elephants tend to approach human settlements more closely at night when people are likely to be inside their homes (Buchholtz et al., 2019). Elephants prefer to use timeworn pathways further away from high human-population dense areas (Songhurst et al., 2016). Comparatively, little is known about how people make decisions when they are vulnerable to HEI.

People at risk to HEI are resource dependent, rural residents who live at the intersection of global demands for elephant conservation and mixed local, national, and international demands for rural development. Previous research has shown that people who live with elephants make settlement decisions based on various push and pull factors. For example, people may be pulled away from their former settlements in protected areas replete with elephants and other protected wildlife into desirable locations by government initiatives offering new housing developments and other basic

infrastructure and opportunity (Milgroom & Spierenburg, 2008; Saugestad, 2005). People might be pushed from their former settlements because of the creation and reinvestment into high tourism-value protected areas (Koot & Hitchcock, 2019), increasing militarization to protect wildlife and protected areas (Hitchcock, 2019; Witter & Satterfield, 2019) or due to increasing elephant populations that make them see their future there as untenable (Witter, 2013).

No country in Africa has experienced increases in elephant populations like Botswana. Botswana is currently home to one third of all of Africa's savannah elephants (Chase et al., 2016), and in the Panhandle, Botswana, elephant populations have tripled in the past twenty years. At a population of 18,000 individuals, elephants currently outnumber the 16,000 people that live there, too (CSO, 2011; Songhurst et al., 2016). While most elders from the Panhandle grew up seeing occasional signs of elephants, such as footprints or dung in the sand, it was only recently that many have seen their first live elephant. For residents of the Panhandle, this is the era of elephants. In light of the recent designation of Mokgacha as a village, a settlement that at the time of the research offered few amenities that might draw people to settle in the village, the objective of this research was to document the relationship between resettlement decisions, state policy, and resident vulnerability to elephants. Specifically, I asked:

Q1: What are the drivers and barriers of rural resettlement in the era of elephants?

Q2: What is the role of the state in guiding the practice of resettlement?

Q3: How does rural resettlement influence resident vulnerability to elephants?

I situated my research in the scholarship of state-building policies, rural lives and livelihoods, and HEI (Figure 17). I build my work from insights developed from the fields of political ecology, anthropology, and development studies, and explore their connections below.

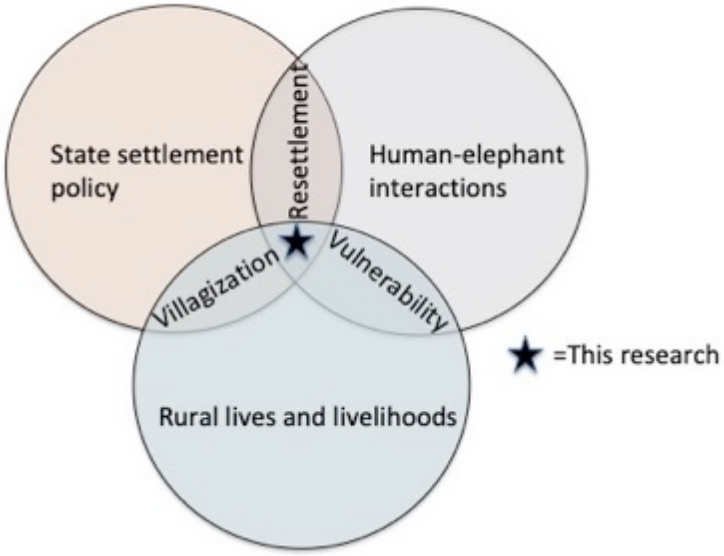

Figure 17. A conceptual diagram showing where this research is situated.

4.1.1. Conservation, development and resettlement

4.1.1.1. Forced displacement or voluntary resettlement?

In post-colonial countries the world over, newly emerged governments began exploring and implementing development projects with vigor. Beginning in the 1970s, development researchers started to take a hard look inward at the impact of development projects on resource dependent, rural communities that were relocated in favor of projects for the "greater good" of national development. Early seminal work looked at flooding impacts of hydroelectric dam sites on forcibly displaced communities (Colson,

1971), and recent studies have extended the literature to include numerous other drivers of displacement, including project-induced displacement (e.g., Cao, Hwang, & Xi, 2012), mining-induced displacement (e.g., Owen & Kemp, 2015), and farming-induced displacement (e.g., Doutriaux et al., 2008; Vandergeest, 2003). People affected by these kinds of development projects are not given a choice in whether or not they want to resettle (Cernea, 1997).

In recent years, scholars have extended this body of work to include conservation, a body of work focused on Conservation-Induced Displacement and Resettlement (CIDR). Work on CIDR has uncovered many of the dark realities of conservation as protected areas increase in number around the world in attempts to reduce biodiversity declines (Agrawal & Redford, 2009; Brockington & Igoe, 2006) and to meet growing demand in nature-based tourism markets (e.g., Milgroom & Spierenburg, 2008; Sirima & Backman, 2013). The creation, protection, and increasing militarization of protected areas around the world has the effect of displacement and dispossession of indigenous peoples and other native inhabitants from the land and resources they historically accessed (Hoole & Berkes, 2010; Koot & Hitchcock, 2019; West, 2006; West & Brockington, 2006; Witter & Satterfield, 2014). When force is not explicitly used, CIDR and DIDR lenses may fail to adequately capture the role of forces beyond boundaries of the project. Scholars now attempt to capture push and pull factors driving human settlement decisions because they can better capture the impact of policies across different scales, including local, national, and regional (e.g., Milgroom & Ribot, 2019; Witter, 2013; Woodhouse & McCabe, 2018).

Across Africa, newly independent nations began to develop and implement villagization policies starting in the 1970s. Villagization is the regroupment of people into central locations, and may occur at the same time as resettlement, which includes the sedentarization of traditionally migratory people (Lorgen, 2000; Van Leeuwen, 2001). Often, but not always, villages are planned using a gridded roads and plot system, aiming to centralize people around basic government-provided services, such as clean water, schools, health care and other services and amenities (Lorgen, 2000). Governments ignore cultural conceptualizations of space and society for "modern" European norms, perhaps with the hidden agenda of improved surveillance of residents and their activities and to usher subsistence households into the formal economy (Robins, 1994).

In some cases, governments used force to achieve their goals with dire consequences. For example, villagization in Ethiopia was introduced as a way for the government to implement agrarian reform and to bring basic services to rural residents (Lorgen, 1999). Farmers were not given a choice about resettlement, and the government used physical force against uncooperative farmers, some of whom fled to Somalia as a result (Rule, 1986). The new village locations were chosen with disregard for both environmental and social needs, and meant many farmers had to travel long distances to get to their fields and care for their cattle (De Waal, 1991; Gebre, 2003).

Similarly, the Village Settlement Scheme guided development in Tanzania following independence. People were encouraged to move into nucleated settlements and work on cooperative farms. Following lack of popular support for these policies, by

1973 the government moved from encouraging villagization to forcing villagization with the plan that all rural residents should live in villages by 1976 (Kjekshus, 1977). A newer version of villagization policy implemented in post-conflict Rwanda claimed to centralize people with the goal of improving access to housing and to diversifing the economy by stimulating off-farm economic activity (Isaksson, 2013). However, resettling households may lose social capital and can actually be made worse off than before resettlement (ibid).

Critical scholars see the practice of villagization as a mechanism for social control, national unity, and economic growth at the expense of social and cultural wellbeing (de Wet, 2015; Gomersall, 2018; Robins, 1994). In places where a singular formal villigization policy does not exist, governments may suggest that people have a choice in the matter of resettlement. Witter (2013) argues, however, that government claims of resettlement as individual choice is false, preferring to decode interactions across push and pull factors and the ways they lead to resettlement outcomes.

4.1.1.2. Botswana's history of pushing and pulling resettlement

The Government of Botswana, like other post-colonial nations, has a history of harnessing the power of push and pull mechanisms to move people out of undesirable and into desirable locations. Prior to independence in 1966, the people of then British-controlled Bechuanaland Protectorate were forced to pay hut and poll taxes to the British government despite receiving little to no services in return (Schapera, 1970a). Because not everyone had cattle or garnered income from agriculture, young men often became

migrant workers in South Africa's mines to earn income to pay the taxes (Harvey & Lewis Jr., 1990). The village *dikgosi* were granted significant power over their population by the colonial administration, and could allocate land and make laws how they saw fit (Molutsi, 1989).

In the 20 years following independence and the establishment of the Government of Botswana in 1966, Botswana transitioned from being a largely rural country to one where more than 20% of the population lived in towns (Harvey & Lewis Jr., 1990). As fewer Batswana went to work in South Africa's mines, they invested into rural livelihoods like agriculture and livestock instead, and this had significant effects on where people lived (ibid). Rural residents moved from villages to *meraka* and arable fields in search of economic opportunity, and the number of villages doubled. In 1971 there were 223 villages, and by 1981 there were 417 villages, with over 80% of the increase in the number of villages with fewer than 500 people (National Development Plan, 1985-91: 12, as cited in Harvey & Lewis Jr., 1990, p. 36).

In 1968, the newly independent nation articulated the Tribal Land Act (TLA), establishing twelve Land Boards throughout the country. The Land Boards exerted control over tribal land in each district, granting citizens rights to formally request land for a residence, for growing food, grazing livestock, and for business purposes (Harvey & Lewis Jr., 1990). This guaranteed that all Batswana had a right to land, and "as the population has grown, some areas that were originally 'lands' areas or 'cattleposts' were converted into ordinary villages for year-round settlement" (Harvey & Lewis Jr., 1990, p. 70). *Meraka* that grew in population transitioned to villages, meaning that people had

to subsequently relocate their cattle or other natural resource-based activities to unoccupied lands since people are not allowed to keep cattle in villages. As a result, many households had more than one dwelling place based on their livelihood activities, which meant that many dwellings were unoccupied (ibid).

Other development mechanisms intersect with resettlement decisions to create a patchwork of policies that push and pull people across the landscape. Beginning in 1965, Botswana adopted a series of National Development Plans (NDPs) that are continually revised. By 1972 the government established the Rural Development Council, a committee comprised of key government and nongovernment representatives focused on issues of rural development (Harvey & Lewis Jr., 1990). Following the elaboration of the Rural Development Council, the third NDP began to integrate aspects of rural development (Holm, 1982). By the adoption of the fourth NDP (1976-1981), Botswana had committed to equal spending on rural and urban development (ibid). Currently, the 11th NDP focuses on key issues of rural development related to delivery of services and social and infrastructure development, with the aim of reducing outmigration of rural residents to urban centers (Ministry of Finance and Development Planning [MFDP], 2016).

Working in tandem with the NDP, Botswana adopted the National Settlement Policy (NSP) in the 1979. The NSP classified settlements according to population size in order to better provision services throughout the country (Magole, 2009). The NSP lays out a strategy for the allocation of resources according to population size, offering that it "provides guidance for people to settle in areas with the best development potential

offering opportunities for improved standard of living" (Ministry of Local Government [MLG], 1996, p. 6). Settlements that reach the population threshold of 500-999 people are classified as tertiary centers, or villages, and through the elaboration of Village Development Plans, the government made tiered infrastructural investment promises to settlements of that size according to potential for development (Republic of Botswana, 1998). The NSP aimed to limit the development of new settlements by encouraging people to move to existing settlements to avoid duplication of services and underuse of public facilities (MLG, 1996).

Rural migration and resettlement are driven by a combination of push and pull factors that are both conservation and development-related. This means that subsistence-level people who migrate and resettle may do so because they are trying to reduce their exposure and vulnerability to environmental or social threats in order to build a better life for them and their family. Vulnerability and reduction of vulnerability are therefore critical components of resettlement and must be explicitly examined as such.

4.1.1.3. Vulnerability, elephants, and the rural household

Despite its appearance of development from the outside, Botswana has extraordinarily high levels of social inequality (Hillbom, 2011). Seventy-five percent of the population lives in urban centers, though the rural population lives a subsistence life (ibid), depending on wild harvested foods and freely available natural resources to buffer against poverty and other environmental shocks (Cassidy, 2003; Mmopelwa et al., 2009). Where people depend on the wild harvest of natural resources in wildlife-rich

landscapes, such as Botswana, they are differentially vulnerable to unwanted interactions with wildlife.

Vulnerability is defined as the degree to which a system or components of a system can be harmed before they fundamentally change (Adger, 2006). When people begin to feel especially vulnerable to external threats, they engage in any number of coping strategies, including preventative strategies, impact minimizing strategies, building up of food and saleable assets, diversifying production and/or income sources, development of social support networks, and post-event coping, for example collecting wild foods (e.g. Cashdan, 1985; Davies, 1993; Khumalo & Yung, 2015; Paumgarten, 2005). Vulnerability is a function of characteristics of the individuals, households, and communities, but also depends upon contexts of the wider political economy (Adger, 2006).

Households and individuals that are better able to recognize and adapt to change are thought to be less vulnerable to environmental or social change (Maru et al., 2014; Miller et al., 2010; Smit & Wandel, 2006). Households with stronger social capital, including family and friends, are better able to reduce their vulnerability to environmental challenges (Cassidy & Barnes, 2012). When the environmental threat is potentially dangerous wildlife, people can reduce their vulnerability to wildlife by adapting to the use of land and resources by the wildlife (Buchholtz et al., 2019). When people and wildlife co-adapt to each other, they are better able to share space and resources, and this has positive impacts on the long-term survival of wildlife (Carter & Linnell, 2016).

For people who share land and resources with elephants, they experience vulnerability in any number of ways. For example, in a traditionally transhumant pastoral population in India, the Van Gujjars formally migrated en masse to the Himalayas, over 250 km away. Due to changes in forest code, and for fear that elephants will damage their dwellings when they leave, the Van Gujjars no longer migrate en masse. Instead, they leave behind family members to care for the dwelling, and those who continue to migrate only travel 50km from their settlements (Dasgupta, 2006).

In the protected area context, forced resettlement of households from settlements to villages outside of the recently created Limpopo National Park in Mozambique resulted in people losing communal autonomy and self-determination (Milgroom & Ribot, 2019). As Cernea stated, "[Compulsory displacements] raise major ethical questions because they reflect an inequitable distribution of development's benefits and losses" (2000, p. 11). Similarly, undesired displacement that occurs as part of dual push-pull mechanisms for resettlement raises ethical questions about the way that rural residents experience benefits and losses due to elephants.

In Botswana, seemingly contradictory conservation and development policies and plans work in tandem, with wide-ranging effects on rural households and communities. Historically, people settled according to kinship groups based on shared cultural norms and values (Mosha, 2014). Settlement was flexible and allowed for social reorganization based on change (ibid). The development and implementation of statewide policies, including Village Development Plans and the NSP, have the effect of villagization. These policies, Mosha (2014) argues, weakened people's communal spirit

that led to the development of shared social norms and sense of place. Furthermore, Magole (2009) argues that the NSP had the effect of assimilation of diverse and indigenous groups into Tswana culture, similar to villagization plans developed in other countries. Scholars argue that rhetoric of national unity, centered on a commonly heard phrase that "We are all Batswana," are at the heart of loss of cultural identity, what Gulbrandsen (2012) called "Tswanification."

While Botswana has developed and implemented a host of complementary social programs that serve as a safety net for the most vulnerable households, including *ipelegeng* Public Works Program for poverty reduction, Destitute Persons Program, primary and secondary school feeding program, and vulnerable groups feeding program, old age pension, among others (Maundeni & Mupedziswa, 2017; Nthomang, 2018), programs are unable to provide total support for all who are in need, especially considering the often varied temporal changes in vulnerability (Maundeni & Mupedziswa, 2017; Mogomotsi et al., 2018). Informal protection through social networks can help fill in temporal gaps missed by government-supported social programs (Mupedziswa & Ntseane, 2013). Because kinship networks can respond quickly to environmental changes, they are crucial for households facing potentially deleterious environmental threats (Kgathi et al., 2007).

4.1.2. A socio-cultural and institutional perspective on HEI

In this chapter, I link literature on government policies that push and pull people to resettle, through a combination of conservation impacts and through settlement

schemes in post-colonial Africa for nation building. I use an ethnographic approach to explore how settlement practice is intricately linked to peoples' identities, changing livelihoods, and growing elephant populations, and I bring into focus the ways in which resettlement practice impacts rural Batswana vulnerability and their ability to adapt to life with elephants. Here I seek to connect ideas put forth by other scholars, in particular findings about push and pull factors in resettlement and how people are influenced by the presence of elephants (Witter, 2013), and the influence of policy on residential land rights (Mosha, 2014) and critical social support systems for the most vulnerable members of society (Kgathi et al., 2007; Milgroom & Ribot, 2019).

4.2. Findings

4.2.1. Born of cooperation and conflict

Although the government officially gazetted Mokgacha as a village in 2014, it had long been clear to residents that Mokgacha would eventually become a village (Figure 18). Starting in 1979, the year that Botswana established its NSP, the government began to make strategic directives for the rural population to come together to receive infrastructural investments. Seronga had long been the administrative center for people living in surrounding settlements and was providing government services to people many miles away, including people from Mokgacha. People alive at the time recalled that some nurses came to the surrounding *meraka* and told people from Mokgacha and Mawana, both *meraka* at the time, that they should decide amongst

themselves where the population would receive a visiting health clinic and build a shelter for supplies and an examination room.

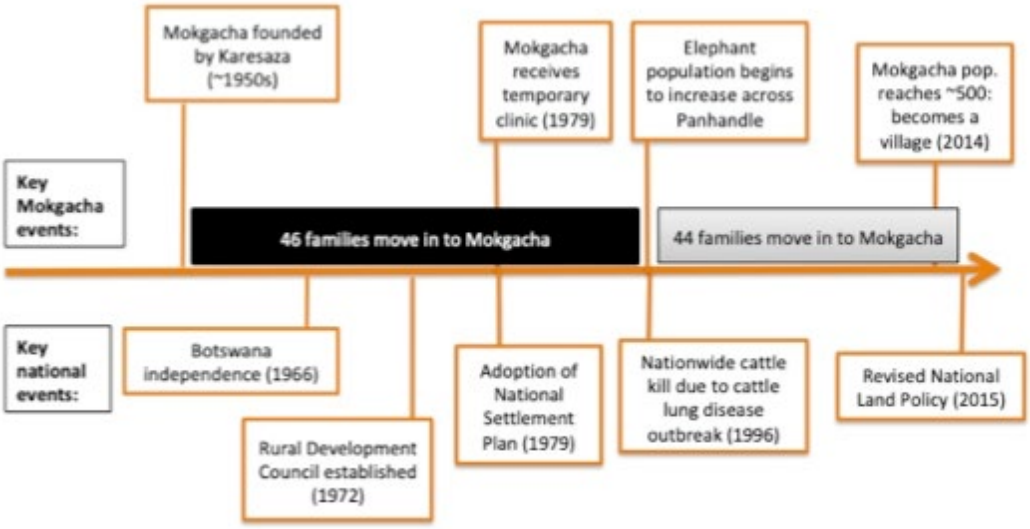

Figure 18. An overview timeline of key local and national events that impacted rural resettlement decisions.

Mokgacha residents, mobilized by the leadership of the charismatic *kgosi*, Karesaza, were faster at organizing and building huts that could be used by visiting nurses. Despite having a smaller population than the neighboring Mawana at the time, the government declared that Mokgacha would be the central receiving point for all services that came to the area. This created a great deal of social tensions over government resources between the residents of the different *meraka*, which was further exacerbated by a political party divide of councilors representing Mokgacha and Mawana at the district level.

The cooperation and sharing that enabled the people from Mokgacha and other *meraka* to the north to come together is not without social tensions. A DWNP official explained that,

> What we know is that sometimes conflict can make people stay or move. When there's a conflict with certain community members, some people will move out and stay on their own. Sometimes people will stay there so that they can develop something that's theirs.

Indeed, many residents who resettled in Mokgacha identify with Mokgacha as their village that belongs to them. For people from other *meraka* that did not receive formal government investment, conflicting perspectives over where people self-identify as belonging have prevented some people from moving to Mokgacha. As one man who lives in Mawana but maintains a home in Seronga told me,

> The government forced us to go to Mokgacha. But we're not used to life there. The government doesn't consult us, they come and tell us it's been gazetted by the government, and is from Kavumo to Danga, but they're forcing us. It's force. I'll call it force. It's better for the government to consult us. They should ask us where we want to reside, in Mokgacha or Seronga.

That tension continues to loom through today, though is dwindling, according to people who felt that the government forced them to get services and representation in Mokgacha. People who felt forced to access services and representation in Mokgacha were beginning to express interest in developing residential plots in Mokgacha, and one resident from Nxiniha who similarly grappled with whether he identifies as belonging to Mokgacha or Seronga won a seat in Mokgacha's VDC during the 2018 election cycle. However, many households that live in *meraka* south of Mokgacha have second homes in Seronga instead of Mokgacha where they access all the required resources. Similarly, all residents of Mokgacha currently walk or hitchhike the 20-kilometer distances to

Seronga or Mogotho to access government services that are currently unavailable in Mokgacha. Mokgacha residents hold onto hope that the government will develop promised services in Mokgacha in the near future.

4.2.2. Livelihood transitions and vulnerability in the era of elephants

In the same way that 1979's NSP changed the trajectory of development for Mokgacha and the neighboring *meraka*, 1996 marked a crucial turning point for all rural Batswana. An outbreak of the cattle lung disease threatened the livestock economy for the nation, and led the government to mandate a cattle kill operation in affected areas around the country. The government offered residents either replacement cattle or 70% of the value per cattle in cash to compensate for lost livestock, dispensing 500 Pula ($100) per animal for a total of 44 million Pula paid out to all affected cattle owners (Hoon, 2004). Just as most cattle holders around the Panhandle opted to accept cash instead of replace cattle (Kgathi et al., 2007), many residents of Mokgacha decided to cut their losses and keep the cash. This was the beginning of the restructuring of rural livelihoods for many households, and fundamentally reshaped the landscape. While access to *meraka* had been critical for livestock-rearing households, households without livestock no longer needed permanent residence in *meraka*.

With the absence of cattle, people living in the *meraka* north of Mokgacha began to move into Mokgacha, which was at the time a *moraka* itself. Many residents explained that they chose to move to Mokgacha in order to build up a place they perceived as being theirs. Although it would take another 18 years for Mokgacha to

formally become a state-sanctioned village, and despite the fact that at the time of this research Mokgacha still had few of the amenities promised by the central government, people were pulled by the promise of government-sponsored developments and possible work opportunities for generating income.

Increases in elephant populations that coincided with the 1996 cattle kill also served to push many people from their *moraka*, which generally consisted of isolated sub-settlements of one household or a few scattered households to one larger settlement comprised of dozens of households, into the village. Indeed, elephants prefer areas with lower human population density and have been shown to be more active on the outskirts of Mokgacha (Songhurst et al., 2016). Thirty percent (17 out of 56) of households who moved to Mokgacha from neighboring *meraka* since the 1996 cattle kill noted fear of elephants as a major consideration for moving. In contrast, only one household head of 11 who moved to Mokgacha prior to the 1996 cattle kill stated that they left for fear of elephants. Households that resettled following the cattle kill but continue to maintain livestock travel to their cattle kraal twice daily, often by foot at dawn and dusk, which puts them at additional risk to unwanted HEI. Most household heads citing fear of elephants as a reason for moving from the *moraka* to the village explained that, although elephants are everywhere, they feel significantly safer in the village than in the *moraka* because there are more people around.

Elephant populations may also influence future resettlement decisions for families remaining in their *moraka* who see the prospects of life with elephants as increasingly untenable. For example, one 51-year-old male household head from

Chinatown, a Boga Khwe sub-settlement of Mawana reported that, “I want to live here but there are too many elephants.” Although he owns cattle, his residence is close enough to where he can make the twice-daily trip to his kraal like other cattle holding residents of Mokgacha. Similarly, a 58-year-old woman living with her extended family in Nxiniha reported that, “Maybe we'll move in years to come because elephants are everywhere,” clarifying that she feels safer in her second home in Seronga because there are many people there. Although they live a considerable distance from Seronga, they have goats, which are typically kraaled at the household residence.

Elephants are a major consideration for some people in terms of how they can carry out their basic livelihood activities, and because livelihood activities differ based on the identity of each person, people are vulnerable to elephants in a few different ways. First, the capacity of the individual and their sense of safety around elephants influences the risks they take that may put them in danger of HEI. As a DWNP officer from Seronga explained,

> The biggest risk we’re having now is people who don’t know how elephants behave… It’s normal for people to see elephants... They think they’re used to them and they reduce their self-protection measures… most young people aren’t having problems with elephants as compared to old people who can’t see or hear well.

Additionally, as mentioned above, people who live in sparsely populated areas are more likely to interact with elephants as they carry out their daily livelihood activities. This principle applies even to households that have settled on the outskirts of a big village like Seronga. For example, one participant who originates from Mokgacha but lives with his young family on his plot of land in Seronga for work purposes noted

that, “With elephants, it’s a major concern. Last year, an elephant got into my yard and walked around and let itself out with the gate.” He explained that because the village had yet to expand water services to residential plots in his neighborhood, most people refused to come to their government-allocated plots. He lives along an isolated road in dense woodlands on the outskirts of Seronga, and he noted that he and his family have encountered elephants on their way to fetch water at the nearest standpipe. Similarly, the *kgosi* of Mokgacha explained that,

> There are lots of spaces in the village which are supposed to be occupied by someone from the village, not occupied by someone from Maun because there will be a poor connection between that person and a resident of Mokgacha. Today, wild animals just go right through the village. When there’s no one staying on that plot of land, the animals can just go through without fearing.

Not only are residents vulnerable in the woodlands, they can be vulnerable right at home in the village (Figure 19). Below I discuss how settlement decisions were historically made and how they helped reduce the vulnerability of residents to environmental threats.

Figure 19. Elephant dung, encircled in black in the foreground, on the edge of Mokgacha village. Encircled in blue, approximately 20 meters in the background, people have begun to construct the frame of a house.

4.2.3. Historical settlement

Historical settlement helped to buffer the ways in which rural residents were vulnerable to environmental threats. Settlement that maintains kinship networks enabled resource sharing that can reduce the vulnerability of elders and other vulnerable populations. As one mother in her mid-20s explained,

> As a village becomes bigger, young people move to their own plots, leaving their grandparents and elders alone. This leaves elders struggling for firewood, water, and other resources they need. It's not that they can only be killed by elephants. There are other endangered wildlife species, too. They might interact with

> [wildlife], so it's better that they stay with grandchildren, children nearby to help them, not leaving them alone.

Families often lived together as a way to share work and resources in a way that buffered the environmental risks for the elderly or people with disabilities. Mothers may leave their young children with parents or elders who stay behind and care for the kids in the safety of the village. This reciprocity allowed family members to not only share in labor and resources, but also to establish familial bonds across generations, ultimately contributing to the development of social capital.

As one DWNP officer explained, this is how people have historically made settlement decisions. "They initially choose to settle to be near to their extended family. This is how people decide where to live." Many Mokgacha residents acknowledged that resource sharing with family members is still critical today. For example, a single mother who resettled in Mokgacha from Danga in 1996 said that, "When we first came to Mokgacha we were choosing our own plots based on how we can be close [to family] because I'm the one who's responsible for helping my mom with firewood, and even food."

As a result of traditional settlement patterns centered around proximity to family, the village was settled along kinship lines, resulting in three distinct sections of the village, what I refer to as North, Central, and South Mokgacha (Figure 15). These different invisible sections of the village reflect historical settlement patterns, as well as more recent resettlement decisions. For example, many of the BaHambukushu-headed households that have settled in North Mokgacha village recently came (since 2012) from

meraka to the north, including Mokgacha *moraka*, Letsao, and Danga. Only Danga still had full-time residents.

In addition, while North Mokgacha was densely settled (n=72 households), South Mokgacha was much less densely settled (n=14 households), in large part due to the fact that many Bayeyi households from the *meraka* south of Mokgacha, in particular Nxininha, Mawana, and Kavumo, had second homes in Seronga rather than Mokgacha. At the time of this research, most households occupying South Mokgacha were Boga Khwe-headed. The village was built around the site of the founding family of Mokgacha, a Bayeyi family, and although Central Mokgacha constituted a significantly smaller part of the village, it was relatively densely occupied compared to North and South Mokgacha (n=18 households) (Table 15).

Table 15. The percentage of households according to the ethnicity of the head of the household based on where each household is located (North, Central, or South).

	Household head ethnicity			
Mokgacha section	**% Hambukushu**	**% Bayeyi**	**% Boga Khwe**	**% Mixed**
North	84.7%	9.7%	2.8%	2.8%
Central	5.6%	83.3%	0.0%	11.1%
South	14.3%	28.6%	57.1%	0.0%

The *kgosi* of Mokgacha told me that in the past, all land allocation decisions were made locally. He explained that,

> The policy at the time, a person would choose his or her own plots of land and show the land overseerer and he would come to me and the VDC to confirm if that person is allowed or not. We'd ask if anyone else is there and that's when the person would be granted the plot.

It is worthy to note that I did not hear of residents who were unhappy with the process or outcomes when they were allocated land directly through the village leaders.

4.2.4. Resettlement and vulnerability to elephants

In post-independent Botswana, land is considered a birthright for all Motswana, and in recent years the Land Board has attempted to regulate how much land an individual can be allocated, as explained by the Seronga Land Board Secretary:

> Within the National Land Policy, once you have a plot, we call it the "one man, one plot" policy. You can't be allocated more than two plots across the country. I can say two, because you're allowed one plot within the Tribal Land and one plot within state land. We're in the process of changing it. It used to be that a married couple could also only have two, but now it will be up to four plots within a married couple because culturally, it's normal that you have a plot in your home place, not your spouses only. But the applications are deferred. Right now it's two plots for a married couple, but I need a plot where I come from.

Due to well-documented issues of poor coordination and record keeping across the different Land Boards (African Development Bank, 2016; Machacha, 1986), it is not uncommon for individuals to be allocated one plot of land in more than one Land Board jurisdiction leading to some individuals claiming numerous titles of residential land in different villages across the country. Several key participants from Mokgacha, in fact, noted that they had different residential plots in other villages, often places where they had full-time employment, which may hinder their ability to claim land in Mokgacha in the future.

The gazettement of the village brought big changes in how land was allocated given that the process of village land allocation is subject to central government policies. Most notably, the gazettement triggered a land grab, whereby people from all over the

country claimed they had customary land rights in the village. As the deputy sub-land board secretary explained, “When the village was gazetted, we had people from all over the country coming in and saying that they’ve been living in Mokgacha. The villagers were raising the alarm with the land overseer.” When a village is gazetted, the Land Board begins by formally titling people who had been residing in the village already, but as the Deputy sub-Land Board Secretary further clarified,

> It was a land grab of sorts. We had people from Gaborone, Maun, running to put their name on the list. We picked plots of people who have been there for a long time before it was gazetted, they were given land through consultation. We took the list to the kgotla to have a consultation. Last Thursday there was a consultation. With the list there were 64 plots in Mokgacha that were registered. We go through one by one and ask questions to verify the plot.

The Land Board put the land allocation process on hold until they were able to consult with the community to verify that people actually occupied the plots that had been registered. Although the Land Board had begun consultations with residents during the time of this research, the land allocation process had yet to resume by the time I finished collecting data. This had the effect of preventing more people living in *meraka* from moving into Mokgacha, and kept people who had recently come of age or started their own families from building their own homes given that their stake of a plot had yet to be confirmed.

Second, the 2015 revised National Land Policy changed the process of residential plot allocation. The sub-Land Board secretary explained that policy revisions require applicants for residential plots to put their names on a waiting list, and as plots become available they will be allocated land on a “first come, first serve” basis. During our interview in his office, he pulled out the draft plan for Mokgacha that contrasts the

haphazard appearance of residential plots allocated in the past in white with black outline to the logical, planned approach for the future that serves to transform the experience of life in the village (Figure 20). All future plots are depicted in pink, and are laid out on neat squares along a grid that will be accessed by straight roads, which will enable the government bring resources directly to the people. Each plot has a number that the Land Board will use to allocate land to people on the wait list, regardless of whether or not people currently reside in the surrounding area.

Figure 20. A section of the 2016 proposed plan for Mokgacha.

While people who already had been household heads in Mokgacha were able to circumvent this system, it effectively treated all people moving in from nearby *meraka* and young people coming of age from deciding where they want to live, as explained by the Deputy sub-Land Board Secretary.

> LR: How about for people who aren't living in Mokgacha now, but who are at the cattleposts?

> Deputy sub-Land Board Secretary: They aren't living in Mokgacha, so they are part of the "first come, first serve".
> LR: What about people who were young when the village was gazetted. How will they been given land?
> Deputy sub-Land Board Secretary: They have to apply like everyone else, and if I could show you the village plan, they will be given land on the Western [sic] side of the village. We're no longer using the system where you point and say that you want to live next to your uncle or your brother.

Combined, the issues of land grabbing and the 2015 "first come, first serve" policy has the potential to make certain households more vulnerable to HEI. First, it is almost certain that young people from Mokgacha seeking land will be allocated on the undeveloped Southeastern side of the village, though many of them may be from the populous Northwestern side of the village. This means they will be living far away from their families, perhaps up to a 45-minute walk. The *kgosi* explained how he sees this policy as problematic: "The policy in the past didn't have conflicts and didn't impact the villagers like today. Like today you can be allocated a plot far away from your family even if you want to stay close." The Deputy sub-Land Board Secretary recognized why this might be especially problematic for people living in proximity of elephants, explaining that,

> Some of them who've been allocated plots, they're not from Mokgacha. And if you're a civil servant living there now and you get affected to [sent to work] somewhere else, your plot will be unoccupied, so here in Botswana where maybe I can borrow salt from my neighbor if I run out, it can be difficult if my neighbors are absent… When the elephants come, if your neighbor isn't there and you need help, it can mean you're alone with the elephants. You might have to walk a long distance to ask for things from your family and that can be hard.

This conflict between the village and the Land Board over residential plot allocation has real consequences for residents who might otherwise seek a residential plot of their own. For example, a 30-year-old mother, KT, explained that she has not

applied for her own plot of land because she cares for both her aging mother and disabled brother and cannot leave them alone. Her older sister, on the other hand, has a plot of land three households away, and frequently supplies her mother with firewood, water, and other resources. Should KT apply for a plot of land, it is uncertain that she would be granted a plot close to her family. In a different case, a 44-year old woman who settled a plot of land in Mokgacha without first receiving a certificate from the Land Board explained, "This situation of being separated from closest family. That's why I settled here without the Land Board consent, as you see. Because in the past we grew up in a big family without the Land Board process." She is currently illegally occupying a plot of land and may be forced to move once the Land Board begins to allocate plots again. It is uncertain if she would be allocated a plot near her family.

The effects of these policies also have a disproportionate effect on single female-headed households who often rely on help through extended family for resources and labor sharing. Specifically, women account for one half of all heads of households in Mokgacha, and 1/3 of all Mokgacha household heads are single women, meaning they have no partner with whom to share responsibilities. 85% of males who head households have a wife or partner, meaning they are two-parent households, while 67% of females who head households are single and the remaining 33% have partners who live with them or out of town (Table 16).

Women who live in rural villages and *moraka* near to their extended families have historically been able to buffer the effects of poverty because, as many residents pointed out, life in Mokgacha is relatively inexpensive as compared to life in larger

villages, like Seronga. Residents are able to access some of the resources they need for daily life, with much additional support provided through government programs that aim to protect poverty-stricken households. When residential plot allocation will begin, it may splinter extended family networks, disproportionately impacting female-headed households since women rely on these extended kinship networks to buffer the effects of poverty.

Table 16. The number of households according to relationship status of Mokgacha Village household heads by gender. Not Applicable (NA) responses reflect the culture of dating and marriage. Men are only considered having a partner once married, while women lose household headship upon marriage.

	# Female Headed Households	# Male Headed Households
Live-in partner	10	NA
Out-of-town partner	7	NA
Single	34	7
Widowed	1	1
Married	NA	45
Total # households	52	53

Prior to independence, people relied on extended family networks to provide material, social, and emotional support (MLG, 2002). In 1980, the Government of Botswana introduced a definition of destitute persons that relies on four criteria. In addition to being considered a person without material and financial resources, they must be incapable of working due to old age or physical or mental handicap, an orphan, or an individual who is "rendered helpless due to a natural disaster or temporary hardship" (MLG, 2002, p. 3). The Land Board recognized that people who qualify as destitute

through Social Services should be allocated plots next to family members who can help them meet their daily needs. The sub-Land Board Secretary explained that, "What we've been doing for vulnerable groups is if a destitute wants a plot and the council will build a house for them, we allocate where they can be provided with a plot of land that's near to people that can provide them the support they need." The Land Board does allow individuals to voluntarily swap plots, but this puts the onus on individuals to come to an amicable arrangement without support from local governing institutions, like the VDC and the *kgosi*.

Because *meraka* are out of reach of the Land Board control, they retain many elements of traditional settlement and residents of *meraka* are able to resettle when and where they deem necessary. For example, all residents of Kavumo *moraka* recently resettled less than half a kilometer down the road from their former settlement where the dilapidated skeletons of their huts remain to this day (Figure 21). The head of Kavumo explained that there were too many big trees around their homes. These trees attracted elephants that could come and browse on the leaves and fruits at night. He reported that he felt afraid the elephants would push the tree onto his thatch-roofed hut. The entire settlement—an extended family—relocated to a location clear of tall trees, rebuilt their homes on a common area, and surrounded the area with a wire strung with cans that rattle to alert them of visitors.

Figure 21. Residents of Kavumo relocated a short distance down the road from their former settlement (above).

This traditional use of space, as shown above, concentrates multiple households on a common, collective space that allows households to concentrate resources and physical proximity to neighboring households. In contrast, Land Board policy has allocated each household a standard plot size that they must use within five years. If they do not build and maintain a home, the Land Board reclaims the property. As a result, people who have yet to build homes on residential plots in the village first erect fences to declare the boundaries. The effect in areas where homes remain to be built is sprawled homes set amongst bounded properties of equal size. As the Subdistrict Physical Planner

for Mokgacha explained, “One of the things I like to say is that the plots we give are way too big. Let us not sprawl our settlements. Once we sprawl the settlements, we make ourselves more vulnerable [to elephants]. And we have big plots with only one hut on them.”

4.2.5. Nation-building or village-building?

These two major changes in settlement practice in Mokgacha—both land allocation processes and village development planning—were directives driven by the central government. When a settlement transitions from a *moraka* to a village, residents are impacted by policies in ways that change not only how they are vulnerable to HEI, but also how they sustain their culture. A former official of the Seronga sub-Land Board explained that people who live in *meraka* are “illegal land occupiers” that the government has been trying to encourage to move to gazetted areas. This official explained that although people who live in *meraka* have a cultural association with the land, they do not have any formal entitlement to claim should anything bad happen to their home or any changes in land use occur.

The policy and practice of residential land allocation is a part of a nation-building technique. Citizens all over the country can apply for a plot of land in Mokgacha, even if they have never been there. By and large, residents and officials both saw the right for every Motswana to live where he or she wants as a good thing. KK, a woman from Danga who moved to Mogotho in order to send her kids to school, explained that, “Every Motswana has the right to stay where he or she wishes and maybe he or she [a

neighbor] can help you." Many residents felt that neighbors do help when they are in need, but that they usually do not help in the same way that they would with family.

While geographic separation from family does not prevent sharing, it does reduce the ability for people to share since communication is difficult without reliable cell phone service or money to pay for phone credit to make calls. Instead, people must physically visit family members in order to learn of who is in need of help. With non-related neighbors, a young woman explained, she is less likely to give help. "It depends on the times they ask. If I have something, I can give to them." However, the social disarticulation that results from spatial separation of families not only affects material resource sharing, but also labor sharing that is critical for many families. For example, this is important for women with young kids who traditionally have relied on extended family to help care for their kids. As KK elaborated, "In this time, I can leave my kids with my nearby family. When I'll be at another part of the village, I can leave my kids with non-related neighbors because there's no one else who can watch them. I'll just go with worries in my heart."

The Deputy sub-Land Board Secretary explained the reasoning behind the residential plot allocation practices. He said,

> You might have a village where Basarwa [Boga Khwe] and BaHambukushu live, and you allocate them land on the other side [of the village] with the other people [from a different tribe], and they don't want to go. They want to share food with their brother and share other responsibilities. We have a mapped area with amenities, electricity, water, all on roads in a straight line, not scattered like things are now. They have to get used to it.

The Environmental Coordinator of the Okavango Delta Management Plan explained that these policies are "bringing a national identity. The main goal of the land

policy is to resolve land problems, so in the past you had clans. It's an unintended benefit, that this policy reduces tribal conflict."

However, assumptions of potential for social tension along tribal lines are problematic. In practice, households were often of mixed ethnicity. 41% of all Mokgacha households are multi-ethnic (n=43) meaning that at least one member of the household had an ethnicity that differed from the head of the household. The percentage of multi-ethnic households varied based on where people live (Table 17), but ranged from 40.3% in North Mokgacha to 64.3% in South Mokgacha. Households were often of mixed ethnicities simply for the fact that it is common for families to live with, marry, or have kids with people from different tribes.

Table 17. Percentage of households with at least one family member of a different ethnicity from the rest of the household, according to section of the village.

Mokgacha section	% households of mixed ethnicity
North	40.3%
Central	61.1%
South	64.3%

Culturally, the village as a whole was also ethnically integrated. For instance, three of the four churches in the village conducted their services in Setswana and were attended by people from all tribes of the village, while only one church, located in North Mokgacha, conducted services exclusively in Sembukushu. Social mixing was very common and has been happening for a long time, so much so that everyone from Mokgacha, regardless of their ethnicity, all claimed the same story about the origin of the elephant—a story that details how a pregnant Hambukushu woman went off into the

woods when she was angry with her family and transformed herself into an elephant. She even carried the same Sembukushu name, Mushova, even when Bayeyi and Boga Khwe participants reported this story as the origin story for their tribe.

While people identified according to their tribal identity, we heard people state several times, "Rona mo Mokgacha," meaning "Us in Mokgacha," as a way to identify a common culture shared by residents of Mokgacha. The land overseer of Mokgacha explained that,

> Across the country, each and every person identifies himself according to where they live. Even people in Maun, people say, "Rona mo Maun", as in, in Maun, we do this and this is how they identify. They identify themselves according to their lifestyles.

He further added that, "[Rona mo Mokgacha] is strong because we see ourselves as one thing in Mokgacha even though we have different cultures."

4.3. Discussion

Rural resettlement was historically driven by cooperation and social tensions between families in neighboring *meraka*. Following the gazettement of Mokgacha as a village, rural resettlement was driven by a combination of push and pull factors. Overall livelihoods restructuring following the 1996 government-mandated cattle kill, plus the increasing population of elephants that prefer to move in low-human population density areas (Songhurst et al., 2016) pushed people from *meraka* to the village. People were also pulled into the village due to familial cooperation, and the promise of developments and related work opportunities.

As people resettled in the village and as younger household members age and create their own families, they chose to seek a residential plot of their own on which to build a home. Before the designation as a village, local governing structures, specifically the *kgosi* and VDC, worked with residents to find satisfactory residential plots. Many household heads chose plots that were close to their elderly or aging parents and other family members because of the benefits of sharing resources and labor that may be especially difficult in the face of increasing elephant populations.

Mokgacha residents are made vulnerable to elephants in two ways. Primarily, since Mokgacha was gazetted a village in 2014, residential land was made available to people from all over the country who apply and qualify. As noted by other authors, including Kalabamu (2000), this led to land speculation by people who had yet to develop their land, resulting in absentee ownership. Absentee ownership of residential land created pockets of unoccupied land, spatially separating nearest neighbors with the effect that elephants may be more likely to pass through the undeveloped areas of the village where full-time residents are exposed to potential HEI.

Additionally, the implementation of the 2015 Land Board policy that grants all qualifying applicants "first come, first serve" residential plots treats all applicants the same. By centralizing the granting of physical location of residential plots, decisions of where people live are removed from local governing institutions and people may no longer live in proximity to family. Although many people felt that they have a good relationship with their non-related neighbors, most people agreed that non-related neighbors cannot help in the same way as related family during times of sickness or

need. This may have a disproportionate impact on people who may be vision or hearing-impaired, in particular the elders. In other ways, female-headed households are also more vulnerable than other kinds of households because they tend to lack labor resources and social support that enables other households to have a more successful resettlement (Abutte, 2000). These groups historically requested assistance from nearby family members, but it is difficult to reliably share resources and labor with a non-related neighbor or a family member who lives on the far side of the village.

Traditional settlement based on maintenance of family networks was widely misinterpreted by government officials as being tribal in nature. The collective village identity is strong in ways that have been ignored by formal policy. People of all tribal groups had a shared collective identity, developed through a history of cooperation for the building of Mokgacha into a village. Many households were actually of mixed ethnicity, while traditional institutions, including marriage and child rearing, natural resource harvest practices, and other institutions, helped residents develop stronger social bonds with neighbors and other village members. Residents held *both* ethnic and village identities at the same time.

4.4. Conclusions

As villages grow, in part because of elephants pushing people from more rural areas, as well as due to the draw of promised amenities from the government that make village life more and more attractive, scholars and rural development practitioners should consider what makes rural life in the era of elephants livable for people. Policy

tools targeting conservation and development currently neglect inter-household and village-level dynamics.

National policies that have the effect of villagization, like Botswana's National Settlement Policy, combined with diverse drivers of resettlement are consequential beyond kinship and family ties. Social disarticulation disrupts communities and social organization. As Cernea (2000) argues, "Life sustaining informal networks of reciprocal help, local voluntary associations, and self-organized mutual service are disrupted. This is a net loss of valuable 'social capital' that compounds the loss of natural, physical, and human capital" (p. 30).

Resettlement, therefore, has resounding effects beyond simple social reorganization. Resettlement impacts how people experience vulnerability to HEI, and this has consequences beyond social order. Where elephants are a hazard, people's struggles for daily living are unique. Policies built far away from these challenges that aim to developed nationalized identity at the expense of local institutions may have unintended consequences for people and their continued tolerance for sharing space with elephants (Naughton-Treves & Treves, 2005).

Traditional settlement is fast acting in the face of environmental challenges because it is decentralized and residents are given choice and can revisit their choice as necessary. Because land allocation was still on hold by the end of this research, people maintained some level of freedom in terms of where they lived, which allowed them to retain many aspects of their social networks. It remains to be seen if in the future, whether through the allocation of plots to absentee owners or through the forced

rearrangement of social networks through plot allocation, households within the community will socially disarticulate and whether there is hope for households to develop stronger social networks outside of family, what Abutte (2000) called social re-articulation. Regardless, standardized ideals guiding what a residence 'should' look like have implications for the vulnerability of residents to elephants even when they're at home due to the prevalence of unoccupied spaces in underdeveloped parts of the village.

While nationalized land use policies have the potential to exacerbate resident vulnerability to HEI, policies also hold potential solutions. Specifically Botswana recognizes special permissions for people who qualify as "destitute." In addition to being considered a person without material and financial resources, a destitute must be incapable of working due to old age or physical or mental handicap, an orphan, or an individual who is "rendered helpless due to a natural disaster or temporary hardship" (MLG, 2002, p. 3). In order to account for local realities, government officials should be allowed freedom of interpretation to determine who counts as a destitute person, in particular because people who are exposed to the hazard of HEI have very unique vulnerabilities that require innovative, and often localized, solutions.

Additionally, although formal government safety nets, in the form of subsidies and handouts, especially in terms of work and food, do seem to offer important protections to reduce social vulnerability, the government should aim to complement, not replace, traditional safety nets. This is especially true for kinship networks that can help mitigate vulnerability by protecting residents through innovative, quick-responding, and often localized, approaches. Future research should seek to quantify the value of

social networks and kinship networks in order to understand the long-term impact of residential plot allocation on vulnerability and inter-household dynamics in the era of elephants.

Key take-away messages for policy revision and development include:

- People are better off in areas that are more densely developed, including both *meraka* and villages. The government should seek to find ways to integrate village development with livelihoods, including farming and cattle rearing, so that people feel they can make a voluntary choice about where and how to live.
    - Current plot sizes may be too large for most households to adequately develop and maintain, resulting in sprawling village development with implications for resident safety while at home. Plot sizes should be decreased to encourage more efficient development of land.
    - Because people feel an ancestral connection to their *moraka*, the government should find a way to recognize or formalize their commitment to the land. This may grant people the freedom to move based on what is best for them, and not necessarily because they feel obligated to hold claim to formerly settled property. This is especially important given that mobility is one important adaptation of people to environmental or social change, and people may want to hang onto that option for the future.

    - Integrated settlement and livelihoods may offer important contributions to reduce HEI though likely come with costs due to both environmental quality and potential human-human conflicts. In the same way that Ecoexist contributed to research on elephant corridors and their protection from development, further work is required to explore potential areas of livelihood integration across the landscape that meets environmental and development constraints.

- People are less vulnerable to elephants when they live near family members. Land allocation decisions should be decentralized to the village level to allow individuals some choice in where they live. The Land Board should devolve some power back to the land overseer, the VDC, and the *kgosi* to grant each applicant more choice in selecting their own plot. Village leaders should be required to attend mandatory trainings to ensure that they are effective at land allocation and capable of identifying and addressing potential issues or conflict.

5. CONCLUSIONS

In July of 2018, I returned to the US after nine months of fieldwork for my dissertation. My field site in northern Botswana was the most rural place in which I had ever lived. Mokgacha was a village of just around 500 people. There was no electricity or potable water infrastructure, the telephone network only afforded me infrequent bursts of WhatsApp messages, and I had no latrine. When I first arrived at my new house, a relatively new two-room cement building, my first task was to hire two young men to help me dig a deep hole in the Kalahari sands in the far corner of my yard to serve as my latrine for the next 9 months. My second task was to learn how to build a wall around the hole using Delta-grown reeds I purchased from my neighbors— then strangers who grew to be friends—, poles I cut with the help of my assistant from nearby bushes, and nylon tire threads I bought at a village store that would serve me well for many different needs. Everything was foreign to me. It was a completely new life for which I was not entirely sure I was prepared.

Over the course of nine months, while I conducted research on the ways that people are adapting to life with elephants, I learned how to adapt to my new life. I learned how to collect and identify firewood, fetch water at the Okavango Delta, and take advantage of trips to neighboring village to fill all of my plastic bottles and jerry cans with potable water from standpipes. I figured out how to set up my solar charging station, how to sit like a lady at community meetings with my legs straight in front of me, how to get around with basic Setswana, and where to get wild fruits when my body

needed vitamins. All the while, I navigated my research, gaining information slowly, checking my assumptions, and reconfiguring my hypotheses about what was happening to residents of the community since the elephant population had doubled in the past twenty years. It was not a smooth nine months of my life, but I could point to the beginning and the end and trace my way down the road, past all of the people, life stories, and cultural knowledge that brought me there.

My primary goal of this dissertation was to bring light to the culture, history, and realities for people who live with elephants. I had initially chosen Mokgacha because it was the most recently upgraded settlement into a village, and because it happened to be nearest neighbors with Seronga, the best developed village in the Panhandle. While many people might have looked at the two villages and concluded that Seronga had more economic disparity and more government services that could make for an interesting research site, I was never interested in the central. Mokgacha interested me because it was peripheral. It seemed to hardly exist in comparison to Seronga. But that was, indeed, my question. I wanted to know, in all earnest, why would people move *here* when they could access so many more development and economic opportunities that could potentially keep them safer from elephants elsewhere? What I discovered was much bigger than the question that brought me there in the first place.

In this final chapter, I present my final message about life in the era of elephants and why HEI as a framework provides opportunity for a more holistic exploration than HEC. I discuss the roles of perceived risk, vulnerability, and adaptation to HEI, and I present an argument for the reinforcement of bottom-up governance rights as a way to

reduce vulnerability of people to HEI as they learn how to live with so many elephants. Finally, I conclude with thoughts on the rhetoric and promise of human-elephant coexistence and offer a set of three guiding principles for scholars and practitioners to engage with people in the pursuit of elephant conservation.

5.1. A view towards HEI in the era of elephants

The Okavango River presents year-round opportunities for people and elephants alike. As with many ecologically-rich landscapes, the Delta is not without hazards. Although elephants are not the only risk for people, they have become in recent years the most perceptibly significant one. Elephant signs, both recent and old, create ever-changing livelihood barriers and opportunities for people. Since the elephant population began to increase twenty years ago, not only have people been confronted with significant changes to their farming systems, but the ways they navigate the landscape, too. The ways that people both use resources left behind by elephants and actively change their behavior in response to perceived risk point to the unstable nature of HEI. HEI are also mediated across time through the stories parents tell their children and have long been ingrained in the cultural lifeways of the tribal groups. Like other human-wildlife interactions, HEI are dynamic over time and rooted in history and culture (Goldman et al., 2010).

Throughout this research, I rely on the term HEI instead of HEC. While this may seem pedantic in some ways, I argue that the adoption of the broader term HEI enables a shift in thinking, from focusing on exclusion-based management approaches that largely

addresses the symptoms of conflict, to thinking about the cultural, historical, and governance-related drivers of interaction (Shaffer et al., 2019).

I argue that HEC as a lens fails to capture the dynamic nature of human decision-making and ability to adapt to environmental changes to reduce conflict. For example, because of shared use of trees by people and elephants, people now readily harvest important materials, such as baobab bark and wood for carpentry or firewood. To be clear, conflict is not absent from, but a part of, HEI. For instance, there is evidence of increasing conflict over demand for wild fruits that sustain both people and elephants. Similarly, as I've shown in this dissertation, elephants eat from the trees planted outside of people's homes, causing some people to resettle. People also respond to national policies and other governing institutions in dynamic ways, though social science researchers have only begun to explore how (e.g., DeMotts & Hoon, 2012; Gaillard et al., 2019; Gupta, 2013). When research is framed exclusively as HEC, it closes off the possibility of complex and even conflicting human-elephant relationships. HEI, although simply a more general term than HEC, leaves room for the unexpected.

5.2. Perceived risk, vulnerability, and adaptation to HEI

As elephant populations continue to increase, people may become even more vulnerable to HEI with further consequence for support by residents who live with elephants. This work provides insights on who, how and when people can adapt to minimize the potential danger of interacting with elephants. As shown by the work of Gaillard and colleagues (2019) there is a large gap in research on people's vulnerabilities

and capacities to manage risk to wildlife and the policy tools that target the "small and frequent hazard" of wildlife. Conservation policies have long supported technocratic approaches that aim to spatially separate people and wildlife, but new approaches should bring attention to and support efforts by rural residents who navigate the shared space and adapt to reduce chances for potentially deadly HEI (ibid). Scholars should integrate adaptation into research models since rural residents are able to make choices to reduce their risk and vulnerability to unwanted interactions with consequences for the system.

Building from observations of HEI in the era of elephants, interactions around diverse types of natural resources are wildly understudied. On a theoretical level, much HEI research has focused on conflict around farms, in other words, private goods. As I demonstrated in this dissertation, HEI occur around common pool resources, like trees, with diverse outcomes. The operationalization and theoretical development of HEI, conflict, and coexistence can benefit from future exploration of interactions around different types of goods and the resulting outcomes.

Facets of people's identities play a role in how they are vulnerable to unwanted interactions that have the possibility to end tragically. With few exceptions, the research on HEI, especially in Botswana, has widely characterized women as being more vulnerable to elephants (DeMotts & Hoon, 2012; Mayberry et al., 2017; Ogra, 2008). This may be because, with few exceptions (e.g., Jadhav & Barua, 2012), much of the literature has focused on crop consumption by elephants or relies on short-term survey research. By using HEI to look at other interactions around firewood, and by using ethnographic, mixed methods to incorporate exploration of diverse facets of people's

identities, I show that vulnerability to HEI is influenced by gender, ethnicity, and age and ableness. More research is needed both to explore the role of class in HEI and to elucidate the interactions of facets of identity in how they play out with HEI. This can contribute to a better understanding of the nuance of both vulnerability and adaptation to HEI.

Significantly, men have largely been overlooked in the conversation about vulnerability to HEI. In this dissertation I show how cattle-based livelihoods and cultural ideals of masculinity play a hidden role in shaping men's vulnerability to elephants. Conservation programs seeking to reduce negative HEI outcomes should aim to reshape ideals of masculinity through, for instance, behavior change programs targeted at men who walk into the woodlands alone during risky times of day. Messaging around vulnerability should be careful to reframe the concept not as weakness, but as the impact a harmful event will have on someone.

Alternatively, external interventions can help to reduce vulnerability to elephants by invisibly influencing decisions people make. Similar to the efforts by Ecoexist to promote collective agriculture around which groups of people can more effectively protect their fields, it may be possible to encourage neighbor-friendly cattle kraaling through targeted land use policy. Future research should explore these or other integrative land management options for their ability to reduce vulnerability. Since HEI occur both within villages by elephants and in the woodlands by people, research and policy should focus on an integrative systems approaches to move from what ecologists call a land-sparing approach to an integrative land-sharing approach that defies strict

social-ecological boundaries (Crespin & Simonetti, 2019). Integrative land use planning should rely on extensive, in-depth participatory research to account for the differences in how people say they use resources and how they actually use resources.

5.3. Top-down and bottom-up approaches to reduce HEI

In the era of elephants, we are only beginning to understand how people's perceived risk, vulnerability, and adaptability to HEI intersects with policies, markets, and culture. This is especially striking considering the bewildering number of policies and programs that create a fabric of interacting incentives. These incentives influence the decisions people make and what their lives look like, by consequence. I demonstrate, through the case of resettlement, that people are pushed and pulled through a web of top-down and bottom-up drivers. Conservation policies are complemented by national settlement policies, in addition to market forces and socio-cultural factors. In some cases, top-down and bottom-up forces are at odds with each other, but often they work in tandem.

Policy tools targeting conservation and rural development currently are comprised of compensation for wildlife-related loss, focused at the household-level, and community-based natural resource management for tourism development, focused at the village-level. Intra-household dynamics are neglected, but are impacted by the fabric of diverse policy tools and are likely to result in social disarticulation with consequences for people's vulnerability to HEI. Prescriptive approaches to conservation and rural development may jeopardize support for local institutions with unintended consequences

for HEI. For example, people's ability to self-organize around culturally-relevant practices, like group harvest, may be at risk to the socially splintering effect of first-come, first-serve settlement practice. More generally, top-down village development policies have implications for the vulnerability of residents to elephants even when they are at home. By contrast, traditional settlement decisions are decentralized and therefore nimble in the face of environmental and social challenges.

People who are exposed to HEI often have very unique vulnerabilities that require innovative, quick-responding, and often localized, approaches. The tension between slow-acting centralized policies on the one hand, and rapidly increasing elephant populations on the other, means that people's vulnerability to HEI will only get worse before it gets better if people are dependent on state support. Government-sponsored social programs are important safety nets, but should not be seen as replacements to traditional safety nets due to lag in formal program delivery as well as the often-temporary nature of vulnerability that can easily be mediated through kinship networks and other informal means.

Local adaptations by individual residents and households to reduce their vulnerability are one important mechanism for reducing problems associated with HEI, though they may not be enough when they act in direct contradiction to nationalized policy. The government should make room for more formal channels that encourage the development and support of local, organic, bottom-up approaches to reduce people's vulnerability. Because each individual, household, settlement, and community faces their own set of challenges that change over time, only bottom-up governance is nimble

enough to allow for people to foster adaptation and reduce vulnerability when prescriptive nationalized policy fails.

5.4. HEI and coexistence in the era of elephants

In recent years scholars have begun to put forth the concept of coexistence, often defined as the potential for humans and elephants to persist or thrive together, as the antidote to HEC (Marchini et al., 2019). Although this dissertation did not aim to directly build an understanding of what coexistence might look like, my findings are of consequence for how coexistence is envisaged. For instance, one significant challenge of the body of literature on HEI, human-wildlife interactions more generally, and the future of coexistence is the significant dearth of research spanning the social scale. This dissertation has, in part, filled that gap, but more research is needed to understand HEI at different levels of the social scale. For instance, a significant amount of research is focused at the individual, household, and community level, while my research has shown that inter-household and inter-community relationships are also important and warrant further investigation.

These gaps may persist due to the general lack of an emic, or insider, understanding of what it means for people to share space with elephants. Ethnography is one important methodology that can help close these gaps and has been relatively absent from the conversation on HEI. The abundance of studies that rely on an etic, or outside perspective, have implications for how scholars define and understand coexistence, in particular since given that in recent years the concept of tolerance (Skupien et al., 2016;

Slagle et al., 2013; Treves & Bruskotter, 2014) has been widely equated with coexistence (Frank, 2016).

Although tolerance may be critical for acceptance of elephants by individuals, tolerance is a psychological state held at the individual-level whose principles are not necessarily scalable to larger groups of individuals where other group dynamics may be more significant (Hazzah et al., 2014; Schusler et al., 2000; Treves & Bruskotter, 2014). More research is needed to understand the interplay between individual tolerance, group dynamics, culture, and various policy tools or interventions and how they play a role in shaping how people live with elephants and, by consequence, the landscape (Skogen et al., 2019).

Instead of relying on tolerance when thinking about coexistence, I argue that scholars should revisit assumptions about whether it is possible or even helpful to operationalize coexistence as a monolithic concept. In this dissertation, I show that people can exist in many ways at odds with elephants and still live, strive, and grow alongside them. Taken together, people in Mokgacha experience both conflict and coexistence with elephants. In other words, conflict and coexistence are not necessarily mutually exclusive. Rather than defining coexistence simply as a state in opposition to conflict (e.g. Frank, 2016; Madden, 2004) whereby humans tolerate the existence of elephants (van de Water & Matteson, 2018), or peacefully negotiate life with wildlife (Alexander & Draper, 2019) in harmony (Barua, 2010), I offer a view of coexistence as a set of principles that can guide the conservation social science agenda. Building from this dissertation, I suggest that scholars and conservation practitioners of HEI:

- Simultaneously acknowledge and address *both* conservation and development concerns for residents who share space and resources with elephants: Rural residents often lack power and voice, and may be unable to hold government and non-government actors accountable for issues of inequitable development and resource access. Elephants are just one of many important concerns for rural residents in Botswana and they do not only impact farming practice. Similarly, although food security is critical to the wellbeing of rural residents, wellbeing extends beyond food security or income into more fundamental challenges of development and self-determination. Conservation and development are intricately linked in these ways.
- Recognize the role that colonial and post-colonial governance has on people's capacity to care for self and family, to sustainably manage natural resources, and to engage in democratic processes: Modern day HEI are deeply shaped by colonial forces that led to significant declines in elephant populations and fundamentally reshaped social values and society. Post-colonial governments, too, have shaped society and culture, with impacts on how elephants are perceived and managed as wildlife. Land use planners and natural resource managers have a responsibility to build trust and empower residents to engage in decision-making processes that impact social organization and broad uses of the landscape. Authentic land use planning and natural resource management have very real implications for HEI and should be considered as part of a holistic strategy to reconcile challenges posed by conservation and development.

- Take a long view on history and recognize that HEI are and always have been in flux: An historical perspective highlights the ways that the socio-political context and environmental factors shape changing HEI and their outcomes, revealing that coexistence can not be conceptualized as a steady-state goal. Human-elephant-woodland systems have always existed in fluctuating states, as witnessed by a look through time at HEI, and because its measure is ultimately subjective and influenced by global forces, coexistence is a moving target.

Coexistence as a final, steady state is a fundamentally flawed perspective for a complex, multi-species system. This is especially the case for humans and elephants, as both learn and adapt to new environmental and social challenges (Shaffer et al., 2019). More work is needed to understand how humans and elephants adapt to the other individually, socially, culturally, and institutionally, and how these adaptations may influence important systems-wide feedback loops into the future. Elephant conservation is a worthy goal but necessitates that the conservation community recognize and value the diverse experiences of rural residents who have long shared space and resources with elephants.

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APPENDIX A. CULTURAL SALIENCE FREE LISTING CATEGORIES AND RESULTS

Answers provided by 20 community leaders when asked "What are the major concerns in life for a person of Mokgacha?" Answers are grouped into categories based on type of response.

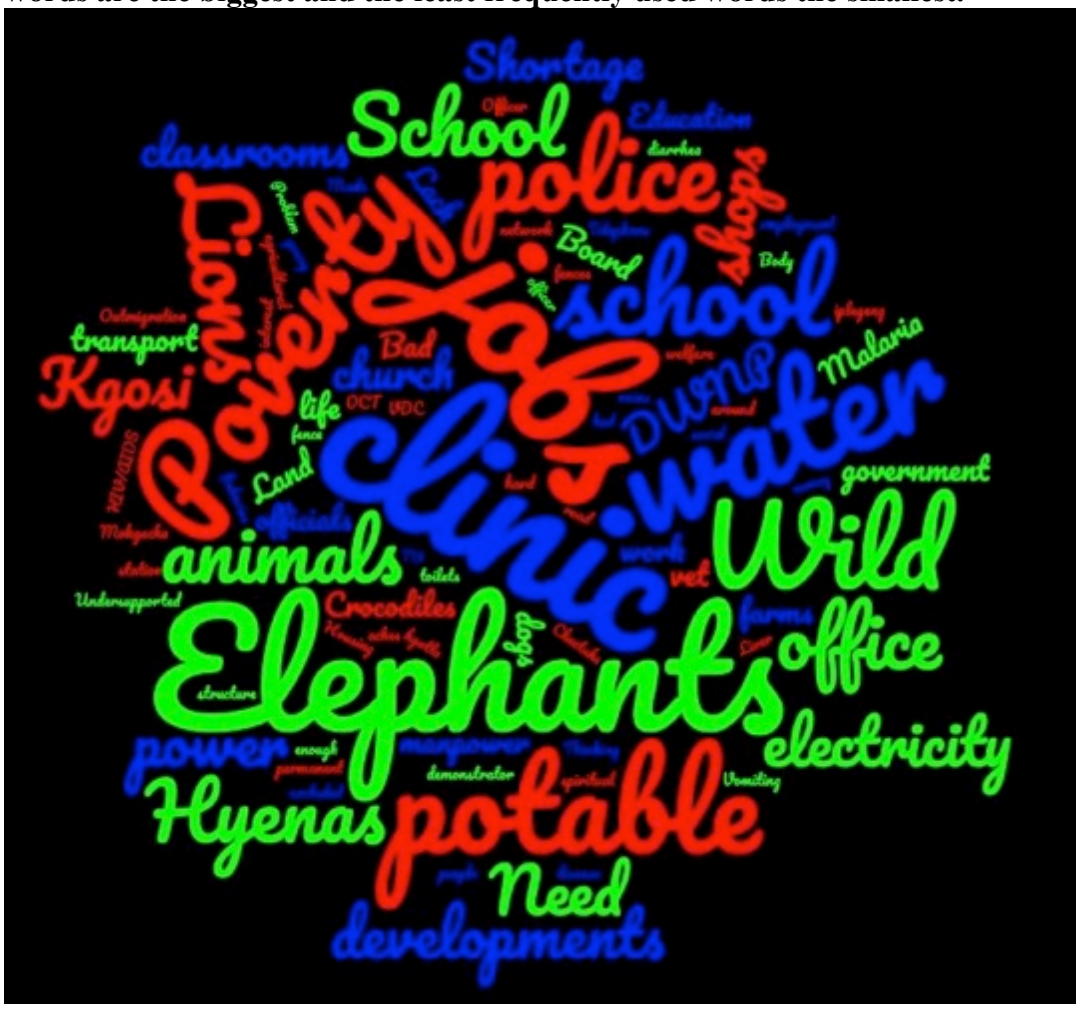
GOVERNMENT SERVICES	PHYSICAL INFRASTRUCTURE	WILDLIFE	SOCIAL	ENVIRONMENT (GENERAL)	HEALTH	VILLAGE CHANGE
School	Potable water	Elephants	Spiritual life	Bad rains	Malaria	Lack of manpower
No clinic	No electricity	Lions	Poverty	No farm fences	Vomiting and diarrhea	Problem with Land Board
Kgosi power	No developments	Wild animals	Unemployment	No water at the farms	HIV/AIDS	Outmigration of young people
No police	No TV	Cheetahs	Education		Liver disease	CBNRM/OCT
No DWNP office	Bad road/transport	Hyenas	Thinking about life		TB	
No social welfare officer at VDC	Housing	Wild dogs			Body aches	
No agricultural demonstrator	No shops	Crocodiles				
No vet	Telephone network is bad					
No fisheries office	No toilets at church					
No government officials	Need a fence around church					
No kgotla office	Need a permanent church structure					
No Land Board officer	Shortage of classrooms					

Cultural salience free list analysis using Smith's salience analysis, in order from least to most salient major concerns in life for a person of Mokgacha

Outmigration of young people	0.00385
No fisheries office	0.005263
No TV	0.00625
CBNRM/OCT	0.00625
No water at the farms	0.00714
Problem with Land Board	0.0077
Lack of manpower	0.0175
No government officials	0.018251
No agricultural demonstrator	0.0184205
Cheetahs	0.02
Spiritual life	0.02
No social welfare officer at VDC	0.021052
Need a permanent church structure	0.0236835
No Land Board officer	0.025
Need a fence around church	0.026315
No vet	0.0281575
No toilets at church	0.0289465
TB	0.0308
No kgotla office	0.031578
Liver disease	0.03465
Housing	0.036841
HIV/AIDS	0.0385
Thinking about life	0.04
No DWNP office	0.040525
Vomiting and diarrhea	0.04235
Body aches	0.045
Bad rains	0.052083335
No shops	0.05643335
Education	0.06
Bad road/transport	0.07265
Crocodiles	0.07284
Wild dogs	0.075
Malaria	0.0962
Wild animals	0.096438665
Shortage of classrooms	0.1058885
Kgosi power	0.10767
No electricity	0.113976667
No police	0.144258

No developments	0.165
Hyenas	0.1690335
Potable water	0.1912015
Poverty	0.2206667
Lions	0.228559834
School	0.30282635
No clinic	0.41258694
Elephants	0.424053
Unemployment/ No jobs	0.46682565

Cultural salience freelisting shown as a word cloud where the most frequently used words are the biggest and the least frequently used words the smallest.



APPENDIX B. GOVERNMENT SOCIAL PROGRAMS, DEVELOPMENT

OPPORTUNITIES AND EMPLOYMENT OPPORTUNITIES IN MOKGACHA

Some government social programs in Mokgacha

Program name	**Program details**	**Administering department**	**Criteria**	**Number of beneficiaries in Mokgacha**
Ipelegeng Public Works Program	Unemployed individuals are employed by the local kgotla up to 2 months/person, up to 2x/year (depending on the funding available)	Ministry of Local Government	Must reside in village (including relative settlements)	42 residents employed monthly on rotating basis (14.5% of adult population)
Tirelo Setshaba (National Service Program)	Local community members work as representatives of government departments (ie. police, Department of Assistance, DWNP)	Ministry of Youth, Sports, and Culture	Youth must reside in village (including affiliated settlements)	5 total: 1 Agriculture, 1 Wildlife, 2 police, 1 clinic
Pension	People aged 65 years and older receive 430 pula/month.	Ministry of Local Government	Must be registered at the Botswana Post Office and requires ID card issued by the government	59
Early childhood feeding program	Feeding program for children between 6 months and 5 years old. Children from 6 months to 3 years 6 months are given tsabana (soft porridge meal) and cooking oil. Children from 3 years 6 months through 5 years are	Ministry of Health	Food must be available at the local tuck shops	75 small children benefit

	given malutu (beans) and cooking oil			
Nyeletso lehuma (Poverty Eradication Program)	Retraining program for people with low quality of living	Ministry of Local Government	Temporary programs may stop at any time	Total 9 people benefit (6 goats, 1 bakery, 1fisheries, 1 garden)
Integrated Support Program for Arable Agriculture Development	Various agricultural subsidies for farming, including payments for hectares plowed, and other agricultural subsidies including free seed distribution, reduced cost fencing, fertilizers, etc.	Ministry of Agriculture	Only farmers	Changes annually
Destitute Housing Unit	Government provides free houses built from cement for individuals with mental or physical disabilities.	Ministry of Local Government	VDC recommends those with severe physical/mental handicaps	9 people have benefited so far; 3 people on waitlist
Destitute Persons Program	Government provides monthly food rations to those considered destitute (sugar, milk, meal, etc.)	Ministry of Local Government	VDC recommends those with severe financial constraints. Age and ability are important factors	16 people benefiting currently

Other government-provided development opportunities for Mokgacha residents

Name of program	**Program details**	**Administering Department**	**Who benefits**
Out-of-school education and training	Local teachers hired to give teach adults (English, Setswana, math, and social studies)	Ministry of Education	1) Adults from settlements and villages or young adults, even children, who dropped out of school 2) Adults with education in these places who can get jobs teaching
Sports competitions (local)	Sports competitions between neighboring villages (Divided according to councilors)	Ministry of Youth, Sports, and Culture	Individuals pay for transport and food, but can win cash prizes as teams
Sports competitions (For qualifying Okavango Villages)	Sports competitions between villages in the same area, based on qualification	Ministry of Youth, Sports, and Culture	Government may only provide transport for those living in remote areas, but teams may win cash prizes
Nation-wide competition for the arts	Competition for the arts (choirs, dancing, bands/musicians)	Ministry of Youth, Sports, and Culture	Anyone can enter, but must qualify first in order to compete

Other livelihood and employment opportunities in Mokgacha

Other opportunities	Sector	Application process	Number employed
Village Development Council	Government	Local elections	10 members
Kgosi	Government	Local elections (with mandatory retirement)	1
Okavango Community Trust and related safari employment opportunities	Private and communal	Board members are elected; Random selection for others and official hiring process	4 permanent, 1 part-time (3 weeks total in 2017)
Primary school teachers	Government	Nationwide applications	4 from outside area
School cook	Government	PTA and teachers decide: application	1 from Mokgacha
Nursery school teacher	Government	Voluntary work	2 from Mokgacha (1 voluntary and 1 through VDC ipelegeng program chosen based on literacy)
Tuck shop	Private	Two tuck shops employ people; Five others are manned by owners	At the time of research 7 tuck shops operating
Transport	Private	Two vans owned by people in Mokgacha; two drivers plus assistants	4
Small business (selling things from home or "market")	Private enterprise	People selling things from home: bread, tobacco, sugar, clothes, reeds, produce, etc.	Variable
Fish sale	Private and government	Sale of salted and fresh fish (government permit required)	Variable
Sale of cattle or land	Private	Occasional sale of livestock to local butchers or grocery stores	Variable
Ecoexist Community Officer	Civil society	Serves as interlocutor between village and Ecoexist	1

APPENDIX C. HOUSEHOLD CENSUS

1) Household head first name: _____ **Male / Female**
2) Marital status: _____ Age: _____ Tribe:_____
4) Do you collect firewood? **Y/N** Occupation:_____
5) Please tell me the first names of the other adults in your household, including occupation, age, gender, tribe, and whether or not he/she collects firewood (FW), as well as listing children by ages, gender, and whether or not they collect firewood

First name	**Occupation**	**Age**	**M/F**	**Tribe**	**Collects FW?**

4) Does your household keep a residence in another location? **Y/N** Where is it?_____
5) If so, when do you stay there? _____
6) If so, why do you stay there?_____
7) I'm interested to know about your household's firewood use. Please list for me the types of tree you use for firewood. Please also list the types of tree you do not use for firewood and explain why and when you do not use them.

Type of tree used		**Type of tree not used**	**Why and when not used**

I'm also interested to know more about how long your family has lived in the area and have a few questions for you about your family history in the area.
8) How long has your family lived in this settlement? _____
9) Who was the first person in your family to move here? _____
10) Why did the first person in your family decide to move here?_____
_____
11) How much longer do you hope to live here? _____
12) Why? _____
_____
_____

APPENDIX D. GROUP MAPPING GUIDE

Firewood collection when living in the village/cattlepost	1) Where does the village/cattlepost begin and end? **(Draw on paper collectively)** 2) Are there key seasons when women are in the village/cattlepost? 3) Are there key seasons when men are in the village/ cattlepost? 4) When women are in the village/ cattlepost, are there key places for firewood collection? If so, where are they? **(Draw on paper collectively)** 5) When men are in the village/ cattlepost, are there key places for firewood collection? If so, where are they? **(Draw on paper collectively)** 6) Are there certain kinds of trees concentrated around these places? If so, what kinds of trees and where are they found? **(Draw on paper collectively)** 7) Are some kinds of trees better than others for firewood? Why? **(Listing and drawing)**
Firewood collection when living outside of village/cattlepost	8) Are there other places outside of the village/cattlepost that women spend other parts of the day or year (ie. farms, veld product harvest, or cattleposts)? **(Listing)** 9) Are there other places outside of the village/cattlepost that men spend other parts of the day or year (ie. farms, veld product harvest, or cattleposts)? **(Listing)** 10) Where are these places? **(Draw on paper collectively)** 11) When are people there? **(Time of day or year)** 12) Who goes to these places? 13) Why do they go to these places? 14) Are there certain places that are best for firewood collection around these areas? If so, where are they? **(Draw on paper collectively)** 15) Are there certain kinds of trees concentrated around these places? If so, what kinds of trees and where are they found? **(Draw on paper collectively)** 16) Are some kinds of trees better than others for firewood? Why? **(Listing and drawing)**
Elephant use of trees and land	17) What kinds of firewood that you collect are most likely pulled down by elephants? 18) What kinds of trees do elephants like for food? 19) Are there some kinds of trees that elephants do not like? If yes, which ones? 20) Are there some areas where you're most likely to see elephants during firewood collection? If so, where are they? **(Draw on paper collectively)** 21) Are there some areas where you are least likely to see elephants during firewood collection? If so, where are they? **(Draw on paper collectively)**

APPENDIX E. RESIDENT INTERVIEW GUIDE

Residence:

Do you have a certificate for a plot of land here?

If yes, why? Is it near to the rest of your family? If not, why not?

Who in your family does not live here? Why do they not live here?

How is life different when you stay close to your family (in the same compound) or far apart in the same village?

What does it mean for you to be a resident of Mokgacha?

What are the advantages and disadvantages of life here in Mokgacha?

What does it mean to be a resident of the Eastern Panhandle of the Okavango?

What does it mean to contribute to development here in Mokgacha?

What was Mokgacha like in the past when you first moved here?

Do you think that life is getting better or worse? How?

How do you imagine Mokgacha in the future?

What kind of community would you like your family to live in?

Do you think Mokgacha will become that community one day?

What will it take to turn Mokgacha into that community?

What are your hopes for Mokgacha?

What roles do the different representatives of the village (ie. kgosi, VDC, OCT) play in your life now and in the future?

What roles do the different representatives of the village (ie. kgosi, VDC, OCT) play in the development of Mokgacha now and in the future?

How important to you are your relationships with other people in the village? (If moved from elsewhere, how is this different from where you came?)

How would your life be different if you lived someplace else?

How would your life be different if others in your family lived someplace else and you stayed here?

Resource harvest:

What kinds of resources do you harvest from your environment for day-to-day life?

What kinds of resources do you harvest from your environment seasonally?

What do these resources mean for you and your family?

How does your household share these resources?

How does your household harvest and process these resources ? (ie. who does what?)

How do you share these resources or work with nearby family members not of the same household?

How do nearby family members not of the same household share these resources or work with you?

How do you share these resources or work with family members residing far apart? (ie. on opposite sides of the village or in the cattlepost)

How do family members residing far away share these resources or work with you? (ie. on opposite sides of the village or in the cattlepost)

How do you share these resources or work with neighbors who are not related to you?

How do neighbors who are not related to you share these resources or work with you?

Under what circumstances would you expect other people to share resources or work with you and how are you connected to these people?

Is there anything else you'd like me to know?

APPENDIX F. FIREWOOD HARVEST FOCAL FOLLOW DATA COLLECTION SHEET

Time: _____Location: _____ Weather: _____

Participant name: _____ Gender: **M / F** Age: _____ Residence location: _____

Participant household: _____ HHH? **Y / N** Occupation: _____Tribe: _____
Other firewood collection participants:

First name	**Gender M/F**	**Age**	**Residence location**	**Name of household head**	**How related to participant? (Family, neighbor, other)**

Was firewood the primary goal of this excursion**? Y/ N** Other resources also harvested: _____
Mode of transport: _____ Tools brought: _____
Primary collection site: _____ Furthest collection site: _____
Use tracker/GPS? **Y / N** Track ID: _____ Total distance travelled: _____ **meters**
Time collection started: _____ Time collection ended: _____ Total time: _____**minutes**

Elephant signs encountered in transit and collection:

Sign type (circle all)
Dung/urine
Footprints
Broken trees
Live elephants

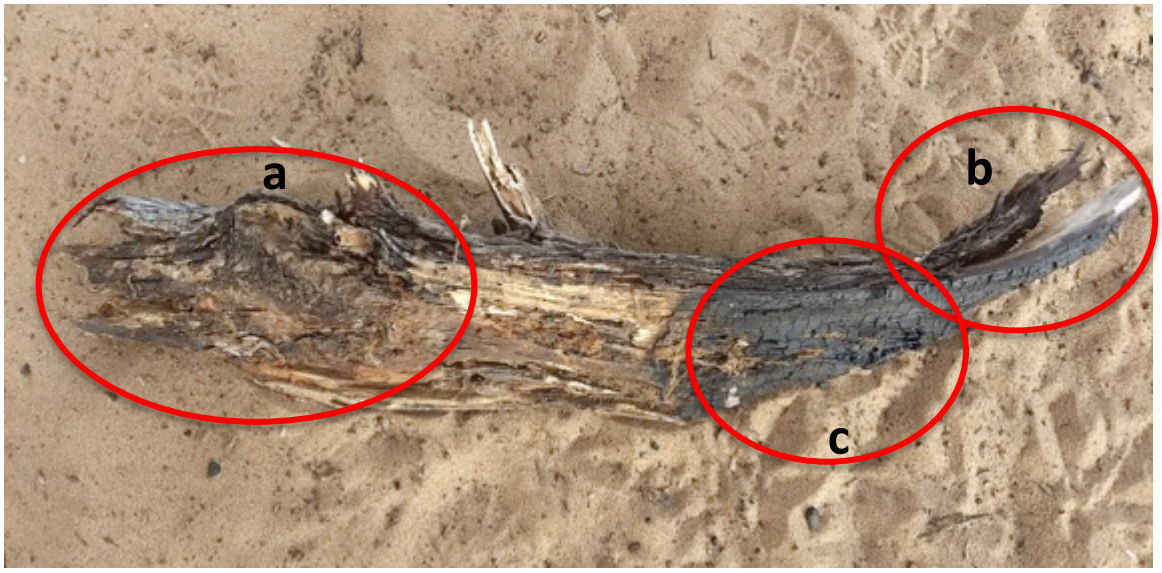
Most recent sign age est.:_____

Firewood collection table:

Reason fallen	**Likely elephant**			**Likely human**			**Likely other (insects, natural, etc.)**		
	Participant	**LR**	**IP**	**Participant**	**LR**	**IP**	**Participant**	**LR**	**IP**
Total weight (kg)									
Species tree (list types)									

APPENDIX G. FIREWOOD HARVEST ORIGIN EXAMPLES

Two typical examples of elephant-caused felling of trees, resulting in the splintering of the tree while still green at the stem. Since these are heavy logs, generally only men with access to donkey carts can harvest this kind of firewood.



This *Colophospermum mopane* (Setswana: mopane) wood has thee major signs of damage- on the left, smooth ax cuts (a), and on the right both splintering from being pulled by elephants (b) and charring from a human-caused fire (c). People will take down large trees by burning them at the base. The twisting and splintering of the wood at the right is characteristic of elephant damage. I identified that the top of the tree was likely towards the left (a) and the bottom towards the right (b) and (c). I classified this kind of damage as 'likely elephant-felled' considering that this size of mopane tree would be difficult to burn if it were alive and green, and was likely dead from splintering before either the fire (c) was set to its base or the top was cut off (a).

The firewood on the top is *Dichrostachys cinerea* (Setswana: moselesele). I deduced that the main stem was likely first damaged by elephants (a) before being cut and killed by humans (b). The damage by elephants was caused on a green tree, characterized by a bending and splintering. However, the ax cuts at the bottom were carried out on a live tree, characterized by a smooth cut on still green wood (b). While ultimately the wood may have died following the elephant-caused damage, I classified this kind of damage as likely human as it seems to be the most proximate cause of creation of firewood. Similarly, the wood on the bottom is mopane. I deduced that, due to a jagged break, this stem was first broken at the top by elephants (d). However, I classified this firewood as 'likely human-felled' due to the ax cut (c) that ultimately brought down the firewood.

APPENDIX H. RAPID FIREWOOD SURVEY

Who was the last person to give you firewood?

Relative Nonrelative _____# HH between

Who was the last person you gave firewood to?

Relative Nonrelative _____# HH between

Please put these people in order of who is most likely to share firewood with each other (using cue cards):

Nearby relative_____ Faraway relative_____

Nearby nonrelative_____ Faraway nonrelative_____

At what time do you usually go to collect firewood?

Why? _____

With whom do you usually collect firewood?

Why?_____