ADAPTATION OF WILDLIFE TOURISM TO CLIMATE VARIABILITY

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A case of Maasai Mara National Reserve

Msc. Thesis

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The Adaptation of Wildlife Tourism to Climate Variability

A case of Maasai Mara National Reserve, Kenya.

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MSC. Thesis

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DEDICATION

This thesis is dedicated to the late David Kirirah Thogo who taught me how to live life to the best of my ability. To be kind and thankful for the opportunities that we have.

May you ride with the angels.

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EXECUTIVE SUMMARY

Tourism is a major income earner for Kenya. With more than 50 national parks and reserves located in various parts, wildlife forms a major tourism product for the country. Wildlife tourism is based on encounters with non-domesticated animals within their natural environment. Key natural resources that wildlife depends on for survival are water and forage. These resources' availability is very susceptible to climate variability. Based on this premise, the study is investigating the adaptation of wildlife tourism to climate variability in Maasai Mara national reserve using the adaptation framework from a supply side.

The study is highlighting the main impacts that climate variability has on wildlife dispersion and migration and consequently on the destination attractiveness. The study investigated the business, technical and policy adaptation strategies that tourism stakeholders are implementing. Data was obtained through in-depth interviews with key stakeholders in the wildlife tourism industry and secondary data analysis.

The study found that climate variability has increased over the last fifteen years with the region experiencing intervals of prolonged droughts and floods more frequently. Climate variability has contributed to the changes in the migration and dispersion patterns of wildlife in and out of the reserve as they search for water and forage. As climate variability is becoming more pronounced, its effect on the destination attractiveness is becoming serious. Tourism stakeholders at the Mara are finding it more difficult to predict when the Great Wildebeest Migration will begin and end, hence affecting the length of the 'high tourism season'. In addition, aesthetic of the landscape has been affected by prolonged drought periods and amenities and infrastructure destroyed by floods.

Based on the findings, as variability in Kenya increases due to climate change adaptation of wildlife tourism will ensure the industries sustainability. These will include strategies such as business adaptation, government efforts wildlife adaptation and research and education will be dependent on increasing the adaptive capacity to climate variability. Challenges to implementation of adaptation in Kenya may include collaboration, capacity building and policy development, implementation and monitoring. In addition, more human and financial resources should be set towards adaptation.

1 INTRODUCTION

1.1 Wildlife tourism and climate variability

Tourism in Kenya contributes 10.5% to the Gross Domestic Product and has been identified as one key economic sector that is affected by changes in climate (KNBS, 2018; Nyamwange, 2016).

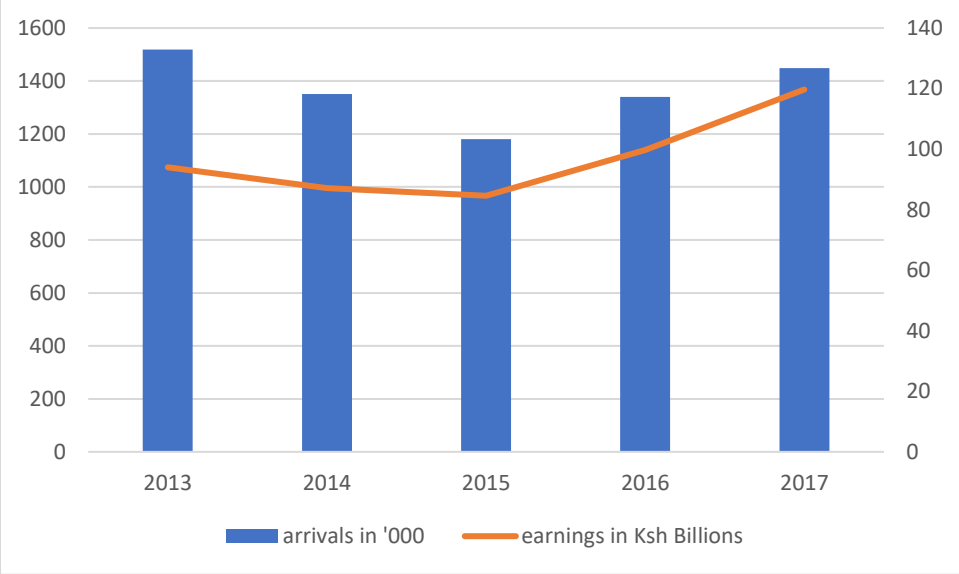

Figure 1: Trends in visitor arrivals and tourism earning 2013-2017 in Kenya

Source: KNBS, (2018)

International visitor arrivals and tourism earnings continued the recovery path witnessed since 2016 as shown in Figure 1.1. The recovery was associated with measures put in place by the Government in the sector that resulted in tourist arrivals going up by 8.1 per cent to 1.45 million in 2017. Consequently, earnings rose by 20.3 per cent from KSh 99.7 billion in 2016 to KSh 119.9 billion in 2017 (KNBS, 2018).

In Kenya, tourism is mainly nature-based because the country is rich in ecological systems, natural habitats, wildlife, lakes, rivers, forests, wetlands and marine life. Tourism depends on scenic features and marine life and wildlife, features that are highly susceptible to climate variations (Munyiri, 2015). Kenya has 54 national parks and game reserves located in various parts of the country making wildlife tourism a major tourism product in the country.

Wildlife tourism has been defined as *"…tourism based on encounters with non-domesticated animals, which can occur in either the animal's natural environment or in captivity…*" (Osano et al., 2013 p.242). In Kenya, wildlife tourism encounters are usually in the natural environment (Ogutu, et al., 2008). Key natural resources that wildlife depends on for survival are water and forage (Okello & Keringe, 2004). Water and forage availability is very susceptible to climate variability as it relies on rainfall which fills the natural rivers and determines the growth of vegetation. The fluctuations encompassing climate variability can impact rainfall patterns, temperature and other variables on time spans from a few weeks to a few years. These short-term changes include occurrences of floods, droughts and changes in temperatures (McCarthy et al., 2001). In recent years many rivers feeding the parks have reduced in water volume while others have completely dried-up. At the same time, the number of cases of wildlife deaths has increased in the same parks. For example, Kenya Wildlife Service (KWS) reported 14 deaths of elephants in 2007, 28 in 2008 and 37 in 2009 due to prolonged and extraordinary dry seasons associated with the La Nina phenomena (Kanga et al., 2013).

One national park that is vulnerable to these variations in climate in Kenya is the Maasai Mara National Reserve (MMNR, the Mara). MMNR is among the most visited national reserves in Kenya offering scenic views and a chance to see the "big five" animals-lions, elephants, leopards, rhinos and buffalo (Kanga et al., 2013, KNBS, 2018). In addition, it is home to the famous wildebeest migration that occurs every year from July to end of August (Mutimba et al., 2010). The 'high tourism season' in the Mara mainly falls in mid-June through October. Due to variations in rainfall patterns, the migration timing changes from year to year shifting it either to earlier or later date. This is because rainfall affects vegetation and water sources hence concentration and movement of animals will consequently be affected (Kanga et al., 2013). In addition, there has been a decrease in volume of the Mara River due to variations in precipitation patterns and local temperatures leading to a reduction in drinking water and inhabitable wilderness (Kanga et al., 2013).

Currently, there are limited studies that are evaluating the relationship between climate variability and how it impacts wildlife tourism in Kenya. It is important for stakeholders of MMNR to formulate and implement sound adaptation options that will regulate the natural or human systems in response to the climate stimuli to moderate harm or exploit beneficial opportunities.

This study, therefore, aims to explore activities that the tourism stakeholders in Maasai Mara, Kenya have taken to help cope with, or reduce the observed and projected impacts of climate variability on wildlife and hence maintain the destination's attractiveness.

To get up-close, in-depth and detailed information, the study will take the form of a case study. The case study chosen in this study is Maasai Mara. Maasai Mara is the most famous national reserve in Kenya, mainly due to the annual wildebeest migration.

1.2 Statement of the problem

Wildlife tourism depends on a sufficient supply of wildlife diversity and abundance at the right place and the right time. Spatial and temporal mismatches potentially reduce tourists' satisfaction and increase the tourism industry's efforts to provide tourists with the experiences they seek. Wildlife's spatiotemporal behavior is closely linked to the availability of water and food. The availability of water and food is in its turn determined by precipitation patterns, which are variable. Sometimes, droughts lead to a reduction in wildlife population (Mutimba et al., 2010, Ogutu, et al., 2009). While a body of literature has developed on the link between climate variability and wildlife, the knock-on effects on tourism have so far received very limited attention. Little is known about how tourism stakeholders respond to climate variability and the resulting variations in wildlife's spatiotemporal behavior. As the variability and unpredictability of the Kenyan climate are increasing as a result of climate change, knowledge about how tourism actors can and do adapt to climate variability is of increasing relevance. Once we understand how to cope with the changes that climate variability trigger to wildlife in Kenya, we can come up with adaptation strategies that will ensure the industry's sustainability.

Despite this, currently, there is limited literature that focuses on how wildlife tourism in Kenya is adapting to climate variability. **Using the case of Maasai Mara, this study addresses this knowledge gap on how climate variability affects wildlife tourism and how stakeholders are adapting to cope with the impacts.**

1.3 Scientific Objectives

Main objective

This main study objective is to understand how tourism stakeholders are adapting to the impacts of climate variability on wildlife tourism.

Research questions

How are wildlife tourism stakeholders adapting to impacts of climate variability on destination attractiveness in Maasai Mara, Kenya?

To answer the above main question, the following sub-questions are addressed.

RQ 1. How have wildlife migration and dispersion patterns varied in response to climate variability in MMNR, Kenya?

RQ 2. Has the temporal attractiveness of MMNR, as a wildlife tourism destination, varied in response to altered wildlife migration and dispersion patterns?

RQ 3. How do tourism stakeholders respond to the variability of the attractiveness of MMNR as a wildlife tourism destination?

1.4 Relevance of the study

Scientific relevance

In the past, tourism stakeholders have been adapting to climate change. For stakeholders to builds on their adaptive capacity, it is important to understand how they have been adapting to the impacts of global climate change. This knowledge will be used on future impacts under different climate scenarios. This study, therefore, contributes to the empirical knowledge base that can later be used for climate change adaptation strategies. In addition, historical climate data can be assessed to determine the past and current probabilities for climate variables such as extreme rainfall, drought and temperatures. This past information is especially important especially if the past is characterized by strong climate variability that has a likelihood of becoming more frequent in the future. Furthermore, variability is projected to increase due to climate change, hence making adaptation of the tourism sector to the impacts unavoidable.

Although Africa has been noted as one region that is highly vulnerable to impacts of climate variability and change, there are limited studies that focus on adaptation. There is a poor level of tourism and climate specific knowledge (Njoroge, 2015). This is a critical issue since in

Africa nature-based tourism is which is climate sensitive is a major economic activity. In addition, due to the continent's lower adaptive capacity adaptation strategies and requirements may differ from those of the global North. Therefore, adaptive strategies may require to be issue specific and addressed at a local level in Africa. In Kenya, climate impact and adaptation studies have mainly focused on fields such as agriculture (Bryan et.al., 2013, Kurukulasuriya, 2013). Authors such as Mutimba et al., (2010) and Ogutu et al., (2009) have studied the impacts of climate change on wildlife in Kenya. They, however, have not focused on wildlife tourism and adaptation which is critical to the sustainability of tourism that is mainly wildlife based. In the completion of this study, I will help address this gap in the literature on the adaptation of wildlife tourism to climate variability and especially applicable to wildlife tourism.

Social relevance

Tourism is an economic pillar in Kenya with the main attraction being wildlife and nature. The information produced in this study will assist in sensitizing the stakeholders on the importance of addressing climate variability by highlighting its impacts on wildlife and destination attractiveness. In addition, the knowledge produced from this research will provide stakeholders with options, adapt and recover from impacts that climate variability may have on wildlife tourism in the future. The findings may also assist tourism stakeholders in the formulation and implementation of policies that are related to wildlife tourism.

1.5 Thesis outline

This thesis is structured as follows: **Chapter one** provides an overview of the linkage between climate variability and wildlife tourism and adaptation. The problem statement, as well as the objectives, are presented in this chapter. **Chapter two** gives a detailed discussion on the literature on wildlife tourism and climate variability. It ends with a presentation of the conceptual framework that guides this study. **Chapter three** follows with the presentation of the methods used to generate information for this study and an explanation of the case study. **Chapter four, five and six** present the findings. **Chapter four** present findings on climate variability and how it impacts on wildlife migration patterns and dispersion. **Chapter five** provides the variations in the temporal attractiveness of the destination. **Chapter six** presents findings on adaptation strategies of wildlife tourism stakeholders. **Chapter seven** provides the discussion of the study, based on

concepts discussed in chapter two. Finally, **chapter eight** presents the conclusion of the study. Recommendations, limitations and areas of further research are also presented here.

2 LITERATURE REVIEW

2.1 Introduction

This section I will review current literature related to wildlife tourism and relationship to climate variability. I will elaborate on the challenge that climate variability is creating on wildlife destinations by highlighting impacts on the destinations attractiveness. Further, I will discuss adaptation strategies that have been documented, and the existing gaps will be explained. I will conclude by highlighting the main concepts of the study in the form of a conceptual framework.

2.2 Wildlife Tourism

Wildlife tourism is one of the fastest growing specialized sectors within the tourism industry (Rodger and Moore, 2004). Wildlife tourism sector is highly climate-sensitive as the climate influences the quality and length of tourism seasons. In addition, climate influences the environmental conditions that may attract or deter visitors from a destination (UNWTO, 2009). Therefore, adaptation to climate variability is being recognized by national and international policy organizations as an alternative to mitigation. This is because projections of climate show large uncertainty in the direction and magnitude of changes in precipitation (Smit et al., 2000). In developing countries, these impacts are increasingly becoming evident, and tourism is becoming strongly vulnerable to climate variability because they are highly dependent on natural resources and these countries have limited adaptive capacity (Aterra-report, 2018).

In the past 50 years, there has been a rapid and sustained growth of tourism (UNWTO, 2017). According to UNWTO highlights (2017), international tourists arrivals grew by 7% in 2017 to a total of 1.3 million, and this trend is expected to continue in 2018. Travel and tourism have become an important contributor to the economy globally (UNWTO, 2017). International receipts earned by tourism in destinations worldwide moved from US$ 2 billion in 1950 to US$ 495 billion in 2000 and US$ 1,220 billion in 2016. International tourism represents 7% of the world's exports in goods and services and ranks third after chemicals and fuels and in many developing countries as it ranks as a top export category (UNWTO, 2017). In Kenya, tourist arrivals received 1.1 million in 2017 with a 3.7% direct contribution to the country's GDP from the economic activity generated by industries such as hotels, travel agents, airlines and passenger transportation (UNWTO, 2017). Through employment and entrepreneurial opportunities, tourism can elevate people from poverty

and hence made tourism a major component of the trade agenda and international development (Hall and Coles, 2008). Figure 2 shows the contribution of the tourism industry to a destination

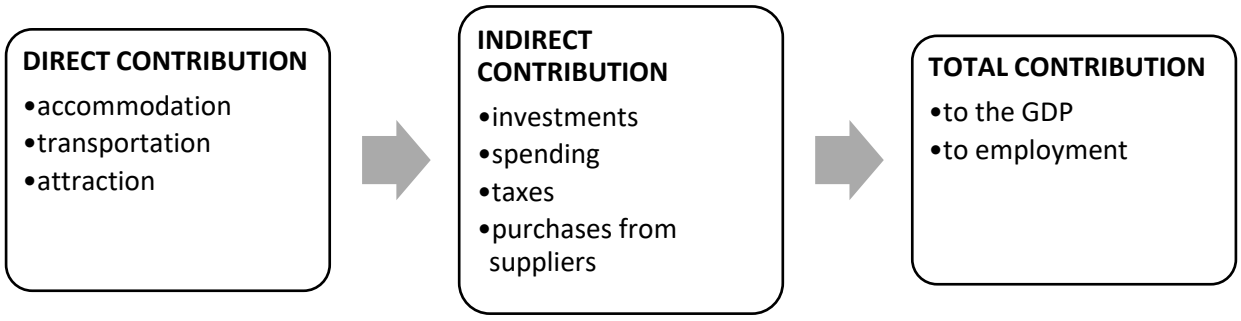

Figure 2: Contribution of the Tourism Industry to a destination

Source: Adapted from WTTC (2012).

According to Higginbotton et al., (2004) a wildlife tourism product consists of encounters between humans and undomesticated animals for leisure and recreation which form the main attractions. These encounters with wildlife and humans can occur in places where the animals are captive for examples in wildlife sanctuaries and zoos or *in-situ* or non-captive for example in public places or national parks. The main factor of wildlife tourism is to be able to experience animals in the wild, appreciate their beauty and observe they're natural behaviour. Animals that are watched include fish, reptiles, mammals, birds and insects. Because of this wide range of different species that are watched in different locations, the profile of wildlife tourists depends on the type of activity and its location.

According to Duffus and Dearden (1990), the popularity of wildlife species for tourism is determined by the historical relationship that is between the humans and that of a species. They also add that tourists are drawn to species that are rare and uncommon. They further explain that wildlife tourism typically depends on the regular appearances of the species that tourists target, and it is usually at a small spatial area. Often it is the quality of natural area's living or biotic elements such as flora and fauna or wildlife that are central in attracting tourists to a specific destination. Hence wildlife tourists seek an experience that will enable them to explore a new ecosystem and its inhabitants a combination of personality variables, including motivation and socio-economic status, drive individuals to seek specific wildlife species.

Tourism based on wildlife has become a major economic activity in several countries. In countries, such as Kenya, New Zealand and Nepal, wildlife tourism accounts for as much as 40–60 per cent of all international tourists (Nyaupane et al. 2004). Wildlife tourism has previously been classified under a broad category of nature-based tourism. However, focus on wildlife tourism as a separate segment has become important as some issues specific to wildlife tourism are masked in the broad nature-based tourism discussions (Reynolds & Braithwaite, 2001). Wildlife tourism is one of the fastest-growing sectors of the tourism industry, comprising some 20 per cent of all leisure activities (Reynolds & Braithwaite, 2001).

Kenya's wildlife falls within counties that have been classified as arid and semi-arid lands (ASALS). Approximately 84% of Kenya's wildlife resides in the 38,000 km^2 networks of national reserves, national parks and county council reserves and other sanctuaries. These networks of protected areas, the state, acting through KWS and its agents which include local county councils, has absolute regulatory powers over access and development of wildlife (Norton-Griffith, 2007).

2.3 Wildlife tourism experience

There are different types of providers of wildlife tourism experiences who include nature and wildlife conservation agencies, government agencies, non-profit organizations and tour companies. These providers have the main aim of providing quality experiences through the services and products provided to the tourists (Higginbotton et al., 2004).

The tourism experience is determined by the attractions which are in the form of products offered to the tourist. This is because they are the main motivators for tourists' trips and form the core of the product. Attractions create the need for other tourism services and can be single units, individual sites or well defined small-scale geographical areas. These areas should be accessible and attract large numbers of people to travel some distance from their home to visit them. There are three main types of attractions which include; features within the natural environment; human-made buildings, structures and sites and special events (Swarbrooke and Page 2012). Figure 3 indicates the interaction between the different components of the wildlife experience.

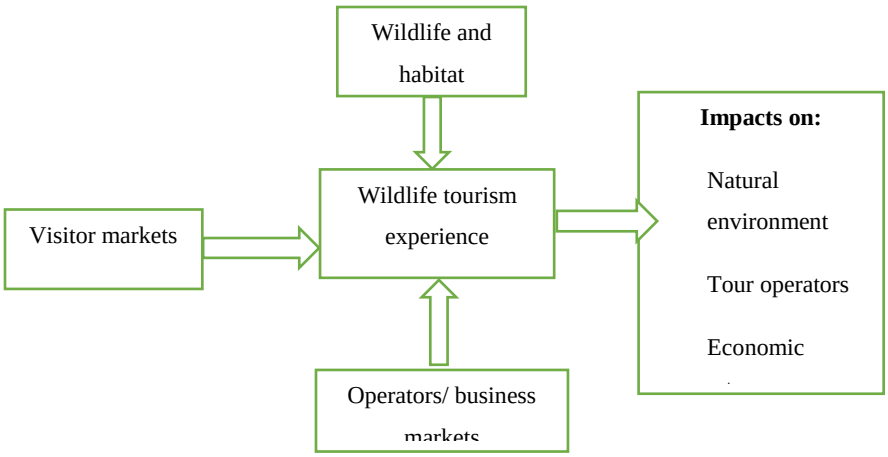

Figure 3: Interaction between components of the wildlife tourism experience

Source: Higginbotton et al., (2004).

Hu and Ritchie, (1993p. 418) define destination attractiveness as… "*a combination of the relative importance of individual benefits and the perceived ability of the destination to deliver individual benefit…*". For a destination to enhance its competitiveness, it must have the ability to use its resources (human, human-made, cultural and capital) efficiently to satisfy all tourists requirements, needs and expectations. Satisfaction of tourists needs will facilitate destinations growth and optimize its attractiveness. The perceived ability of a destination to meet its customers' needs, determines the destinations' attractiveness and its likeliness to be chosen to visit and spend time (Mikulic et al., 2016; Mihalič, 2000). However, some resources are difficult to influence through development strategies such as climate and landscapes; the destination managers should develop a policy for protection to protect them and avoid degradation of the natural resources (Haugland et al., 2011).

According to Reynolds & Braithewaite (2001), the quality of wildlife tourism experience will depend on several factors that include:

- The authenticity of the natural environment that the wildlife is viewed in.
- Intensity or excitement generated by the experience.
- The uniqueness of the experience.
- Duration/ length of exposure to the stimuli.
- The popularity of the species which is driven by factors such as physical attractiveness, size and drama or danger associated with the species.

- The species status that is defined by the rarity of the animal.

Traditionally research on wildlife tourism has focused on; tourism experience (enjoyment/satisfaction) and change in purchase behavior (Keller, 1980; Berry & Kellert, 1980; Bitgood, 1987); impacts on the environment with focus on actions that can minimize impacts or contribute to the health of environment (Dalal-Clayton, et al., 1997); and carrying capacity (Sharkey, 1970, Williams & Gill, 1991).

2.4 Climate variability and its impact on wildlife tourism in Kenya

IPCC (2007b) defines weather as the fluctuating state of the atmosphere which is characterized by precipitation, temperature, wind, clouds and other weather elements. Climate is defined as the average weather which is described in terms of the mean and variability of pertinent quantities over a period ranging from months to a larger time scale (IPCC, 2001). Climate of places varies, depending on the distance to the sea, latitude, presence or absence of mountains, vegetation, or other geographical factors. IPCC, (2007) defines climate variability as;

"… the variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all temporal and spatial scales beyond that of individual weather events..." (IPCC, 2007, pp. 872).

Variability of climate may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability). IPCC (2007), states that changes in climatic features such as temperatures will vary globally, with hot extremes, heavy precipitation and heat waves continue to be more recurrent. Many major tourists' destinations will need to be aware of these extreme events to be prepared to respond through strategies for disaster risk management and systematic capacity building to the natural hazards at the local levels (UNWTO, 2007).

There are still considerable debates about the importance of climate in shaping the vegetation biodiversity and ecology. This is because of the interplay of the different land tenure and management systems in Kenyan rangelands. In addition, the economic factors associated with changes in resource use within the areas are poorly understood. However, Ogutu et al., (2003), notes that the increase in climate variations and shifts in climatic conditions have been seen to have major impact on the populations of many organisms. The authors further explain that as the

atmospheric pressure fluctuates, that is Northern Atlantic Oscillation (NAO) several ungulate species dynamics in the northern hemisphere are influenced. In the southern hemisphere, on the other hand the eastern Pacific Ocean sea surface temperatures affect atmospheric pressure conditions. These generate the El Niño- Southern Oscillation (ENSO) influencing the distribution of precipitation in that region. Other anomalies may arise from temperature irregularities from the Atlantic and Indian Oceans together with ENSO being responsible for the Interdecadal oscillation in rainfall that has manifested in southern and eastern Africa in the past 18 years.

Eastern Africa is mainly a savanna region, where vegetation growth is mainly determined by rainfall which in turn influences the population and abundance of large mammalian herbivores. In the Mara-Serengeti ecosystem, rainfall in the past 30 years has been characterized by periods of predominantly wet years followed by dry years that last for about a decade. For example, after wet years in the 1970s, it was followed by predominantly dry years that persisted from the 1980s to the mid-1990s. This was followed by a wet phase in 1996 and the El Niño floods in 1997/98 and La Nina drought in 1999/2000 conditions that are characteristic of the ENSO phenomena (Ogutu et al.,2008).

The implications of this continued climate variations are mostly on the habitat. The quality of the vegetation for wildlife and livestock deteriorates causing phenological shifts including deviations in breeding dates budburst and flowering and possibly interrupting the already existing fauna and flora (Ogutu et al., 2008). In addition, continued changes in the climate of the region may lead to disruptions in wildlife migration patterns and populations in the protected areas due to a reduction in the vegetation cover. In addition, anthropogenic land use and cover changes may prevent species from potentially spreading to areas with the suitable climate in the future. Hence, climate variations might pose a great threat to the future animal and plant communities in the savannah as their lack of free mobility and flexibility of wildlife species to track variations in climate. This may endanger the health and existence of the wildlife resources upon which the country's wildlife tourism sector is based (Mawdsley, 2006).

Predicting the climate change in Kenya is difficult due to the natural variability and other factors such as omissions in the global level. However, climate models show an increase in climate extremes. An increase in temperatures will have a significant impact on water it intensifies the drought conditions that are already being experienced. In addition, the rainfall pattern in Kenya is

unpredictable with a tendency to fall heavily. This will likely cause problems by increasing the frequency of floods occurring due to heavy rainfall periods (Herero et al., 2010).

2.5 Adaptation of wildlife tourism to climate variability

Changes in the climate and environment may create threats or opportunities for a destinations core activity in tourism. Nature-based tourism activities are particularly sensitive to these changes in environment and climate. It is therefore important for all relevant stakeholders to respond to the risks that climate variations pose to the tourism industry attractiveness. Adaptation has been defined by the IPCC as;

…adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploit beneficial opportunities… (IPCC, 2007 pp. 869).

As variations in climate become more frequent, so are the observed impacts of extreme climate events increase. These impact the physical and ecological systems of a tourism destination. Societies, individuals and organizations must, therefore, adjust their behaviour in response to past variations in climate and adapt to the changed future conditions in climate (Adger et al., 2004). Adaptation may be reactive in that it is prompted by past or current events or anticipatory when it is based on an assessment of future conditions (Adger et al., 2004). Social, economic and environmental drivers motivate adaptation.

Adaptation benefits local communities as responses are targeted to a specific impact. Therefore, it is best to implement adaptation at local destination levels as this is where the impacts and benefits are largely felt (Jopp et al., 2010, Scott et al., 2008). In addition, the adaptation approach taken is complex as there are several stakeholders involved in the tourism industry such as tourism businesses, public sector, accommodation providers and the tourist. To achieve sustainable adaptation multiple adaptation and cooperation are required among the different stakeholders (Jopp et al., 2010). The main adaptation types suitable for the tourism sector have been discussed in the literature include business, technical, policy consumer and research and education (Jopp et al., 2010, Scott et al., 2006, 2008). It is, however, important to note that wildlife tourism adaptation studies are limited.

- **ADAPTATION MEASURES BY BUSINESSES**

Businesses form the core elements of the tourism sector (see figure 3) hence the majority of adaptation literature is focused on tourism businesses. One of the most mentioned adaptation responses to climate variability is the business ability to diversify products and change location. In addition to diversification, giving more emphasis to new seasons may also increase the adaptive capacity of a destination. Tourism associations and business should also have training programs on climate change adaptation and encourage environmental management (UNWTO, 2008).

- **TECHNICAL ADAPTATION MEASURES**

Involves utilizing technology to innovate new methods to cope with impacts and provide customers with information. It requires specialized equipment and use of new technologies and innovations. In addition, it will enable access to early warning equipment (e.g., radios) to tourism operators. Tourism industry associations should be able to develop websites with practical information on adaptation measures Reservoirs and desalination plants. Furthermore, governments and local communities should have an elaborate water consumption system, have access to weather forecasting and early warning system and advanced building design or material (e.g. fire resistant) standards for insurance (UNWTO, 2008).

- **POLICY**

United Nations Development Program (UNDP) (Lim & Spanger-Siegfried, 2004), has provided four guiding principles in adaptation policy framework development. First, adaptation should be placed in a development context. Secondly, it is important to recognize that adaptation occurs at different levels particularly at the local level, hence it is mainly bottom-up. Third, current adaptive experience should be used to build on future adaptation. Hence adaptation is an ongoing process. Lastly, it is important to have an actual policy on adaptation. In the context of tourism, these guiding principles can be implemented by enhancing the role of public policies in planning and merging them into regional tourism programs. Richard et al., (2010), emphasizes that this would enable to bring about the benefits by raising awareness in local communities to take proactive measures to respond to climate variability.

Although Kenya has prioritized adaptation through plans such as the National Climate Change Response Strategy (NCCRS) and the National Climate Change Action Plan 2013-2017

(NCCAP), tourism sector has often been overlooked by governments and policymakers when examining adaptation options, with sectors such as agriculture and water receiving more attention (Munyiri, 2015).

- **CONSUMER ADAPTATION**

As discussed above (section 2.4), variations in climate may affect the wildlife destinations attractiveness. Wildlife is the major motivator for wildlife tourism, changes in the ecosystem and environment may prove to have a negative impact on the specific destination. This is because it may lead to changing of tourist travel patterns and behaviour depending on the availability of wildlife. It is important for researchers to understand how this may impact the consumers currently there is very limited literature that relates to wildlife tourists (Njoroge, 2015).

- **RESEARCH AND EDUCATION**

For continued adaptation, it is important for all tourism stakeholders to assess the awareness of businesses and tourists, as well as a knowledge gap. In addition, set in place monitoring programs for wildlife destinations to evaluate their vulnerability to climate extremes (UNWTO, 2008). Education programs can include water conservation and sustainable tourism for employees and guests.

2.6 Adaptive capacity

Depending on three key resources: money, knowledge and time, tourists have the greatest adaptive capacity. This is because they have the freedom to choose the destinations that will best satisfy their needs. However, suppliers of the tourism services and tour operators in destinations have less adaptive capacity especially in nature-based tourism as the product is produced and supplied at the same place and most of their assets are immobile (Adger & Vincent 2005).

2.7 Conceptual Framework

For the Mara wildlife tourism stakeholders to effectively adapt to climate variability, it is important to have information on two important perquisites; information on what to adapt to and how to adapt to mobilize resources for implementation of adaptation measures. In this study key concepts that arise from an increase in climate variability and its impact on wildlife migration patterns and dispersion how these changes impact the destination attractiveness. From this

knowledge, wildlife tourism stakeholders can decide upon the best adaptation measures. Their relationship is presented in figure 4.

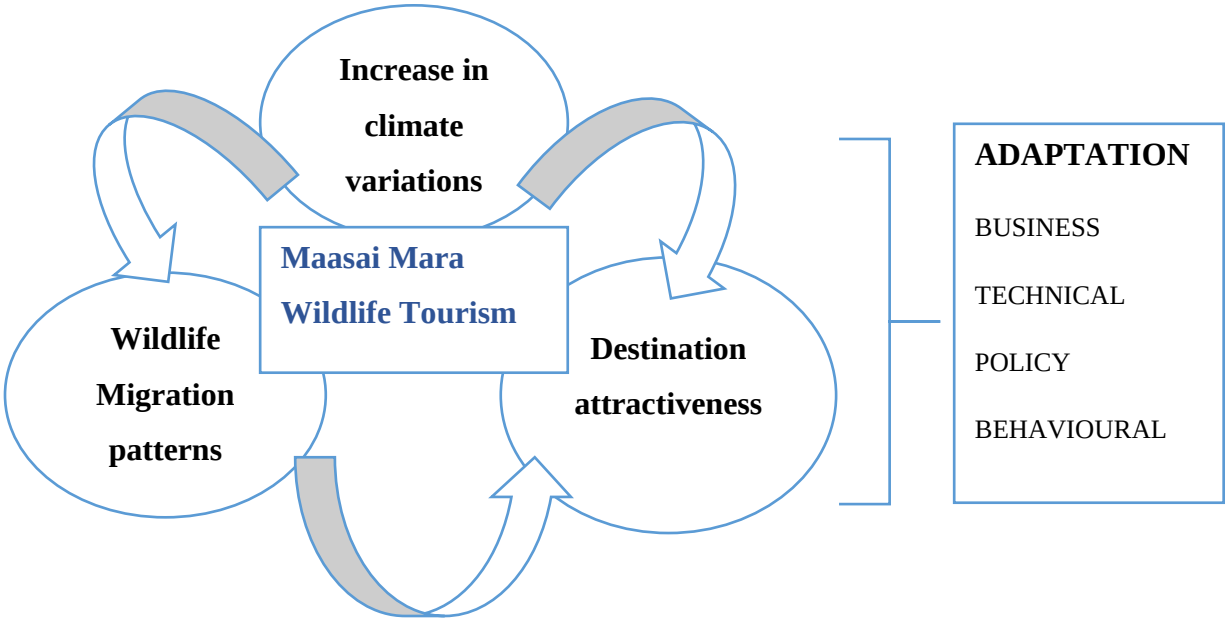

Figure 4: Adaptation of wildlife tourism to climate variations

Source: Author 2018

Extremes caused by climate variations such as floods and droughts may lead to changes in the vegetation that comprise the animals' habitat would lead to highly sensitive species to undergo dramatic shifts in geographical distribution (Root & Schneider, 1993). Although in some cases migration of animals may occur due to changes in vegetation, in some environments populations may be unable to migrate due to lack of migration corridors hence leading to extinction (UNWTO, 2008). In "normal" levels of environmental variability, most wildlife populations can accommodate the changes. However, an increase in climate-induced environmental variance may lead to decline in populations as individuals may be unable to reproduce successfully (Brodie et al., 2013). The severity and extent of drought are expected to increase under climate variations especially in arid and semi-arid areas, and this can impact the species and ecosystem due to mortality caused by water-stressed animals and plants, decreased resource availability and shifts in vegetation types (Brodie et al.,2013).

The main attraction of tourists to a Maasai Mara is the wildlife. Tourist activities in the Mara are mainly non-consumptive (e.g. wildlife watching) of free-ranging wildlife (Catlin et al., 2011). Non-consumptive wildlife-oriented recreation (NCWOR) has been defined by Duffus & Dearden (1990 p. 218) as a "*human recreational engagement with wildlife wherein the focal organism is not purposefully removed or permanently affected by the engagement"*. Therefore, wildlife tourism includes the provision of an experience rather than a product. Maasai Mara tourist stakeholders (hosts communities, tour operators, managers, business and government institutions) put wildlife at the centre of their product development and marketing of the destination. However, with the variations in climate, the migration and dispersion patterns of wildlife are changing the destination attractiveness may be affected. In addition, the landscape aesthetics in which the wildlife is located can be affected which will then impact wildlife tourism

As wildlife tourism is an important employer for many communities living close to natural parks and reserves, interruptions in the natural resources can be detrimental to the economy of said local communities. It is hence important for the government and the industry stakeholders to respond to the risks that climate variations pose to the wildlife tourism industry attractiveness. Adaptation involves adjustment of the natural or human system to respond to actual or expected climate stimuli or their impacts to enable moderation of harm or exploitation of the beneficial opportunities (McCarthy et al.,2001). Adaptation includes activities that have taken place before impacts have been observed (anticipatory), and after impacts have happened, they can both be planned. Reactive adaptation can also be spontaneous (Scott et al., 2012).

The table (1) below shows the range of managerial, technical, behavioural, policy and research adaptations currently being used by various stakeholders to deal with climate variability at destinations. Each destination climate and tourism product have a specific adaptation which commonly involves multiple adaptations. This creates a complex mix of adaptations strategies being practised.

Table 1: Portfolio of climate adaptation utilized by tourism stakeholders

Source: Adapted from Scott et al., (2008); Jopp et al., (2010)

Type of adaptation	**What it involves**	**What it requires**	**Examples**
Business management	Involves techniques that tourism operators, regional governments and tourism industry associate to reduce vulnerability.	Destination managers to change their marketing approach and use advanced building standards.	Strategic Marketing techniques, e.g. new pricing strategies, market and product diversification. Redirect clients away from impacted destinations, low-season closures, water conservation plans.
Technical	Involves utilizing technology to innovate new methods to cope with impacts and provide customers with information.	Specialized equipment and use of new technologies and innovations.	Alternative energy sources.
Behavioural	Involves the tourists as they have the ability for spatial, temporal and activity substitution.	Technical and business management to manipulate the behaviour of tourists.	Good practice is in-house.
Policy	Involves coordinated political lobbying for GHG emission reductions and adaptation and seeking of funds to implement adaptation.	Plans and setback requirements and building design standards.	Consideration of climate change financing and credit risk assessments.

Research	Assessment awareness of business and tourists and knowledge gaps.	Monitoring programs.	Extreme event risk exposures.

Product and market diversification are main adaptation strategies that destinations apply to cope with the impacts of climate variability (Scott et al., 2008). In addition, marketing is also a key strategy that destination stakeholders apply to adapt to natural seasonability. Inadequate water supply brought about by climate variability is a major pressure experienced in nature-based destinations (Scott et al., 2008). Example of technical adaptations that can increase water supply for wildlife in parks includes the building of water tanks and water transfers through pipelines and tankers (Scott et al., 2008). Example of policies that can be developed by the government to regulate the tourism industry and cope with variations in climate include; wildlife management, water management and adaptation policy (Scott et al., 2008). Finally, research on adaptation to climate variability, extreme events exposure and vulnerability will fill knowledge gaps and information obtained will assist in decision making on which adaptation strategies to implement.

Adaptive capacity of wildlife tourism

Adaptive capacity has been defined as the '*...ability of a system to adjust to climate change including climate variability and extremes, to moderate potential damages, to take advantage of opportunity or to cope with the consequences...'* (Scott et al., 2012 p.267*).* The mix of social, technological, economic, political and biophysical conditions within which climate adaptation takes place will determine the capacity of individuals or social system to adapt (Smit & Pilifosova, 2003). The ability of the wildlife tourism industry to cope with the impacts of climate variations on the destination attractiveness is an indicator of a relatively high adaptive capacity with the industry (Scott et al., 2008). Tourists have the greatest adaptive capacity as they have the freedom to avoid destinations affected by climate variability or change their time of travel to avoid unfavourable climate conditions. However, suppliers of tourism services and tourism operators of specific destinations are less adaptive as they must be able to respond to clients demands and provide information to influence their travel choices. (Scott & Jones, 2006).

3 METHODOLOGY

3.1 Introduction

This chapter presents the main methods used in the study to produce information for the study based on the conceptual framework given in chapter 2 (section 2.7) above. It gives a detailed description of the case study, epistemology and ontology, methods of data collection and analysis.

3.2 Case study

The main aim of this study is to find out if and how tourism stakeholders have responded to the impacts of climate variability on wildlife tourism. To get up-close, in-depth and detailed information, the study will take the form of a case study. The case study chosen in this study is Maasai Mara. Maasai Mara is the most famous national reserve in Kenya, mainly due to the annual wildebeest migration.

Description of the Maasai Mara

Maasai Mara is situated within the Great Rift Valley in the southern part of Kenya and it derived its name from the indigenous people – the Maasai community – and the Mara River that cuts through the Reserve. MMNR is located at 1 30′S and 35 0′E in Narok County. Measuring at approximately 1700 km^2 in size, the Mara is an unfenced savannah grassland reserve. MMNR is located at the north part of Serengeti/Mara ecosystem with Loita Plains on the north-east, Laleta Hills on the east, Siria Escarpment on the west and Serengeti National Park on the south (Dublin, 1991). MMNR is managed and run by the Narok County Council. Adjacent to the north of the national reserve 13 conservancies have been set up to aid in conservation and eco-tourism as shown in figure 5.

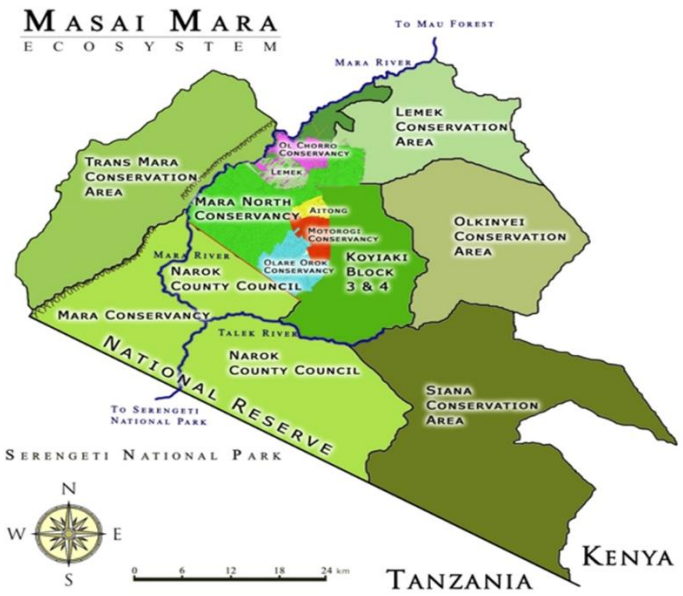

Figure 5: Maasai Mara Ecosystem

Source: http://www.maranorth.com/ecosystem.html

MMNR has a wide variety of animals, landscape, and natural resources and accounts for 25% of Kenya's wildlife. It is home to elephants, black rhinos, lions, leopards, cheetahs, crocodiles, hippos, buffalos, different bird species, plains zebras, hartebeests, wildebeests and other herbivores. The reserve hosts an annual migration of wildebeests, zebras and Thomson's gazelles from the adjoining Serengeti National Park. The main tourism activities undertaken in reserve are safari and cultural tours, camping, bird watching, balloon safaris, bush dinners and horseback safaris. In addition, MMNR accounts for 12% of the lodges, 16% of bed capacity, 67% of camp-sites and 74% of camping capacity in Kenya (Wishitemi, 2008).

Climate of Maasai Mara

The weather and the cycle of four seasons per year influence the migration. The seasons include the ‘short dry season’ is which is from December to February/March; the ‘long rains’ that are from March through April and into May; and the ‘long dry season’ is from June to September, with the two-week ‘short rains’ falling any time from October into November. Migration begins in March when the southernmost Serengeti begin to dry out and wildlife head into Kenya and the Maasai Mara to look for greener grazing areas. The wildebeest spend several months feeding in the scattered distribution of green pastures and isolated rainstorms on Maasai mara grassland. In

late October, when the short rains start falling on the Serengeti plains, leading to vegetation growth, the wildebeest start heading south again (Musiega, 2004). This is illustrated in figure 5 below.

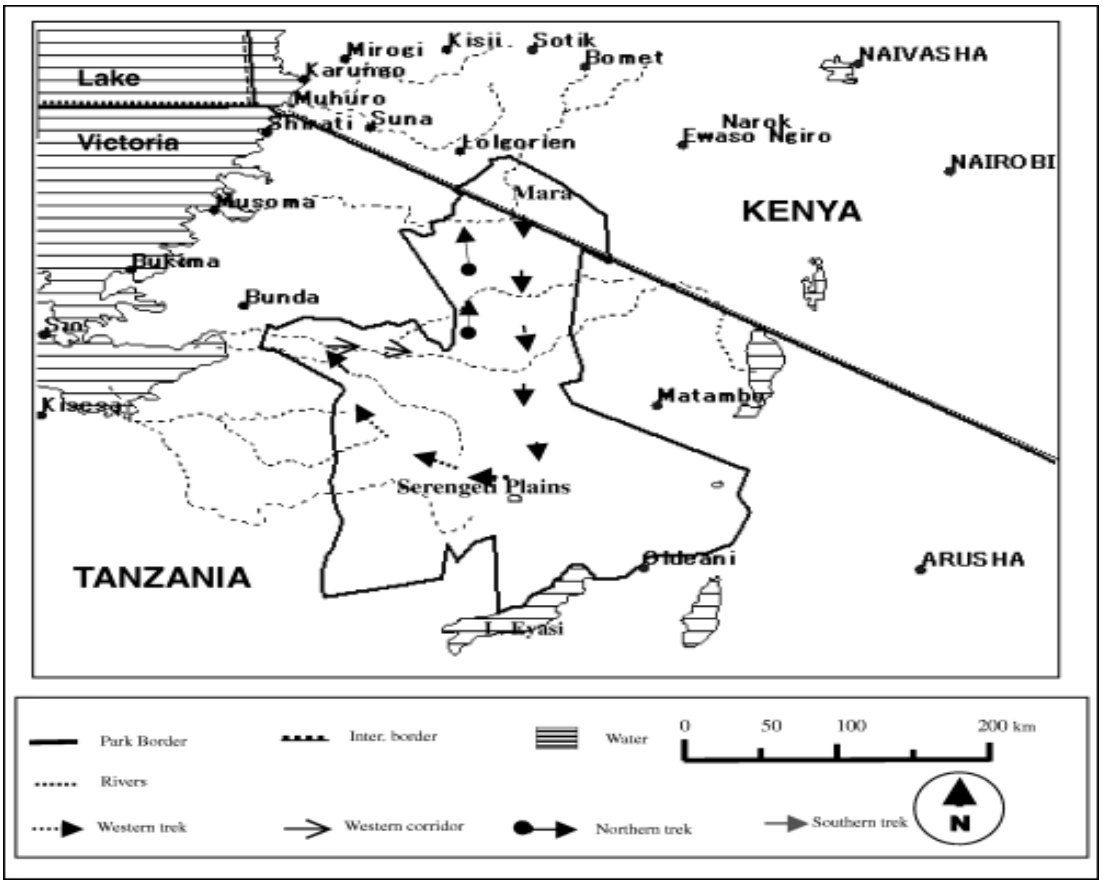

Figure 6: Wildlife Migration Pattern

Source: Musiega, (2004)

3.3 Epistemology and Ontology

The study takes an exploratory approach. Climate and tourism is a topic that has gained much popularity in research in the recent years. However, as discussed (see section 2.6) there has been very limited adaptation studies specifically to wildlife tourism. With data collected from, this study makes strides in filling this gap.

This study applied an interpretive approach as it aimed to enhance our understanding of the adaptation phenomena in climate variability and wildlife tourism studies which are grounded on the realm of the social world. Interpretivists emphasize that the social world is meaningful in a way that the natural world is not (Gorton, 2010). In interpretive ontology, realities are

comprehensible in the form of multiple, intangible mental constructions, based on the society and environment. In addition, in interpretivism, there is a link between the researcher and the subject of the research since people cannot be separated from their knowledge (epistemology) (Guba and Lincoln, 2005).

The knowledge from the individuals is not the absolute truth and hence alterable hence as the researcher I will remain as objective as possible when interpreting meanings to make sense of the actions, institutions, value systems and any other elements that comprise the social world under study (Gorton, 2010).

In addition, I applied a descriptive interpretive methodology and methodological triangulation by obtaining both secondary and primary data (Gorton, 2010). To ensure the validity and reliability of my study, I applied concurrent triangulation. Quantitative and qualitative data was generated simultaneously hence providing findings that have a broad and deepened insight into the research subject (Boieje, 2010).

3.4 Methods

Research Question 1 (RQ1): How have wildlife migration patterns responded to climate variability in MMNR Kenya?

The following sub-questions were addressed to answer RQ 1:

1. How has climate varied locally in the past 15 years?
2. How has the variations in climate impacted the migration and dispersion of wildlife in MMNR, Kenya?
3. What variations in the migration and dispersion patterns of wildlife have been observed in MMNR, Kenya?

To answer this main research question 1 (RQ1), I conducted a comprehensive content analysis from secondary data such as journal articles and books, travel websites. In addition, I collected data on climate and temperature of Narok county for the last 15 years from the Kenya Meteorological Department (KMD). I also collected wildlife census data from 2010-2017 from Kenya Wildlife Service (KWS). This data was supplemented with interviews. Interviews were conducted with Chairman; Maasai Mara Tour Guide Association, Narok County; wildlife and

tourism department, Chief park warden, Sekenani gate, Maasai Mara, Managers, Ol Chorro Conservancy, KWS, Research Scientist (Maasai Mara Station), KWS, Rhino manager (Maasai Mara), Campsite Manager (Olderpoi Mara Camp). These interviewers were chosen because they are important stakeholders in the park management. Local experts on wildlife tourism and climate variations (Kenyatta University, School of Environment and School of Tourism; Muranga University, School of Hospitality and Tourism) were chosen based on their climate adaptation and tourism-related studies. From these data, the observed influence of the extreme events on wildlife migration and dispersion were established.

Research Question 2 (RQ 2): How has the temporal attractiveness of MMNR, as a wildlife tourism destination, varied?

The following sub-questions were addressed to answer RQ2:

1. What is the best time to visit Maasai Mara to view wildlife?
2. Identify the main stressors to wildlife tourism in MMNR caused by climate variability. For example, past occurrences of extreme events and describe their magnitude, frequency and distribution and compare them to the climate system of the destination.

To answer this question (RQ2), I obtained data on the monthly statistics on information about tourists' temporal distribution in MMNR for the past 15 years from Kenya National Bureau of Statistics (KNBS). Average seasonal data for 'low and high' tourists' season for each year was established. These data were compared to data collected from RQ1 above to obtain their relationships.

Research Question 3 (RQ3); How have tourism stakeholders responded to the variability of the attractiveness of MMNR as a wildlife destination?

To answer this question, the following sub-questions were answered:

1. Which tourism stakeholders have been actively involved in the adaptation process?
2. What are the current behavioral, technical management, policy research and education adaptation options being employed by the local tourism stakeholders in MMNR?
3. How effective have the adaptation options employed to cope with the changes in migration patterns been?

To answer these questions, literature was reviewed on the adaptation of tourism and specifically nature tourism to variations in climate. In addition, primary data was collected in the form of in-depth interviews with tourism stakeholders.

3.5 Data collection

Data was collected in January 2018, after obtaining the relevant research permits (National Commission for Science, Technology and Innovation, KWS, Department of Education Narok County, Department of Wildlife and Tourism, Narok County). Identified respondents were contacted, and meetings were scheduled.

I developed a semi-structured interview schedule (see appendix 1 & 2) and scheduled all in-depth interviews with the local experts from January 2nd to 31st. Site visit to MMNR was scheduled from 9nd to 12th January and 30th to 3rd February where interviews with tour guides, park and conservancies management, game wardens and local guides were conducted. I have chosen to use interviews as the provided an opportunity to learn about the adaptation of wildlife tourism to climate variability through the perspective and experience. This allowed my respondents to share their stories and knowledge on the topic under study (Boeije, 2010). I did my best to create a rapport with my respondents to have an easier conversation. I did this by developing an interview schedule that guided me to know which questions ask and be aware of the answer option that I may expect and provide room for probing. In addition, my interviews were structured according to the target respondents (See appendix 1 & 2). Interviews were conducted in English, recorded, and confidentiality assured.

3.6 Data Analysis

I conducted a detailed content analysis of secondary data obtained from the literature. Secondary data sources included; journal articles, web pages, newspaper articles and books. Key search terms for the relevant literature will include; ‘climate’, ‘climate variations’, ‘vulnerability’, ‘adaptation’, ‘wildlife tourism’, ‘wildlife tourism experience’, ‘destination attractiveness’, ‘Kenya wildlife migration’ and ‘dispersion’, ‘biodiversity’, ‘ecosystems’. The deductive analysis was undertaken as I had already developed research questions and theoretical framework. I formulated the main categories from the key terms and defined each term. I then collected data from the secondary sources and put them in the categories and interpreted the findings in the form of texts.

I gathered quantitative data on climate trends, migration of wildlife and tourists in the past 15 years in Maasai Mara. The averages of this data will be calculated to establish how climate has varied over the last 15 years and how this has affected migration of wildlife and tourism arrivals. The data was presented in the form of graphs and line charts.

I transcribed the interviews. I applied a deductive approach to analyze data from the interviews. To adhere to deductive analysis, from the theory I developed questions that guided interviews. In the analysis, I had predetermined codes that were based on the themes of the questions and literature. From the transcribed data, I assigned the predetermined codes to lines of texts. In addition, I will have determined whether the codes developed that far cover data sufficiently and created new ones if need be. I then did an overview of the fragments that have been assigned a specific code and considered their similarities and differences and developed categories in the form of a code tree. The categories and sub-categories were then described with their distinctions and relationships made.

4 CLIMATE VARIABILITY IMPACTS ON WILDLIFE MIGRATION PATTERNS

4.1 Introduction

This chapter aims to present the findings of the first research question of how wildlife migration and dispersion patterns of wildlife changed in response to climate variability. To do this, I answer three critical sub-questions; How climate has varied locally in the past 15 years. How variations in climate have impacted the migration and dispersion of wildlife, and what changes in the migration and dispersion patterns of wildlife have been observed in MMNR. Results presented here are a combination of climate data extrapolated from KMD, wildlife population data from KWS and field interviews.

4.2 Climate Variations in the Maasai Mara in the past 15 years

Data collected from KMD and interviews confirmed that the rainfall pattern in the Mara is bimodal with a minor peak in November-December and long rains during January to June with peaks during April. The total monthly rainfall in the dry season averaged at 50mm and 87mm to 130mm during the rainy season as indicated in figure 7.

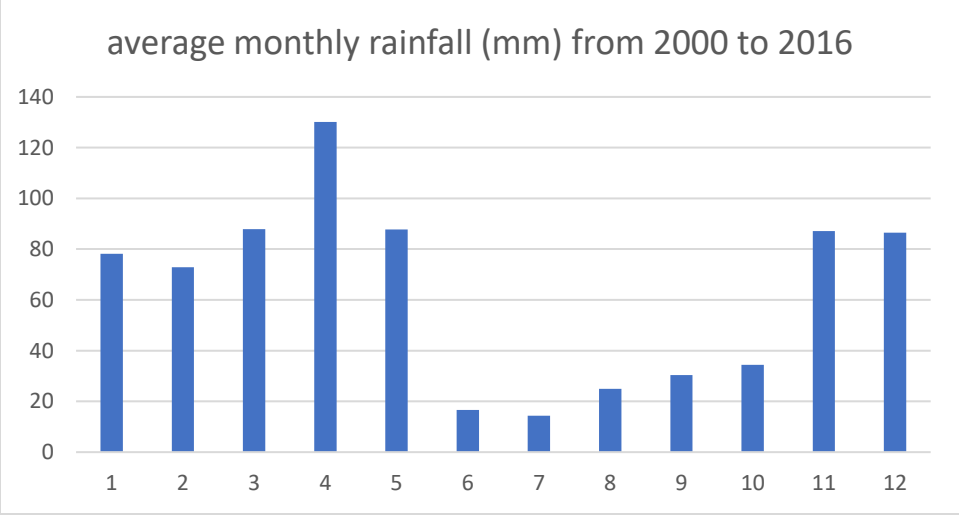

Figure 7: Average monthly rainfall (mm) in Maasai Mara from 2000 to 2016

Source: KMD

From figure (8), below one can observe that there is a significant increase in rainfall every three to four years followed by low rainfall averaging 40mm per year. These are observed in figure (8) where droughts were experienced in 2000, 2005 and 2009 and extreme wet periods during the year, 2002, 2006 and 2015.

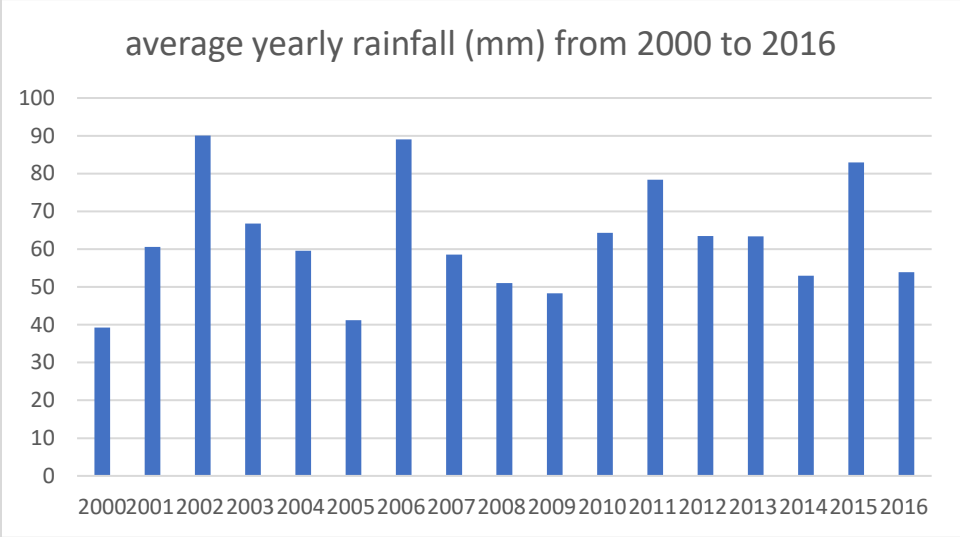

Figure 8: Average Annual Rainfall (mm) in Maasai Mara from 2000-2016

Source: KMD

Although the average rainfall per year has remained consistent, the weather conditions have become more erratic and unpredictable according to the interviews conducted. According to R2, *"…there before, as communities, we used to know the seasons of the year. And especially here we used to know the short rains, the long rains and the dry seasons and as a community, we used to know the seasons of the yea**r.** Like now we normally used to expect short rains from February to June and long rains from September to December. Or October to December. And the dry spell from June to September. But now it has become more difficult to predict. When you are expecting rain, there is a dry spell…".* R1 also commented on this by saying *"…we normally don't expect rain during January, but now we have a lot of rain. And just last month it was very dry…".*

And R5 "…*The past few years the weather has been more erratic than ever. Like the time it was supposed to rain it didn't rain and although if you look at the exact figure, the rain is equivalent to our average, the way it is spread throughout the year it is not the same as the patterns that we have been used to*…". In addition to erratic weather patterns, the Maasai Mara has also

been experiencing extreme weather patterns. R1 confirmed this *"...It seems to be getting extreme as when it is dry it is extremely dry and when it rains it floods..."*. It was common agreement that the region alternated from periods of extreme drought or flooding.

From the data collected from KMD, there has been an increase in temperature in the Maasai Mara over the past 15 years from 2000 to 2016. The temperature is increasing steadily from 9.9 ^{0}C to 11.4 ^{0}C with high temperatures being recorded in April and May from 2000 to 2016 as shown in the graph below (figure 9, 10).

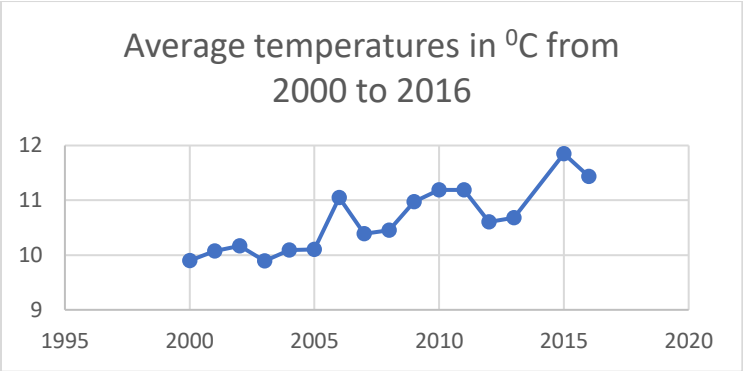

Figure 9: Average temperature (^{0}C) in Maasai Mara from 2000-2016

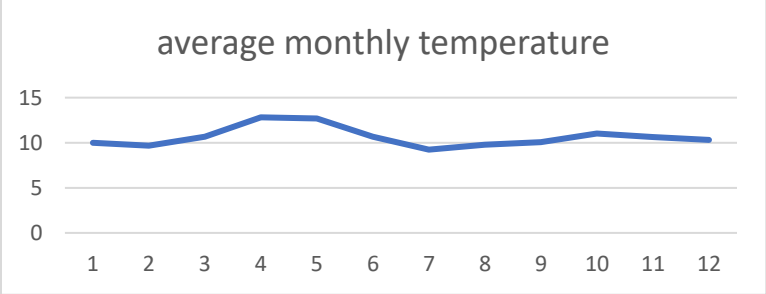

Figure 10: Average monthly temperature (^{0}C) in Maasai Mara from 2000 to 2016

4.3 Impacts of climate variability on wildlife migration and dispersion in the Maasai Mara

According to R 3, there are two types of wildlife species of wildlife in the Mara, the resident species and migratory species. From data received from KWS, there has been an increase in the number of resident species in the past eight years. Recent surveys in 2014 show an increase of

population to 50, 961 from 38, 000 recorded in 2010. However, these number is far below the 150,000 records of 1970 (KWS census data).

According to R3 Mara has seen an increase in the population of elephants from 1,448 in 2014 to 2,493 in the census conducted in 2017 (KWS)... "…*Elephants are not migratory as such, but we have also elephants that do move depending on the availability of forage, and some of them move up to Serengeti Tanzania and then back to Kenya Mara, we have several routes for migration for elephants. That is also dictated by the availability of forage which is dictated by climate…" (*respondent 3).

Severe droughts have led to the loss of pastures contributing to the population decline of wildlife population in the Mara. The local communities who are Maasai are pastoralists and keep large herds of livestock which also compete for forage and water with the wildlife. In addition, there is an increase in agricultural cultivation of land surrounding the Mara. Here communities set up earth dams (see figure 13) that rainwater can collect and use it for farming and livestock. A major conflict between the local communities arises during the dry season when the wildlife drink from the dams (Respondent, 1,3,5).

Figure 11: Earth dam

Source: Author

Respondent 5 stated *"…Mainly conflict arises if the water source is man-made. Because they (local communities) build the earth dams for water for their livestock. For example, you find the elephants trample on it and they drink it up too much you find that there is going to be a scramble for that scares resource…"*

The main water supply of water in the Mara ecosystem is the Mara river which has Talek river as its main tributary. Deforestation of the Mau forest, variations in climate are causing the irregular flow of the Mara river. Respondent 3 explained this impact *"…we have several streams that originate from the river that we have. But they normally dry up especially during the dry season… So, you will find that wildlife will move to areas that we have water, and this is the time that we normally get conflict between human beings and wildlife. Especially due to the competition of resources. Because most of the communities have dug these earth dams, during the long rainwater normally collects in those dams, and during the dry periods, it becomes the only source of water for both the wildlife and livestock. You see now when the wildlife drinks that water it creates conflict as the water is for the community and their livestock…"*

This negatively affects wildlife causing them to change their breeding grounds, increase in animal mortality, change in migration patterns and routes and animal populations. Respondent 5 Stated *"…The Hippos, however, experience the most difficulties because of the water levels in the Mara River. And especially last year, the water levels seem to have come down. However, I am not sure whether it is a perception issue, or we are using climate change as a scapegoat, but the water levels are down. And there have been several animals that died last year, and it is rare that we get to see an animal like a hippo die. But it is twofold because there is not enough grass for them outside because of the drought and but also the water itself is not enough for them to run into…"* these phenomena were confirmed by respondent 2 *"…Ten years now we cannot be able to predict when the migration will occur…"*.

Respondent 2 *"…animals normally have time for breeding and the breeding time for both domestic and wild animals is during the rainy season. The domestic and wild animals don't know the changes in climate, and their period for breeding does not change. They have young ones expecting a rainy season, and then there is a dry spell. And that means there will not be enough forage for both domestic and wild animals. So that has affected both domestic and wildlife…"*

5 CHANGE IN THE TEMPORAL ATTRACTIVENESS OF THE MARA AS A WILDLIFE TOURISM DESTINATION

5.1 Introduction

From the findings in chapter 4, climate variability is impacting the wildlife population. This will lead to a trickledown effect on wildlife tourism as wildlife is the main attraction. This present the section on the findings of the impacts that Maasai Mara is already experiencing due to climate extremes. The section will answer the second research question through the following sub-questions; What is the best time to visit Maasai Mara to view wildlife? What are the main climate-induced stressors to wildlife tourism?

5.2 Temporal wildlife tourism distribution in Maasai Mara

The high season begins in July to September and the month of December. Low seasons are usually from January to May and November. These seasons coincide with the Great Wildebeest Migration as this is the main tourist attraction in the park. However, due to climate-induced changes in the migration pattern, prediction of when the migration will occur has become difficult. According to Respondent 1,2, and 4 this can reduce the length of the tourism season.

"Sometimes it affects tourism because most of the tourists visit Mara because of the migration and they l know that the migration has ended they cancel their trips. Most of them. So, it reduces the number of tourists visiting Maasai Mara" (Respondent 1).

"… there are changes in the migration, and a lot of people come to the Mara for the migration… people always book their trip via the internet, and they always have to ask whether the migration is there. So, if the migration delay, that means there is also a change in their travel or the number of visitors in the Mara…" (Respondent 2).

From data collected from KNBS, the tourist arrivals in the Mara has been on a decline from 2015 as indicated in figure 14.

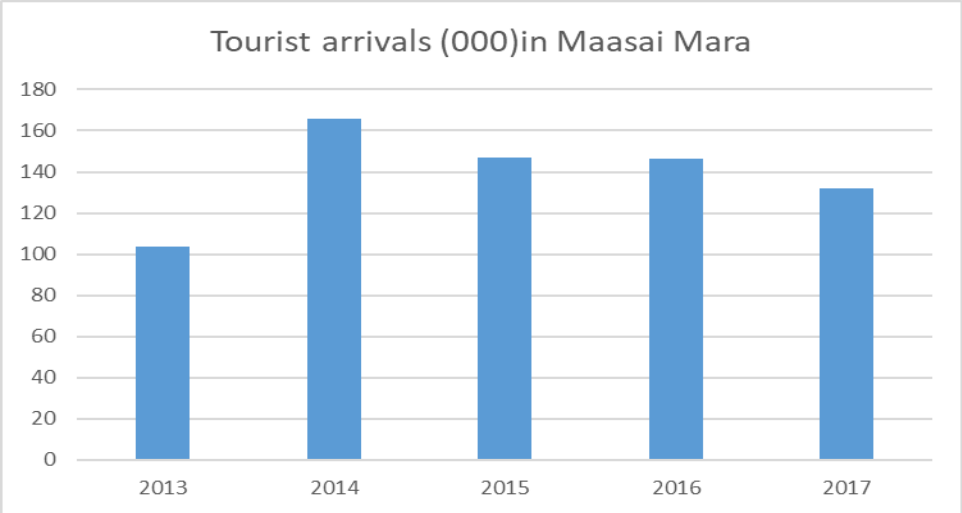

Figure 12: tourist arrivals (000) in Maasai Mara from 2013-2017

Source: KNBS (2018)

5.3 Climate-induced stressors to wildlife tourism

Changes in the distribution of wildlife species lead to dispersion of animals within the Mara. Therefore, it means that there is a reduced probability of sighting of animals within the park. While on a game drive in the park, I observed that the tour guides are in constant communication with each other. This is to communicate any sighting, especially of lions and elephants. This, therefore, leads to overcrowding of tourists on one area where there has been sighting of this wildlife. This problem becomes intense during the 'high' season where every tourist would like to view the migration of the wildebeest along the hot spots as compared to the 'low' seasons. Reducing the attractiveness of the destination especially the special interest tourist who prefer smaller crowds. I can also note that in reviewing tourists' comments on online travel advisory websites on their experience in the Mara, they site overcrowding in one area as the biggest problem.

In dry seasons, there is reduced forage for both livestock and wildlife; this means that the local communities will travel more in reserve to graze their livestock. Respondent 4 explained that tourists complain as they view this as a reduction in the attractiveness of a destination where they were expecting to see pristine uninhabited area *"…when there is drought, you find that some parts of the conservancies still have some grass. So, you will find that all the numbers of livestock of the*

owners of the conservancies bring all their cattle to that area … for sure the tourists now are affected because they do not want to see that…".

Impacts of climate variability extremes in the Mara is not only confined to the wildlife. Extremes such as drought and floods also impact the overall tourism of the region. According to R1, the Mara is a savannah grassland which is characterized by long tall green grass, woodlands and shrubs. In dry periods, these sceneries are reduced to bare grounds which leaves the Mara looking un-aesthetically pleasing to the tourist who visits with high expectations and reducing the variety of tourists' attractions.

During periods of extreme rainfall, the excess water destroys the infrastructure and amenities. Due to the destruction of paths for game drives, some areas become inaccessible meaning that tourism will be confined to just specific areas of the Mara (see figure 13).

Figure 13: Ongoing construction of a bridge in the Mara

Source: Author, 2018

Moreover, most accommodation facilities are tented camps which become flooded in that season. This implies that the camps remain closed during the flooding season. This reduces the number of accommodation facilities available especially in April and May. This was something I experienced from my visit to the Mara. For my data collection in January, I arrived at Sekenani Gate at 6.00 p.m. after a three-hour drive on a dusty 80 km road. Upon my arrival, I started looking for accommodation only to be informed that most campsites had been closed due to the unexpected heavy rains. The few open accommodation facilities with the cheapest ranging at an average of 60

euros a night and located in very remote areas. It took me two hours driving through a rocky road, heavy rains and getting lost in the dark to arrive at my chosen campsite. After a hero's welcome from the manager, he informed me that it the unexpected rains have destroyed the path as water has washed off the top sandy layer leaving it a rocky path. The night followed heavy thunderstorms short-circuiting the solar electricity connection to my rented tent.

6 ADAPTATION OF WILDLIFE TOURISM TO CLIMATE VARIABILITY

6.1 Introduction

For a destination to main its attractiveness, stakeholders need to respond to changes that climate variability has caused. So far in chapter 5, we have identified the main impacts of climate variability on wildlife tourism from the findings. In this chapter, I will answer my last research question on how tourism stakeholders have responded to the variability of the attractiveness of MMNR as a wildlife destination. To gain this information, three sub-questions were addressed. Which tourism stakeholders have been actively involved in the adaptation process? What are the current business, wildlife management, policy, research and education adaptation options being employed by the local tourism stakeholders in MMNR? How effective have the adaptation options employed to cope with the changes in migration patterns been?

6.2 Tourism stakeholders involved in the adaptation process

This study focused on the supply side of wildlife tourism. Stakeholders that were identified to be active in the adaptation process included, the National Government, County Government of Narok, Local communities Tour operators, KWS, and Hospitality and Accommodation providers. Their roles however differed. The main adaptation strategies themes emerged from the findings: business, wildlife management, policy, research and education. The next section discusses the various types of adaptation undertaken by the different stakeholders.

6.3 Adaptation of businesses in the Mara

One main source of income in the Mara is from accommodation facilities which are predominantly tented camps, tour operators and tour guides. Accommodation facilities (see figure 14) are located within and outside the reserve borders and in the conservancies. In addition, further income is generated by the county government through the park fees administered before entry to the reserve.

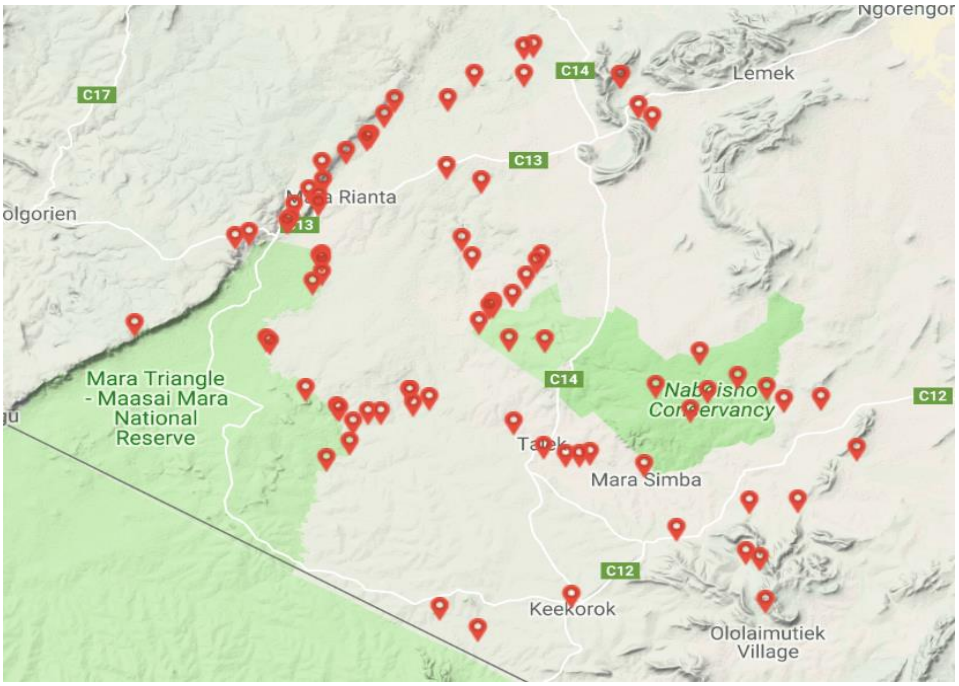

Figure 14: Accommodation facilities distribution in the Mara

Source:https://www.africanmeccasafaris.com/travel-guide/kenya/parks-reserves/masai-mara/map

The first main problem that business managers have responded to is the reduced income from the increased seasonality of tourism in the reserve. With high seasons coinciding with migration, slight changes in the migration pattern leads to cancellations of trips to the reserve. During this period, the local business together with the county ministry of wildlife and tourism come together to market the destination. In case of migration occurring earlier than expected, businesses update their websites to inform potential tourists of the beginning dates. Respondent 1 *"…Since this is a seven wonder of the world a well-known park, but we also do marketing to give tourists information on when the migration has begun…"*. Respondent 2 stated *"…We as tour operators depend on what the people want, and they mainly want to see the migration. If the migration starts early, we put in our websites that it is happening now instead of you to come on July if the migration is happening will tell them this is the time to come if they want to see the migration…"*.

Figure 15 below shows an extract from African Mecca Safaris website announcing the new dates for the wildebeest migration in the Mara for 2018.

MASAI MARA MIGRATION FACT GUIDE & BEST TIME TO SEE IT IN 2018-2019 ~~(2017)~~

MIGRATION OVERVIEW | MASAI MARA PRICES | PARK RATING

2018 & Upcoming 2019 Tracker Updates (2017 Ended) On The Great Wildebeest Migration Herd In Masai Mara

The Great Wildebeest Migration in the plains of East Africa is one of the world's most thrilling, intriguing and spectacular displays of wildlife behavior. As such, our travelers place great timing importance on having the best front row seats to see the event. By sharing our personal knowledge, local experience and expertise of the Great Migration in Masai Mara National Reserve, AfricanMecca Safaris helps you have a **superlative safari trip in Kenya's pristine wilderness outback**. Masai Mara is the most noted location of the wildebeest migration due to its famed Mara River crossings, and this has led to some misunderstandings about the migration itself. The migration is an ongoing movement of animals that takes place throughout the year. The migration occurs within an area that is known as the "Serengeti ecosystem." The 40,000-square mile area is defined by Masai Mara National Reserve in the north and, in the south, Ndutu, Ngorongoro Conservation Area and Maswa Game Reserve in Tanzania. The central, eastern and western areas include Grumeti Reserve, Loliondo, the official Serengeti National Park including part of southern expanse of Kusini and other protected areas. The migration is not a singular, isolated event. Instead, the phrase describes the constant movement of over 1.5 million wildebeests and hundreds of thousands of zebras, as well as elands and gazelles. As with other wildlife, the purpose of the movement is the search for pasture and water. When supplies of these vital resources are depleted in one area, the animals move to another area where water, grasses and other food sources are plentiful.

Figure 15: dates for wildebeest migration announcements

Source: https://www.africanmeccasafaris.com/travel-guide/kenya/parks-reserves/masai-mara/wildebeest-migration

The county government under the leadership of Narok Governor, Hon. Samuel Tunai has halted development of tourism facilities in the MMNR. In addition, the county government has threatened to demolish camps and lodges that do not meet international standards. Mr Tunai said *"We are not going to issue licenses for the construction of new facilities within and outside the 1,526-kilometre ecosystem. The moratorium will be in place for protected areas, wild animal gorges, and breeding areas,"* (Business Daily, Dec. 27, 2017). This move was supported by major tourism players in the country which includes the Kenya Tourism Federation (KTF), Kenya Association of Hotelkeepers and Caterers (KAHC) and Kenya Coast Tourism Association (KCTA). This move is aimed at halting environmental degradation in the light of impacts caused by climate extremes. This means that policymakers are trying to reduce harm from other sources to be able to handle more climate-related harm.

Another response to extreme climate condition for accommodation businesses is closure during the low tourism season and extreme flooding season (R6). Furthermore, in the Mara, several businesses put up temporary camps during high season to earn big and then remove the structures during low season. This is a move that tourism players in the county are moving against, as the camps are usually said to be degrading Mara's ecosystem.

6.4 Adaptation strategies for wildlife management

Since wildlife tourism survival in the Mara is dependent on the availability of a wide variety of wildlife species and their habitat, it there expected that most impacts of climate variability would directly affect the wildlife. Therefore, a number of adaptation strategies are geared towards the continued survival of a healthy ecosystem. My main finding is that wildlife management forms the core of adaptation in the Mara. I categorized the main findings under two main wildlife management adaptation strategies undertaken in the Mara after deductive codes; land and water management and protection; and monitoring and planning (discussed in adaptation policy in section 6.5).

Land and water management and protection

The county government undertakes the management of MMNR. Land and water management within the Mara is undertaken by the Department of Water, Energy and Natural Resources in conjunction with the Department of Wildlife and Tourism and KWS (Respondent 7). Climate variability intensifies the effects of land-use, cover changes and water availability. Due to the increased frequency of droughts in the Mara, there is an overall reduction in both long and short rainy seasons increasing the temporal and spatial variability of rainfall.

The main source of water for both wildlife and livestock in the Mara is the Mara River that flows from the Mau forest and drains into the Lake Victoria. Land use management forms an important factor in processes such as erosion, surface runoff and recharge.

KWS is at the forefront of increasing the scope of protected areas. As water is one of the main conflicts between wildlife and local communities, some responses undertaken include fencing of earth dams and physical control of wildlife movement by KWS rangers. "…*we fence some of the earth dams so that we at least control the movement of wildlife. We have also stationed the rangers at various places where when conflict arises, and we send rangers to control those particular animals so that they don't allow animals to go to drink water from those places…"* (Respondent 3). In addition, there are rangers located strategically within the park to regulate the grazing of livestock within the reserve since it is a protected area.

Deforestation is also being closely monitored with an increase in programs to plant trees. "…*we have more trees being planted than being cut down. We also enforce that no trees are being*

cut, because indigenous trees are not supposed to be cut down, we do this by arresting people…" (R3). In addition to KWS, local tour guide associations have also taken up this strategy. *"… we have now started a tree nursery. Some of our members have already started a tree nursery whereby we plant trees around the Mara …"* (R2). In addition, the Narok County government has executed a permanent logging and charcoal ban in the area to curb the problem of deforestation. This was a directive that came from the Deputy President who suspended logging in all forests in the country for at least three months from March (Daily Nation, March 4, 2018).

The government has also taken direct efforts towards protection of the region to facilitate climate-induced movements of wildlife by refining the migration corridors for the different species. This is detailed in the latest publication of a report on Wildlife Migratory Corridor and Dispersal Areas in Kenyan Rangelands and Coastal Terrestrial Ecosystems under the Kenya Vision 2030. The report highlighted the main migratory corridors of key wildlife species and proposed areas that can be further protected to allow for dispersal of wildlife (Kenya Vision 2030, Ojwang' et al., 2017).

6.5 Adaptation policy

Kenya government is also taking steps in addressing climate variability and change through policies, strategies and laws. The national government is working together with the local counties, government ministries and departments, Non-Governmental Organizations (NGOs), Community Based Organizations (CBOs), the private sector and academic and research institutions (Munyiri, 2015). In this section, I will provide a content analysis of the adaptation strategies that have been proposed in the various policy related to climate variability and change and wildlife tourism industry in Kenya. These policies include;

- Wildlife and Conservation Management Act of Kenya 2013
- Wildlife policy of 2007
- The Kenya National Tourism Strategy (2013-2018)
- The National Climate Change Response Strategy (NCCRS)

WILDLIFE AND CONSERVATION MANAGEMENT ACT OF KENYA 2013

The Wildlife Conservation and Management Act (2013) was builds upon other natural resource management legislation that include The Water Act (Cap 372), The Forest Act (Cap 385), The Environmental Management and Conservation Act EMCA (387), The Wetland Regulations of 2009, The Mining Act (Cap 306), The Tourism Act (Cap 383), The Firearms Act (Cap 114) and The Fisheries Act (Cap 378). These laws aim to ensure sustainable tourism development in Kenya as provided for in the Constitution.

This law governs the management of wildlife in Kenya. The law with aims at creating a fair and just relationship between wildlife and people through ensuring that people benefit from wildlife while not destroying the habitats and ecosystems. The law is enforced by KWS, Kenya Police and support from other government agencies. This law has allowed for the formation of wildlife conservancies. Conservancies are recognized as protected areas that help in conserving the biodiversity and creating livelihoods. Conservancies are created through an easement agreement which is a voluntary or negotiated agreement between landowner and land trust or government agents that permanently limits uses of the land to protect its conservation values. Easements allow a landowner to remain owning and using his or her land and to sell it or pass it on to heirs and continue to:

- Preserve plants and animals.
- Further sustainability of wildlife conservation
- Maintain wildlife migration corridors or dispersal areas.
- Preserve water quality and flow in a dam, lake, river or aquifer.
- Preserve outstanding geological, ecological, archaeological, historical or cultural features.
- Preserve scenic views and landscapes.
- Prevent or restrict mining or mineral/ agricultural activities that could harm wildlife conservation.
- Prevent or restrict infrastructure developments that could harm wildlife conservation

WILDLIFE POLICY OF 2007

This policy was formulated with the aim of providing a framework for conserving Kenya's biodiversity of species, ecosystem and habitats. The policy acknowledges that climate change and variability has direct physiological impacts on individual species, changes in reproduction and alters interaction among species. Under this policy, the government adopts an ecosystem approach to wildlife conservation and management in the country. In addition, Government encourages a range of participatory approaches through regional and district wildlife conservation committees and constituency wildlife associations to mainstream and empower communities to participate in the conservation and management of wildlife and related planning, implementation and decision-making processes.

Under the policy, there is provision for wildlife disaster preparedness, response and rescue. This section acknowledges that the country's wildlife is periodically experiencing effects from floods and droughts. The policy proposes the development and implementation of a wildlife disaster preparedness, response and rescue strategy.

THE NATIONAL CLIMATE CHANGE RESPONSE STRATEGY (NCCRS)

NCCRS aims to address the challenges posed by climate change and variability by increasing the understanding of the climate changes nationally and locally. The policy aims to reinforce focused actions towards climate change mitigation and adaptation through the collaboration of stakeholders. In the report, tourism is identified as one of the countries important economic sectors. However, it states that tourism is among the most vulnerable sector as most attractions in Kenya are nature based. The report proposes the development of a national wildlife adaptation strategy by KWS and WWF and the tourism industry.

7 DISCUSSION

7.1 Introduction

Our understanding of climate variability and wildlife tourism is still limited hence the need to improve our understanding of this link. Earlier climate research in Africa has shown the frequent occurrence of extreme climate events such as floods and droughts and an increase in temperature. These extremes have been given as one reason why there is a change in migration and dispersion patterns of in wildlife in Kenya. Particularly vulnerable to these changes is wildlife tourism, which is a major contributor to the country's GDP. Potential impacts on the attractiveness of Kenya as a wildlife tourism destination, climate variability is one challenge that the industry will face in coming years. It is therefore important for the tourism stakeholders to cope with, manage or adjust to these changing conditions through adaptation.

This study has the main aim of understanding how tourism stakeholders in Maasai Mara are adapting to the impacts of climate variability on wildlife tourism by identifying how wildlife migration and dispersion patterns have varied in response to climate variability in MMNR, Kenya. In addition, the study investigated the changes in the temporal attractiveness of MMNR, as a wildlife tourism destination, in response to altered wildlife migration and dispersion patterns. Finally, the adaptation strategies were undertaken by tourism stakeholders to cope with the variability of the attractiveness of MMNR as a wildlife tourism destination.

The study objectives were investigated in the form of a case study on Maasai Mara (see section 3). Results from this study show that there have been variations in climate in Maasai Mara. These changes in climate have influenced the temporal attractiveness of Mara as a wildlife tourism destination by causing changes in the migration and dispersion patterns of wildlife in the Mara. The results finally showed that the tourism stakeholders are applying adaptation strategies to ensure that the attraction. This chapter will discuss my findings.

7.2 Climate variations and wildlife: wildlife migration and dispersion patterns change in response to climate variability

The findings from this study indicated that climate has varied in Maasai Mara in the past fifteen years. From data collected from KMD, my findings are every three years the region experiences severe droughts. In addition, there has been an increase in temperature for the region

(see section 4.2). From the interviews, I was able to conclude that climate influences wildlife migration and dispersion patterns. Mainly wildlife will move depending on the availability of water and forage which is influenced by climate. Availability of these resources will also determine their breeding periods. In the Mara, the main migratory corridor is the Serengeti- Maasai Mara Ecosystem. Migration begins in March when the southernmost Serengeti begin to dry out and wildlife head into Kenya in the Maasai Mara to look for greener grazing areas. The animals will continue feeding on the grassland for several months. In late October, when the short rains start falling on the Serengeti plains, leading to vegetation growth, the wildlife starts heading south again (see figure 5). Due to climate variability, prediction of when migration will begin has become difficult for stakeholders in the region (see section 4.2).

As migratory species are moving from the Mara to the Serengeti, resident species then disperse often moving away from the park to populated areas in search of water and forage. With increased incidences of a dry spell in the ecosystem, water has become a scarce resource leading to an increase in deaths of aquatic animals such as hippos and crocodiles which live in water. While the ungulates move further away from the reserve in search of pasture causing conflict with the local community.

I would like to note however that debates are going on what is the main problem that is causing a decline in wildlife populations in the Mara. We cannot ignore the fact that in addition to climate variability, there has been an increase in human population in the area. Since Maasai are pastoralists in nature they tend to keep livestock. Hence, there is more livestock competing for resources with wildlife within the reserve. In addition, large areas that formed part of dispersion lands for wildlife have been fenced out to allow for wheat farming. The destruction of the Mau Forest complex which is the main source of the Mara river is also a contributing factor. These factors spell doom for the wildlife population in the Mara as there is a constant fight for space. The main question then becomes how much of the wildlife decline can be attributed to climate variability.

The main issue that arises from the reduction of the levels in the Mara River, which is a source of life for the Mara, is that the animals will be forced to migrate to other areas where there is life. These other factors then exacerbate the effects of climate variability and especially effects

from climate extremes such as droughts. This then seriously puts attractiveness of Maasai Mara as a wildlife tourism destination in trouble as it is highly dependent on wildlife.

7.3 Change in the temporal attractiveness of the Mara as a wildlife tourism destination

According to the literature reviewed (see section 2.3), a destination attractiveness is determined by its ability to deliver individual benefits. This will determine whether that visitor will revisit the said destination. Benefits are delivered through the provision of products and services that either meet or exceed the expectations of the tourists. Since this study focuses on non-consumptive wildlife tourism, tourism providers are providing encounters of humans with undomesticated animals.

Using Reynolds & Braithewaite (2001), factors that create an attractive wildlife tourism experience (see section 2.3.1), I will discuss the main stressors to wildlife tourism in the Mara caused by climate that affects the destination's attractiveness based on my findings.

Ecosystem challenges

Wildlife needs a healthy ecosystem to survive. However, due to extremes caused by climate variability, the following stressors are affecting the tourism of the region.

a) Water loss

In the Maasai Mara tourism 'high' season is usually from July to September this coincides with the Great Wildebeest Migration. As the climate continues to vary, tourism stakeholders are finding it more difficult to predict when the migration will begin and end. This means that the length of the high tourism season is affected. With stakeholders admitting that they are experiencing cancellations if tourist finds out that the migration season has ended earlier than expected. This reduces the amount of revenue that the tourism industry in that region earns. In addition, to changes in migration times, the drying up of the Mara River where the wildebeest cross to go to the Serengeti during migration threatens the whole attraction.

In addition to the viewing of the wildebeest migration, the Mara is home to resident species that disperse according to the available water and forage. As water availability in the park reduces the wildlife is forced to drink from man-made water sources such as earth dams that leads to

conflict with the local communities leading to wildlife dispersing over large area. Tourists are then forced to drive for long distances to view wildlife. And the sighting of rare species may cause overcrowding of tourists in that area which reduces the attractiveness of the experience.

In addition, the mushrooming of irrigated wheat farms around the reserve and overgrazing has reduced the aesthetic appeal of the Mara landscape. As landscape forms part of the visible physical features, it is seen as the beauty in which the wildlife resides in and is experienced. Tourists pay to see wildlife behind a savannah background. Instead, they end up seeing more cows and goats reducing the quality of tourism experience in the Mara.

b) **Biodiversity loss**

The second stressor to wildlife tourism in the Mara is a loss of biodiversity. Since 1977 population of wildlife in the Maasai Mara has significantly reduced (Ogutu et al., 2001). With the number of goats and cattle tripling in reserve, the population of wildlife especially the ungulates have significantly reduced. This is due to the constant competition of the resources whose availability has been significantly affected by climate variability. With frequently recurrent drought seasons, the grassland is unable to recover during the wet season. This is further intensified by deforestation and destruction of vegetation around the reserve to allow for the increase in population. The struggle for tour operators then becomes ensuring that tourists can sight wildlife.

Amenities and accessibility challenges

From my findings, climates extremes such as extreme rainfall cause flooding in the area leading to the destruction of the infrastructure and amenities. The tourism destination also requires an adequate supply of amenities such as accommodation and infrastructure such as roads that allow access to the attraction. Most of the accommodation facilities in the Mara are campsites, which cannot withstand heavy rainfall and flooding. This means that in rainy seasons, the availability of accommodation facilities in the reserve become limited. In addition, most roads in the Mara are not tarmacked. In the rainy season, some areas of the reserve are cut off due to poor roads.

7.4 Adaptation strategies

Government and the tourism industry need to respond to the risks that climate variations pose to the wildlife tourism industry attractiveness. Adaptation involves adjustment of the natural

or human system to respond to actual or expected climate stimuli or their impacts to enable moderation of harm or exploitation of the beneficial opportunities (McCarthy et al.,2001). From my findings, stakeholders in the Mara have begun to realize how climate variability has affected wildlife tourism and will continue to impact tourism in the region if immediate adaptation is not implemented. In the Maasai Mara, stakeholders involved in adaptation include; National Government under the Ministry of Tourism, County Government of Narok, NGOs' (WWF, Save the Elephant), KWS, Tour operators and the local community.

This research applied adaptation strategies proposed by Scott et al., (2008) and Jopp et al., (2010) (see table 2). They propose five adaptation strategies (business, technical, policy, behavioral and research) that tourism business can adopt to cope with the impacts of climate variations in climate. From my findings, Maasai Mara tourism stakeholders are applying the business and wildlife management, research and policy adaptation strategies. The strategies application will be discussed in this section.

Business adaptation

From my findings, businesses are adapting in several ways. First, there is close monitoring of when the migration begins to do extensive promotion to create awareness to potential tourists. This is normally done by tour operators in their websites and the Ministry of Tourism. In addition, the government is limiting the number of accommodation facilities in the reserve. Lastly, some facilities choose to close during the low season and times of extreme flooding.

Although this is viable options of business adaptation, in my opinion, they lack sustainability. Business operators in the Mara must explore diversification of wildlife their tourism products as a form of adaptation. During my fieldwork conducted in January which is a so-called low season, there were very few tourists in the reserve. Tourism stakeholders in the Mara should move from depending highly on the Great Migration of Wildebeest as the main attraction in the Mara since its future is unpredictable in the current climate conditions. They should do extensive promotion for safaris and take advantage of the resident wildlife population. They can do this through organizing budget domestic tours in "low season", to ensure consistency flow of tourism in the reserve. Maasai Mara should go through a rebranding to diversify and develop additional services to have long-term economic impacts.

Large hotel co-operations can rebuild faster or have permits to build permanent structures. This leaves small hotels vulnerable to climate impacts reducing their adaptive capacity. Some cannot recover and end up closed after flooding. Issues of flooding can be tackled through the construction of accommodation facilities in higher grounds. These efforts require the cooperation of the local government and local owners of hotels.

Wildlife management

Wildlife form the core product in wildlife tourism. Hence I found that most adaptation strategies are geared to ensuring that the wildlife populations are sustained. Climate variations have had a major impact on the wildlife populations, and this is threatening the sustainability of wildlife tourism in the Mara. To respond to this impact the national, local government together with KWS and other NGOs such as WWF are actively involved in adaptation.

Main adaptation strategies here include land and water management and protection. Activities include fencing of earth dams to limit human-wildlife conflict, reforestation and planting of trees, protection of indigenous trees and refining of wildlife migratory corridors. These strategies will enable to increase the area of protected habitats for wildlife. However, their effectiveness will be dependent on other external factors such as population growth, land set aside for agriculture and other economic activities such as livestock keeping.

It is therefore important to conclude that the success of wildlife management is dependent on the cooperation of all the stakeholders and especially the local communities. Economic benefits of wildlife tourism must have a competitive advantage over other types of land use in the area and must be appreciated in every household. The local government must promote equity and reduce poverty to encourage the local community to recognize the importance of maintaining the Mara ecosystem.

Adaptation policy

Effective wildlife governance requires structures, legal and policy instruments that are functioning. Policies and legislation provide a direction on how to govern the wildlife and wildlife tourism. Solutions to wildlife management issues come from policies such as; Wildlife and Conservation Management Act of Kenya 2013, Wildlife policy of 2011, The Kenya National

Tourism Strategy (2013-2018), The National Climate Change Response Strategy (NCCRS), Kenya Vision 2030 (see section 4.5.3).

As the Maasai Mara is currently facing challenges on the ecosystem, these policies need to be harmonized and reviewed to suit the region. In addition, tourism as an industry and the role it plays in the ecosystem has been poorly represented in the policies, with main objectives focusing mainly on wildlife conservation. The main problem of having multiple policies at different levels each with different interests and addressing different issues, there is a lack of integration. For example, in Narok, I observed that the Department of Wildlife and Tourism concentrates mainly in revenue collection at the main gates and regulation of trade related to tourism, KWS is responsible for wildlife management and protection of the ecosystem, and the Department of Environment responsible for Water Management. This fragmentation of institutions for adaptation means that there is very little inclusiveness when it comes to policy formulation and implementation. The multi-faceted nature of wildlife tourism calls for the need of integration of all development, implementation, monitoring and evaluation of policies.

Furthermore, cooperation between stakeholders is invaluable to ensure the future survival of the wildlife tourism industry in the Mara. Responsible government agencies and stakeholders should consult each other when formulating policies and regulations for wildlife tourism. Not forgetting the local communities who interact with the wildlife and tourism. I would propose a bottom-up approach when it comes to formulating adaptation policies.

7.5 Adaptive capacity

The future of Maasai Mara as a wildlife tourism destination depends on the adaptive capacity of the region. Tourism stakeholders need to learn lessons from present and past adaptation. Tourism stakeholders need to maintain homogeneity when making decisions regarding wildlife tourism and climate variability. At the same time, they should distribute roles among the public and private organizations to ensure management success. One factor to look out for is the availability of resources that can sustain the increasing population of communities and support wildlife population will have a significant impact on the adaptive capacity of the region. Inadequate human and financial resources will continue to increase human encroachment on wildlife dispersal and migration areas and put a strain on the available water and forage. In addition, the weak institutional capacity of stakeholder to implement the policies and legislation

is also leading to failures when it comes to implementation of formulated regulations and policies. The adaptive capacity of wildlife tourism industry is further reduced by the poor financial management practices, corruption and weak enforcement of policies.

8 CONCLUSION

8.1 Introduction

Wildlife tourism is a major income earner in Kenya. Since wildlife tourism is dependent on the natural environment, the quality of the experience may be influenced by variations in climate. **Based on this premise my study set out to investigate how tourism stakeholders are adapting to the impacts of climate variability on wildlife tourism destination attractiveness**. The study applied the adaptation framework to look at the different adaptation strategies that tourism stakeholders can implement.

From my findings, I conclude that stakeholders are adapting to climate extremes such as droughts and floods. They do this by first managing the tourism business through strategies such as marketing to create awareness on when the migration begins. In addition, there is the closure of accommodation facilities during 'low' seasons and seasons of extreme flooding because of damage to the tourism infrastructure. Furthermore, to reduce damage to the ecosystems, construction of new facilities has been halted in the reserve. By reducing harm from other sources, they can be able to handle climate-related impacts. Secondly, stakeholders are engaging in wildlife management strategies that include land and water protection. Activities undertaken here include reforestation and prevention of deforestation, provision of security to manage wildlife movements to avoid human-wildlife conflict over resources and monitoring pastoralism in the reserve. The national government has undertaken adaptation strategies by addressing climate change in policies, strategies and law. They include the Wildlife and Conservation Management Act of Kenya 2013, the Wildlife policy of 2007, The Kenya National Tourism Strategy (2013-2018) and The National Climate Change Response Strategy (NCCRS).

Secondly, from the results, I can conclude that the weather conditions in the Mara have become more erratic and unpredictable in the last fifteen years. There is an increase in the frequency of extremes such as droughts and floods being experienced. These extremes have contributed to habitat loss which is essential in sustaining wildlife in the Mara. Other factors such as population increase, livestock grazing, agriculture, deforestation and poaching have exacerbated the impacts of variations in climate leading to human-wildlife conflict. Due to these changes, wildlife migration patterns and dispersion within the reserve is changing as wildlife look for forage and water.

Wildlife tourism in is highly dependent on the sighting of wildlife. With the changes in the migration and dispersion patterns of wildlife, tourism becomes more vulnerable. One main attraction of the Mara is the Great Wildebeest Migration. It is becoming more difficult to detect when the migration will begin and end, causing a reduction in the length of the high tourism season for the reserve. In addition, dispersion of wildlife in and outside the reserve in search of forage is making it difficult to sight them, leading to tourist overcrowding in areas where the wildlife is concentrated.

Moreover, during times of prolonged droughts, pastoralists are grazing their livestock further in the Mara, reducing its attractiveness of the destination. Droughts also leave the savannah grassland looking bare; this reduces its aesthetic appeal to tourists. Periods of prolonged flooding, on the other hand, destroy the tourism infrastructure and amenities such as roads and accommodation facilities crucial to the provision of services.

8.2 Practical relevance

From the study, I can conclude that successful adaptation requires the destination to investigate the past and predict future scenarios that climate variability that may impact wildlife tourism. This is because successful adaptation will determine the length and number of tourists. First successful adaptation strategy for the stakeholders in the Mara is marketing. It will, therefore, be an important adaptation strategy that can be implemented in Kenya and abroad. I would also like to add that to reduce the dependence on the international tourism market which is highly seasonal and specific; stakeholders can attempt to market the destination nationally to increase domestic tourism. In the Mara, for example, attracting domestic tourism all year round will prevent them from being highly dependent on international tourists who want to see the Great Wildebeest Migration which is becoming more unpredictable with the variability of climate. This will mean that in case they experience cancellations from international tourists they still have income from the domestic tourism.

In addition, from the study, we learn that climate extremes such as flooding lead to the destruction of amenities that are critical to the provision of services to tourists. As variability in Kenya increases due to climate change, the occurrences of periods of flooding may increase. Future constructions of amenities such as accommodation and transport facilities should be planned

according, ensuring that they are not susceptible to floods. This will avoid having to close them during the flooding seasons.

Furthermore, as climate variability increase, the patterns of wildlife migration and dispersion will vary as wildlife is searching for green pastures and water. This is bound to happen to the protected areas in Kenya. From the study, we learn that the proper land and water management will ensure that cases as human-wildlife conflict and wildlife population decline are not experienced. With a sustained population of wildlife, the main tourist attraction will not be at risk.

From the study, I can also conclude that one main challenge that may hinder future adaptations is lack of collaborations. To enhance the adaptive capacity of the wildlife tourism, collaboration between the stakeholders in Kenya when it comes to developing and implementing adaptation strategies required. There is especially be done between the local government and local communities. The public and private collaboration will determine the success of adaptation strategies implemented. It is important to use a bottom-up approach when formulating policies and regulations that deal with the adaptation of wildlife tourism to climate variability. This will create an environment where the local communities will feel included and be motivated to conserve the wildlife.

Also, the collaboration will lead to the formulation of an adaptation strategy specific to the tourist destination. That involves the formulation of a comprehensive action plan, research objectives and monitoring system. Future needs of tourism in the area should be identified, and financial resources set aside and used effectively to increase the resilience of the wildlife tourism system. The local government should collaborate with the local communities in flexible zone management. Hence, they can change the boundaries of the reserve to have buffer zones around where land use is carefully monitored. In addition, a disaster management plan for the area should be designed to respond to the crisis brought about by extremes from climate variations.

Other concern is that may limit future adaptation the limited climate and wildlife tourism-based research and education programs in Kenya. It is important for tourism stakeholders to have education programs with locals on conservation and advocate for sustainable utilization of wildlife resources and sensitize them on activities that are damaging the ecosystem. This will make it easier to be able to adapt to climate-induced changes. Avoiding long-term harmful behaviour that will put the growth of wildlife tourism at risk will enhance the industries sustainability. In addition,

collaboration with education institutions is important to facilitate research on adaptation and climate variability as it affects wildlife tourism. Further**,** the local government should acquire adequate knowledge of the local population growth rate and size to prioritize land and management issues. This will enable them to know the degree to which wildlife resources are under threat.

8.3 Theoretical relevance

This study was based on adaptation strategies adopted from Scott et al., (2008) and Jopp et al., (2010) that identified five adaptation strategies of tourism to climate variability. The strategies included business, technical, behavioural, policy and research. Based on this and the conceptual framework developed I can conclude that adaptation strategies can be applied in wildlife tourism in Kenya can be summarized in table (2) below:

Table 2: Adaptation strategies for wildlife tourism in Kenya.

Source: Author, 2018

Type of adaptation	**What it involves**	**What it requires**	**Examples**
Business management	Involves techniques that tourism operators, regional and national government.	Destination managers to change their marketing approach and use planned building of amenities.	Strategic Marketing techniques, e.g. new pricing strategies in the form of budget tours in the 'low season', market diversification to attract domestic tourism. Product diversification.
Government strategies	Involves renewed ecosystem management plans for future climatic scenarios.	National, regional and KWS to manage land and water in wildlife areas.	Prevention of human-wildlife conflict. Increase migration and dispersion corridors. Reforestation and prevention of deforestation. Protection of riparian areas.

Policy	Involves coordinated adaptation and collaboration and seeking of funds to implement adaptation.	Plans and setback requirements and building design standards.	Refining the following laws and policies: Wildlife and Conservation Management Act of Kenya 2013 Wildlife policy of 2007 The Kenya National Tourism Strategy (2013-2018) The National Climate Change Response Strategy (NCCRS)
Research	Assessment awareness of business and tourists and knowledge gaps.	Monitoring programs.	Train stakeholders and communities on impacts of extremes such as floods and drought and climate change and adaptation.

8.4 Limitations of the study

The research methodology approach was a case study. Hence data collected is specific to Maasai Mara. This means that generalization to other Kenyan national reserves is not assumed. More data from other reserved is required to enable comparisons. In addition, there is limited knowledge in the literature on climate variability and wildlife tourism and especially on Kenyan context.

The study was conducted in the Maasai Mara and concentrated on the supply side of wildlife tourism. Hence the view of tourists was not included, and any conclusions made were based on the opinions of tourism stakeholders in the reserve.

In addition, due to time constraints, the study was only able to give a snapshot of the current adaptation strategies that are being applied. It would be interesting to evaluate their effectiveness through statistical models over a longitudinal study.

In addition, during data collection, one problem experienced is access to people, organizations and raw data. With a lot of time spent getting the necessary permits that allowed me to collect data.

8.5 Areas of further research

A comparative study would increase the validity of this research. It can be interesting to know how climate variability is impacting other wildlife destinations in Kenya and evaluate if they are experiencing the same impacts as in Maasai Mara. In addition, the adaptation strategies that employ would be an interesting find.

Wildlife tourism is a growing market segment that requires further research. Information on their perceived experiences in wildlife destinations in Kenya considering the impacts of climate variability is an area for future research. In addition, long-term quantitative research on adaptation would also help to create awareness on the best adaptation strategies that the wildlife tourism industry can implement.

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10 APPENDICES

10.1 Appendix 1. Interview schedule for tourism stakeholders

Introduction

My name is Emmah Muchoki and I am currently working on a research project about how wildlife tourism has adapted to climate variability in Maasai Mara, Kenya from Wageningen University to complete an MSc in Leisure, tourism and Environment. Your help and assistance in participating in this interview is invaluable for the study. All the information you provide will be completely anonymous and confidential. Thank you for participating.

Section 1: Introduction of the respondent

1. Kindly tell me your field of expertise and how long you have been working in this field.
2. What type of tourism organization do you represent?

Section 2: Climate variability in Maasai Mara and its impact on wildlife migration.

1. How do you feel the weather pattern in Maasai Mara varies over the last 15 years?
2. In the past 15 years, have there been any incidences of floods and droughts?
3. When were they experienced?
4. In your opinion, how is climate variability influencing availability of water for wildlife in the Mara?
5. How do you think this is affecting migration patterns in the Mara?

Section 3: Mara attractiveness

1. How have the best times to view migration of wildlife in reserve changed over the past 15 years?
2. Have the numbers of tourists' arrivals in the park changed in the past 15 years?
3. How has the length of tourism stay changed in response to climate variability and migration patterns?
4. Are there any other climate related issues that tourism industry faced in the last 15 years? If yes kindly give examples. ***(Probes; infrastructure damage, tourist satisfaction, competitiveness, quality of tourism)***

Section 4: Adaptation

1. What is your role as ***(insert respondent position here***) in the adaptation process?
2. What are the main adaptation objectives for the Mara?
3. What adaptation strategies has management your institution implemented to cope with climate variability***? (Probes; marketing, product diversification; low-season closure; water conservation plans).***
4. Are there any new technologies that have been invented and implemented to cope with climate variability in the Mara? ***(probes; specialized equipment).***
5. What climate related research projects is your company undertaking related to wildlife tourism in the Mara?
6. What education programs on climate adaptation are being undertaken in the Mara?
7. What regional adaptation policies to climate have been formed and implemented in the Mara? What backing have implementation of this policy received and from whom?
8. What opportunities have been brought about by the variations in climate?
9. What constraints have you encountered in adapting to impacts of climate variability on wildlife tourism?
10. What extreme climate impacts have you not able to address?
11. In your opinion, what opportunities have been brought about by climate variations in the Maasai Mara?

10.2 Appendix 2: Interview Schedule for Local Experts

1. What is the name of your institution?
2. Which extreme climate events are evident in Kenya?
3. Which of these extremes impacts affect wildlife tourism and how?
4. How do think wildlife tourism has been impacted by these extreme events?
5. What are current practices of adaptation that wildlife tourism stakeholders employing to cope with these extremes?
6. What tourism opportunities do you think have been created by climate variations in Kenya?
7. What constraints does wildlife tourism face in adapting to climate variations?

8. What is the future of Maasai Mara as a wildlife tourists' destination in light of climate change?