VULNERABILITY AND ADAPTATION OF THE TOURISM SECTOR TO CLIMATE CHANGE IN NAIROBI, COAST AND CENTRAL TOURIST CIRCUITS IN KENYA

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University or any other award.

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DEDICATION

To my husband Gichuru Munyiri and daughter Muchiru: the fountain of my inspiration.

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OPERATIONAL DEFINITION OF TERMS

Adaptation is the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Climate is the mean and variability of temperature, precipitation and wind over a period of time, ranging from months to millions of years (the classical period is 30 years).

Climate change refers to any change in climate over time, whether due to natural variability or as a result of human activity.

Climate change indicators are extremes in the weather patterns such as droughts, floods, high temperatures, storms, fog and mist.

Climate variability refers to variations in the mean state of the climate.

Vulnerability is the degree to which a system (eg tourism) is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. It is the residual impacts of climate change after implementation of adaptation measures.

Tourism is the activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes

ABBREVIATIONS AND ACRONYMS

ANOVA – Analysis of Variance
ASAL - Arid and Semi-Arid Land
CCSR - Center for Climate System Research
CDM - Clean Development Mechanism
CVI – Climate Vulnerability Index
GBR – Great Barrier Reef
GCM- Global Circulation Model
GDP – Gross Domestic Product
Gg - Gigagrammes
GHG – Greenhouse Gases
GoK – Government of Kenya
IPCC – Intergovernmental Panel on Climate Change
ITCZ - Indian Ocean, and the Inter- Tropical Convergence Zone
JKIA - Jomo Kenyatta International Airport
MDGs - Millennium Development Goals
NCAR – National Center for Atmospheric Research
NCCAP – National Climate Change Action Plan
NCCRS – National Climate Change Response Strategy
NEMA – National Environment Management Authority
PRECIS - Providing Regional Climates for Impact Studies
SARS - Severe Acute Respiratory Syndrome
SSA - Sub-Saharan Africa
UNCCD - The United Nations Convention to Combat Desertification
UNCED - United Nations Conference on Environment and Development
UNCSD – United Nations Commission on Sustainable Development
UNEP - The United Nations Environment Programme
UNESCO -The United Nations Educational, Scientific and Cultural Organization
UNFCCC – United Nations Framework Convention on Climate Change
UNWTO - The World Tourism Organization
VSD – Vulnerability Scoping Diagram
WCED - World Commission on Environment and Development
WMO - World Meteorological Organization
WTTC – World Travel and Tourism Council

ABSTRACT

Tourism heavily relies on climate as a resource but is highly climate-sensitive. Evidence has shown that a certain amount of climate change has occurred. Africa is considered as one of the most vulnerable regions in the world to the effects of climate change. At a local scale, Kenya's substantial arid and semi-arid and coastline increases its vulnerability. In addition, overreliance of a lean natural resource base for tourism puts the sector into increasing risk. Documentation of vulnerability and adaptation of Africa and more so tourism to climate change is limited. Different stakeholders agree that there is need to improve response initiatives geared towards mitigation and adaptation. This study seeks to assist tourism and other stakeholders reduce vulnerability and improve adaptation efforts. To facilitate this, a critical review of relevant literature was undertaken and a comprehensive countrywide bottom-up approach assessment of vulnerability and adaptation of tourism to climate change was carried out. This was done by exploring the impacts of climate change on the tourism sector from both supply and demand side and the resultant adaptation practices, analyzing the policy framework in Kenya and estimating the vulnerability level, using explanatory sequential design. Through triangulation, information was sought from tourists, hotel managers and tourism / climate change experts from three major tourism regions in Kenya. A total of 36 hotel managers and 352 tourists filled questionnaires whose results were verified by 20 experts. Further, tourists numbers were compared against precipitation over a 40 year period. Content analysis, Chi-Square, ANOVA, correlation and regression are among the statistical methods used for data analysis. Results generally indicated that climate change impacts are currently affecting the tourism sector in the country and that the supply side is more affected by these impacts than the demand side. Sensitivity of tourism to climate change depends on the type of indicators; the source market; the purpose of travel; the age of tourists; the class of accommodation facilities and marital status. Exposure depends on the type of climate change indicators; the geographical location of tourist facilities and the nature of occurrence of the indicators. Furthermore, although the industry has put commendable efforts towards adaptations, the sector is faced by several challenges such as lack of information and finances. Policy analysis shows that although Kenya has made commendable efforts towards formulating policies on climate change, most content of these policies is not based on primary research. The regression coefficients of determination for the perception of the tourists concerning importance of weather and climate change indicators is explained by 78.9% of the variance ($R_{adj} = 0.789$), while that of that of the hotel managers is explained by 97.9% of the variance ($R_{adj} = 0.979$). From the regression analysis, it can be concluded that vulnerability depends on direct indicators, general indicators, indirect indicators and weather factors and magnitude of impacts on resources, infrastructure; facilities; activities; and services. Further, a Vulnerability Scoping Diagramme (VSD) for tourism was constructed in order to describe the current vulnerability of tourism to climate change impacts in Kenya. Generally, the tourism sector in the country is found to be highly sensitive, highly exposed, with moderate adaptive capacity and therefore highly vulnerable. Finally, a conceptual model for vulnerability assessment for the tourism sector was developed. Further research is suggested on the implications of climate change policies on tourism operators and the economic impacts of climate change on tourism resources.

CHAPTER ONE: INTRODUCTION

This chapter starts with a background of this study with an overview of the current status of the general relationship between tourism and climate change. This follows with an overview of the problem statement, objectives, research hypothesis, significance and anticipated output, delimitations, limitation and assumptions.

1.1: Background

Kenya's tourism industry is largely nature-based (GoK, 2013). The country is gifted with a variety of habitats and ecological systems, including wildlife, forests, lakes and rivers, wetlands and marine life that is important for tourism. Consequently, tourism mainly depends on wildlife, the beach and scenic features. Climate change is likely to impact on low-lying coastal areas, islands, arid and semi-arid areas, forested areas, areas prone to natural disasters, areas liable to drought and desertification, and areas with fragile ecosystems, including mountainous ecosystems (GoK, 2011; GoK, 2013). Kenya's geography, substantial arid and semi-arid area, coastal tourism resources and unique biodiversity and natural heritage mean that the country is particularly vulnerable to climate change. Approximately 80% of Kenya's land is classified as arid and semi-arid land (ASAL) (GoK, 2013). The country's economic and livelihood systems are highly dependent on natural resources, which are very sensitive to changes in climatic conditions. This makes the country very vulnerable to climate change. The country's climate varies considerably, with wide variations across the country and with very strong seasonality.

Kenya is one of the leading tourist destinations in Sub-Saharan Africa with significant potential for tourism growth. It is against this realization that the Kenya Government prioritises the sector in its development blueprint, Vision 2030, which seeks to make Kenya *"a top 10 long haul tourist destination offering a high-end, diverse, and distinctive visitor experience"* (GoK, 2007:33).

On the global scale, Kenya's contribution to GHG emissions is negligible but the country is extremely vulnerable to the impacts of climate change. The country is a net carbon dioxide sink and has introduced a range of low carbon options across many sectors such as renewable energy in the electricity sector and sustainable land use management (NEMA, 2005; NEMA 2011). More frequent and severe floods and droughts, rising temperatures, declines in annual rainfall, rising sea levels, and reduced water availability are already a reality. The destruction of ecosystems essential for the survival of wildlife will adversely affect tourism (NEMA, 2005).

A report produced by the Government of Kenya on the climate change response strategy indicates that:

> *... the direct and indirect impacts of climate change are already being felt across the country and there is a high possibility of increasingly severe changes in the future if unprecedented measures are not taken to reduce GHGs emissions (GoK, 2010:45).*

According to a report by UNFCCC and UNDP, Kenya's climate has been changing considerably over the years. Average annual temperatures increased by 1°C (15 per cent rise) between 1960 and 2003, with most warming taking place in the 'long rains' season

of March, April and May. There are relatively more 'hot days' during the 'long rains' season – an additional 18.8 per cent (UNFCCC, 2011; McSweeney *et al.,* 2010).

Projections indicate increases in mean annual temperature of 1 to 3.5^0C by the 2050s (SEI 2009) and 1.3 to 4.5^0C by the 2090s (McSweeney *et al.,* 2010). Although, observations of rainfall over Kenya since 1960 do not show statistically significant trends, there is an increasing but no statistically significant trend in the proportion of rainfall occurring in heavy events (McSweeney *et al.,* 2010). All projections indicate increases in the frequency of days and nights that are considered 'hot' in current climate, which is projected to continue. On the other hand, the frequency of 'cold' days and nights has decreased significantly, which is also projected to continue (McSweeney *et al.,* 2010).

Kenya has in recent years had its share of climate-related impacts such as prolonged droughts; frost; hailstorms; extreme flooding; receding lake levels; drying of rivers and other wetlands; among others leading to large economic losses and adversely impacting many sectors including tourism (GoK, 2013). Since the year 2000, there has been a steady increase in extreme weather events such as prolonged droughts and intense flooding. For instance, according to a report by the Stockholm Environment Institute (SEI) on the Economics of climate change in Kenya, the El Niño (1997/98) and La Niña (1999/2000) episodes were the most severe in 50 years (SEI, 2009). In addition, due to droughts, the country's famine cycles have reduced from 20 years (1964-1984), to 12 years (1984-1996), to two years (2004-2006) and to yearly (2007/2008/2009) (SEI,

2009; UNFCCC, 2011; GoK, 2010). Further, the glaciers on Mount Kenya have been disappearing, leading to the drying up of some river streams. These climatic changes have resulted in food and water shortages, landslides, soil degradation, increased pests and a loss of biodiversity (UNFCC, 2011).

It is now recognized that regardless of the emissions reduction efforts, there is an inevitable need for societies around the world to adapt to unavoidable changes in climate (IPCC, 2007b). Therefore, greater emphasis on research that specifically addresses the informational needs of the tourism stakeholders should be considered (Scott and Becken, 2010). Consequently, assessment of vulnerability and adaptation is crucial in responding to the changing climate. However, vulnerability and adaptation assessment methodologies and models are still very preliminary (Carter *et al.*, 2007; Jopp, *et al.*, 2010).

This study deviates from earlier vulnerability assessment approaches, characterized as 'top-down', that use global climate projections and downscale them regionally. These approaches do not fully address adaptation and are surrounded by many uncertainties. Rather, this study uses 'bottom-up', detection approach, since vulnerability to present-day climate variability and change is already a threat in Kenya. Nevertheless, a tourism industry that anticipates potential changes is more likely to be less affected by these changes (less vulnerable), has more possibilities to recover from external and internal shocks (more resilient) and has more opportunities to take advantage in the emerging

conditions and is more likely to be successful in the current era of rapid change (IPCC, 2007b; Jopp *et al.*, 2010; Goosling *et al.*, 2012).

1.2: Problem Statement

Climate change is the single greatest environmental challenge to the world today (WTTC, 2011). Africa is considered by the IPCC and many other studies as one of the most vulnerable regions in the world to the effects of climate change (Boko *et al.*, 2007; Hope, 2009; Kumssa and Jones, 2010; Conway and Schipper, 2011). According to the IPCC, there is a notable lack of geographical balance in the data and literature on observed changes with a marked scarcity from developing countries (IPCC, 2007b; Hope, 2009). In addition, tourism has been pointed out by the UNWTO, the IPCC and the Government of Kenya as one of the most vulnerable sectors alongside agriculture and biodiversity, yet it is also identified as a key economic sector (IPCC, 2007b; UNWTO, 2009; Kumssa and Jones, 2010; GoK, 2011;). However, documentation of vulnerability and adaptation in the tourism sector is limited (Rosenzweig *et al.*, 2007). As the IPCC report states that:

… very few assessments of projected impacts on tourism and climate change are available… There is a need to enhance practical research regarding the vulnerability and impacts of climate change on tourism, as tourism is one of the most important and highly promising economic activities in Africa. Large gaps appear to exist in research on the impacts of climate variability and change on tourism and related matters … (Boko et al., 2007: 450,459).

At a local scale, Kenya's substantial arid and semi-arid and coastline increases its vulnerability. According to a response strategy report by the government of Kenya, the level of knowledge about Kenya's vulnerability to climate change impacts is not

accurately known (GoK, 2010). What is known, however, is that the country is vulnerable to climate change because of her dependence on climate sensitive sectors such as agriculture, water and tourism. The report further states that;

> *…How vulnerability varies across Kenya is something that is yet to be determined. An appropriate approach to coping with climate change impacts requires proper knowledge of the vulnerable nature of communities, groups and sectors. This will then inform the measures that need to be taken in order to minimise the negative impacts of climate change, and exploit the beneficial ones…* (GoK, 2010:72*).*

Possible reasons for this imbalance are lack of data, research, published studies and technical expertise. In addition, development of methodologies and models of vulnerability and adaptation assessment are still preliminary (Carter *et al.*, 2007). A concerted effort is needed to develop a common solution that can be embraced by the tourism industry, governments and consumers worldwide to tackle climate change in a co-ordinated fashion (WTTC, 2011). Vulnerability assessment could address these needs. Therefore, there is need to improve the observation networks, enhance research capability and advance response initiatives geared towards mitigation and adaptation that could inform appropriate actions to safeguard the industry against a possible catastrophe.

1.3: Purpose of the study

This study seeks to improve the understanding of the relationship between climate change and tourism. It also shows how vulnerable tourism sector is to both the physical and economic impacts of climate change, resulting in an assessment that is salient to decision-makers, credible and socially and politically legitimate. This will enable stakeholders to build resilience and adaptive capacity of the sector and provide certainty

for the purpose of future investment. The results will improve the understanding of the complex nature of present vulnerability of tourism to climate change, and how it may evolve over the coming decades in order to assist in coping with current and future changes. In addition, it will create opportunities for tourism stakeholders in the most vulnerable regions to develop their knowledge, skills and capacity, and plan for situation-specific solutions in order to address climate change impacts and sustainable development. The research has attempted to address the uncertainties related to the implications for the geographic and seasonal redistribution of tourists due to climate preference. Furthermore, the research seeks to construct a vulnerability assessment model suitable for developing countries, where most impacts of climate change are already evident. Generally, climate change will need to be considered in strategic planning so that the tourism sector can realize opportunities of a changed climate and confront the challenges posed in a sustainable manner (Scott and Jones, 2006). The focus of the analysis is to make tourism sector less vulnerable to impacts of climate change.

1.4: Objectives

1.4.1: General Objective

To investigate the vulnerability and adaptation of the tourism sector to climate change in Kenya.

1.4.2: Specific Objectives

i. To explore the perceived impacts of climate change indicators on the tourism sector in Kenya.

ii. To assess the tourism sector adaptation practices to climate change indicators in the country.

iii. To review climate change policy affecting tourism in Kenya.

iv. To investigate the vulnerability of the tourism sector to the indicators of climate change in Kenya.

v. To construct a conceptual model for vulnerability assessment.

1.5: Research Hypotheses

Hypothesis 1: H_o: Perceptions of climate change impacts indicators by tourists do not vary by region of residence, purpose of visit, age, marital status or accommodation type.

Hypothesis 2: $H_{o:}$ Perceptions of climate change impacts indicators by hotel managers do not vary by hotel rating and location.

Hypothesis 3: H_o Vulnerability does not vary by tourists and service providers experiences.

1.6: Significance and anticipated output

On the global scale, results from this study will be used by climate change and tourism decision makers such as the IPCC and the UNWTO to understand vulnerability and adaptation in developing countries. Consequently, the study will help tourism destinations anticipate potential changes and build a stronger, less vulnerable and more resilient, tourism industries. Nationally, the Government of Kenya, various relevant ministries, civil society, private sector and the general public will use the information to

improve their understanding of vulnerability and adaptation to climate change. For example, in the effort to achieve Vision 2030, all stakeholders should consider the impacts of climate change and their implications in all facets of development. This will help them make informed decisions on practical adaptation actions and measures to respond to climate change on a sound, scientific and technical basis. Furthermore, researchers in climate change and tourism can use the methodology and conceptual model developed in this study to assess vulnerability to climate change especially in developing countries.

The anticipated output will include:

- Ratings of impacts, magnitude of these impacts on components of tourism and importance of weather parameters.
- Adaptation measures, opportunities and challenges
- A conceptual framework showing the sensitivity, exposure and adaptive capacity of the tourism sector to the impacts of climate change

1.7: Delimitations

The scope of this research is delimited to Kenya. Information was collected from tourism and climate change stakeholders and experts only. In addition, only tourists and general managers of tourist hotels, (3, 4 and 5 star hotels) represented the stakeholders. The experts were drawn from key stakeholders including government, academia, civil society and private sector. In addition, the study was based in Nairobi, Coast and Central tourist circuits.

1.8: Limitation

Due to technical complexity, this study focused on a single sector (tourism). To be more policy-relevant, future analyses need to account for the interactions and implications between different sectors, particularly at national level but also through global trade and financial flows. Also, data was collected only from hotel managers, tourists and experts. Involvement of more stakeholders and experts could have resulted in a more comprehensive research output.

1.9: Assumption

It was assumed that the chosen stakeholders and experts provided all the information required truthfully, on past and present impacts of climate change. Also, it was assumed that the various ratings of opinions are accurate.

CHAPTER TWO: LITERATURE REVIEW

This chapter gives an overview on climate change and shows its relationship with tourism. More emphasize is given to the challenge of climate change for tourism through an elaborate discussion on the direct climate change impacts on tourism; climate-induced environmental changes; impacts of mitigation policies on tourist mobility and demand implications of climate-induced societal change. Further the current situation of this relationship is discussed in Africa and Kenya as well as in relation to justice and policy. Assessment of vulnerability is expounded with a conclusion on the existing gaps.

2.1: Tourism

The tourism sector has an important place in climate change debate, given its global social and economic value, its role in sustainable development and its strong relationships with climate (Simpson *et al.*, 2008; Scott *et al.*, 2011). Tourism is currently one of the largest economic sectors worldwide. The sector's contribution to economic activity worldwide is estimated at some 5% (UNWTO, 2011), contributes 6-7% employment worldwide (UNWTO, 2010) and 9% of global Gross Domestic Product (GDP) (WTTC, 2011). For many developing countries it is one of the main sources of foreign exchange income, creating much needed employment and opportunities for development. For example in Kenya the 1 million tourists registered in 2010 generated US$1 billion in tourism receipts (GoK, 2011). In addition, tourism is the largest foreign exchange earner for Kenya and accounts for about 10% of Kenya's GDP and 9% of

employment opportunities (GoK, 2011). Therefore, the continued and sustainable growth of the industry is critical to the economic and social wellbeing of millions of people. Tourism and the environment are interdependent, which makes tourism susceptible to the impacts of climate change (Scott *et al.*, 2011). In fact, climate change is already influencing the industry's investment decisions, day to- day operations, the tourism product itself, and consumer demand patterns (WTTC, 2011).

The United Nations World Tourism Organization defines tourism as:

… the activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes… (Vanhove, 2011:4).

The tourism industry is one of the largest and fastest growing global industries and is a significant contributor to national and local economies around the world (Scott and Lemieux, 2011). The industry represents far more than just travel for leisure. It also includes travel for religion, business and visiting friends and relatives. Figure 2.1 shows the contribution of the tourism industry to a destination.

According to WTTC (2012) the industry is characterized by considerable diversity and a fragmented structure. It has direct, indirect and induced impacts to a destination. It contributes directly to a destination through accommodation, transportation and entertainment, as well as through various tourism related industries such as food and beverage. Indirect contribution includes money spent on investment in the industry and

government taxes. Induced contribution relates to creation of market for recreation clothing and household goods.

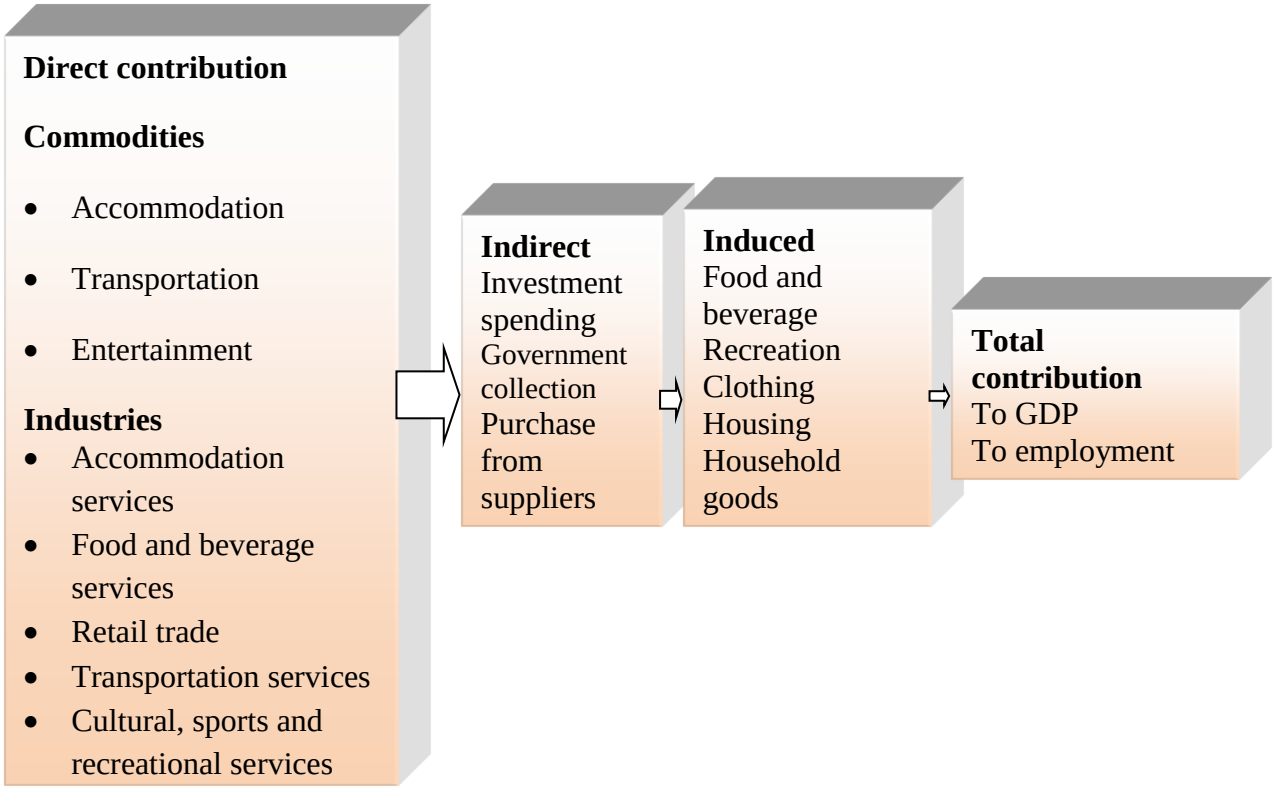

Figure 2.1: Contribution of the Tourism Industry to a destination.
Source: Adapted from WTTC (2012).

2.2: Tourism in the world

The last six decades have seen extraordinary growth for tourism, as shown in Figure 2.2. According to the World Travel and Tourism Council (WTTC), in 2011, the industry contributed 9% of global GDP, or a value of over US$6 trillion, and accounted for 255 million jobs (WTTC, 2012) or 1 in 12 jobs (UNWTO, 2011). Despite occasional shocks, international tourist arrivals have shown impressive uninterrupted growth – from 25 million in 1950, to 278 million in 1980, 528 million in 1995, 939

million in 2010, 980 million 2011 to 1,035 million in 2012, as shown in Figure 2.5. In addition, international tourism receipts reached US$ 1,075 billion worldwide in 2012, up from US$ 1,042 billion in 2011 (UNWTO, 2012; UNWTO, 2013).

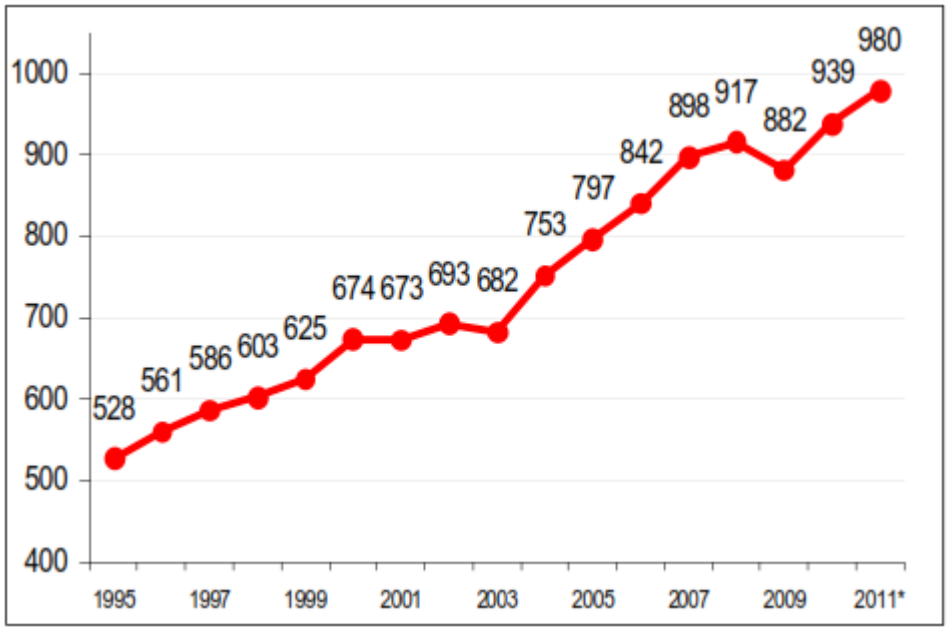

Figure 2.2: World International Tourists Arrivals
Source: UNWTO, 2012:1

This extraordinary growth was achieved amidst multiple changes and shocks that the world has suffered in the recent past, from man-made crises such as major political changes in the Middle East and North Africa to natural disasters in Japan and other parts of the world and global economic crises - from which the world is still recovering (UNWTO, 2011). The industry, despite being extremely vulnerable, has always bounced back, proving its resilience and capacity to rebound (UNWTO, 2012). Over the next ten years the industry is expected to grow by an average of 4% annually, which will translate to 10% of global GDP, and US$10 trillion. By 2022, it is anticipated that it will account for 328 million jobs, or 1 in every 10 jobs on the planet (WTTC, 2012).

2.3: Tourism in Africa

While the majority of international tourism currently occurs in developed countries (as shown in Figure 2.3), the sector is a vital contributor to the economy of many developing countries.

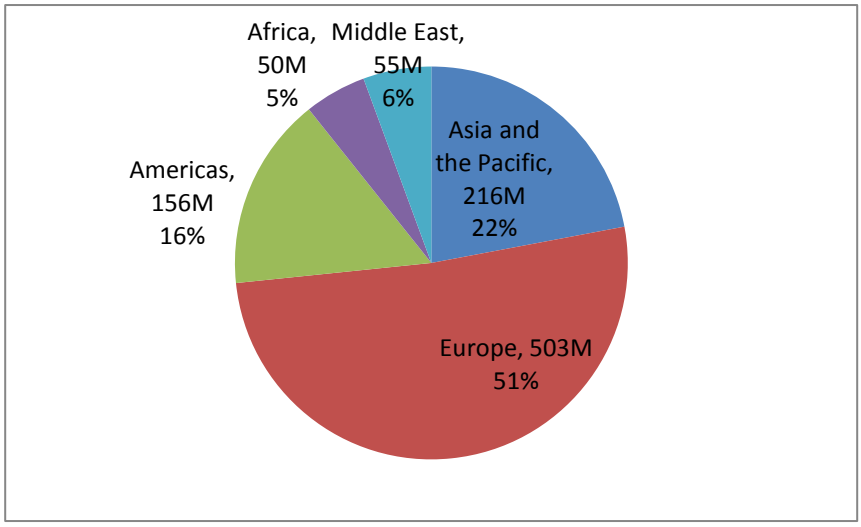

Figure 2.3: World inbound Tourism: International Tourist arrivals, 2011.
Source: UNWTO (2012).

Africa showed strong resilience in 2009, a year tagged by the UNWTO as one of the toughest for the tourism industry, characterized by continued global economic recession which was aggravated by the uncertainty around the AH_1N_1 influenza pandemic and Severe Acute Respiratory Syndrome (SARS) (UNWTO, 2011). The continent recorded a 3% growth in international tourist arrivals, against a worldwide decline of 4.2%. All other regions recorded negative growth (UNWTO, 2010). According to the 2012 UNWTO World Tourism Barometer, in 2011, Africa maintained international arrivals at 50 million since the gain of 2 million arrivals for Sub-Sahara Africa (+7%) was offset

by the losses in North Africa (-12%) (UNWTO, 2012), as shown in Figure 2.4. All other regions experienced substantial growth, except the Middle East, which recorded a decline of -6%.

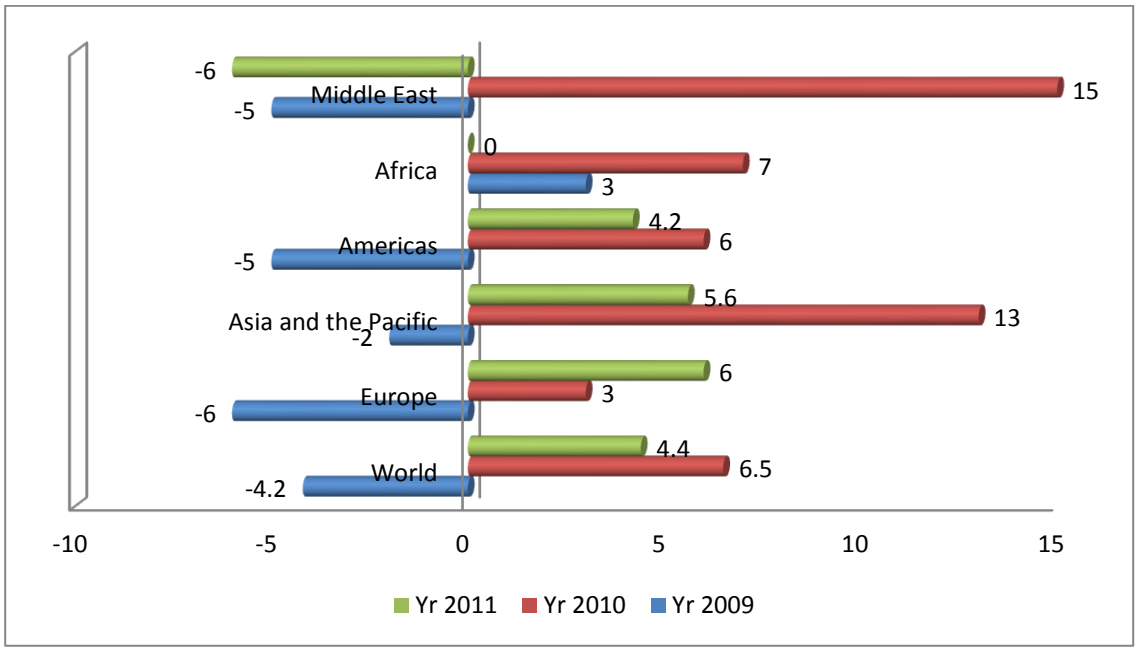

Figure 2.4: Growth of International Tourism Arrivals by regions.

Source: UNWTO (2010) and UNWTO (2012).

2.4: Tourism in Kenya

For Kenya, tourism is one of the major economic pillars, enjoying significant growth (13% p.a.) over the past few years (GoK, 2007). The sector is the largest contributor to foreign exchange earnings of over US$1 billion (Ksh 73.7 billion). The country has shown an impressive performance in the tourism sector since 2002, increasing the total number of annual tourist arrivals (domestic, regional and long haul) from an estimated 1

million (Ksh.21.7 billion in revenue) in 2002 to 1.6 million (Ksh.65.2 billion in revenue) in 2007, as shown in Figure 2.5.

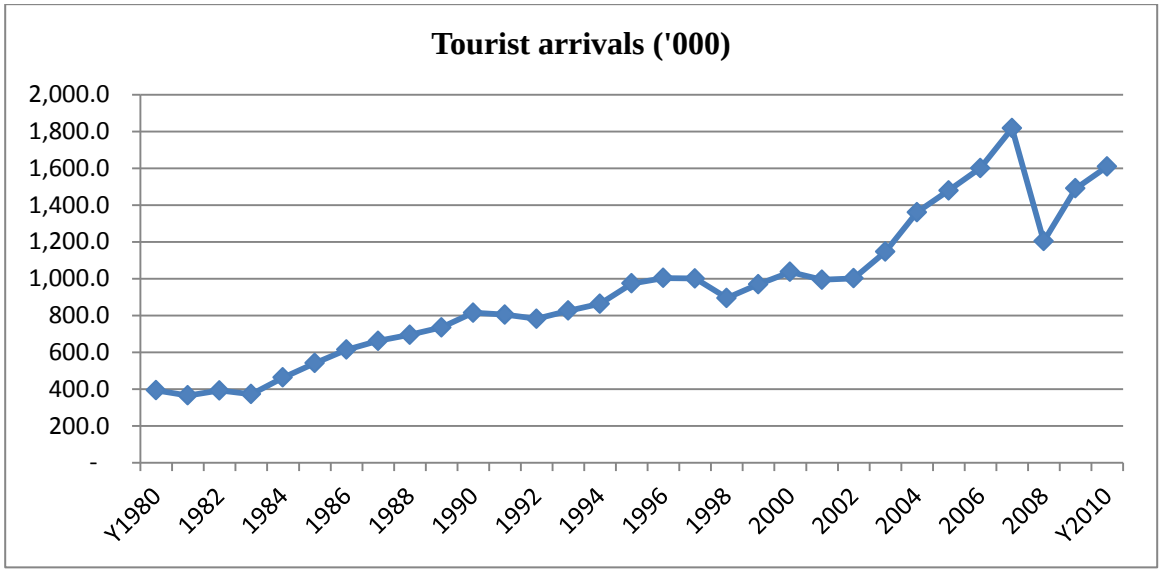

Figure 2.5: Tourist arrivals in Kenya from 1980 to 2010 in thousands.
Source: Adapted from KNBS (2011).

This improvement occurred despite major global challenges that faced the sector, such as rising oil prices and health scares, (including fears of avian flu) and advisories against international travel to Kenya. After this impressive growth, the sector was unfortunately significantly affected by the 2007/2008 post election violence which saw the numbers fall to 1.14 million, with Ksh 52.7 billion in earnings. However, tourists arrivals have since steadily increased to 1.46 million in 2010 amidst major security threats from neighbouring Somalia with even relatively better returns than ever before with Ksh.73.7 billion, as shown in Figure 2.6.

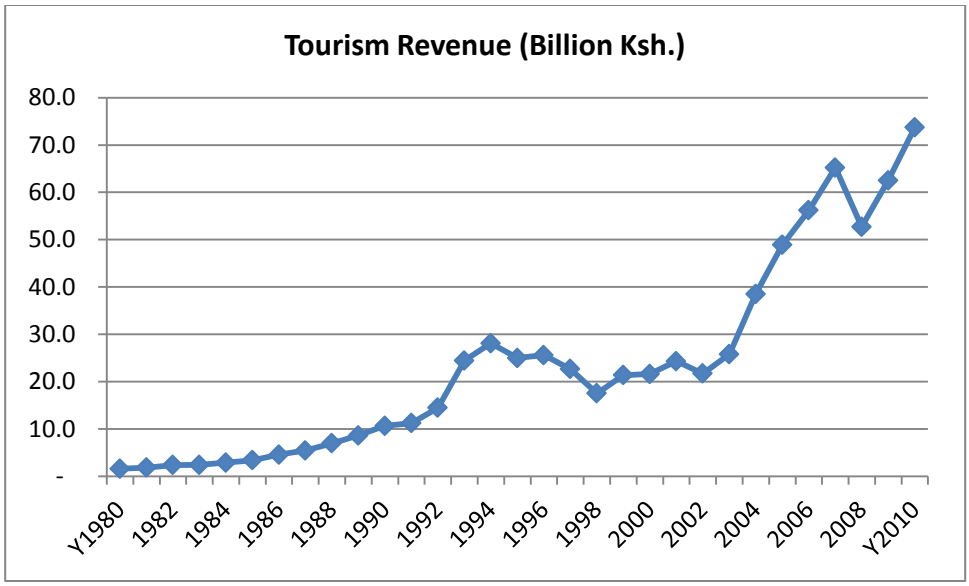

Figure 2.6: Tourism revenue in Kenya from 1980 to 2010
Source: Adapted from KNBS (2011).

2.5: Overview on climate change

In a narrow sense, climate can be defined as the 'average weather' (IPCC, 2007b). Weather, on the other hand, can be defined as the state of the atmosphere in a given place at a given time (Martin, 2005). Climate is usually described in terms of the mean and variability of temperature, precipitation and wind over a period of time, ranging from months to millions of years (Le Treut, 2007). 'Climate change' refers to any change in climate over time, whether due to natural variability or as a result of human activity (Hegerl, 2007), while 'climate variability' refers to variations in the mean state and other statistics of the climate on all temporal and spatial scales beyond that of individual weather events (IPCC, 2007b: 872). The most important human activity contributing to climate change is the emission of green house gases (GHG) which are

those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation (IPCC, 2007b). Human-induced land-use changes and forestry activities (afforestation and reforestation) are important sinks of GHG that reduce the impacts of climate change (Klein *et al.,* 2007).

In the late 1950s researchers in Scripps Institution of Oceanography began to measure the concentration of carbon dioxide levels in the atmosphere (GoK, 2010). Interest in research on the environment in general and climate change in particular increased considerably in the 1960s through 80s. In 1987, the United Nations World Commission on Environment and Development (WCED) alerted the world on environmental concerns including climate change and associated the change with increasing atmospheric concentrations of GHGs. They came up with the Brundtland Report also known as *Our Common Future*. Following these discussions, it became evident that climate change was one of the undesirable consequences of man's unsustainable development practices (UNCSD, 2007). Therefore, (United Nations Environment Programme (UNEP) and (World Meteorological Organization (WMO) jointly established the Intergovernmental Panel on Climate Change (IPCC) in 1988 as an effort by the United Nations to provide the governments of the world with a clear scientific view of what is happening to the world's climate and translate this information into *IPCC Assessment Reports*. (IPCC, 2010). So far, four assessment reports (1990, 1995, 2001 and 2007) have been completed that give assessment of climate change impacts for every continent, identify some of the most vulnerable places and people and maps projected impacts against future warming trends (IPCC, 2007a).

The Brundtland report laid the groundwork for the convening the Earth Summit five years later in June 1992. Among the summit's outcomes were the United Nations Framework Convention on Climate Change (UNFCCC), which is the key international treaty to reduce global warming by reducing GHG emissions and cope with the consequences of climate change. The IPCC also provides the UNFCCC with information on scientific technical matters through Technical Papers, Special Reports and Methodology Reports (IPCC, 2007a). The Earth summit led to the establishment of the World Summit in 2002 which led to more governmental commitments on climate change among other issues (IPCC, 2010). To date, many governments have held a number of conventions that have resulted into different commitments.

The IPCC (2007a) has indicated that there is compelling evidence indicating that global climate has changed compared to the pre-industrial era and is anticipated to continue to change over the 21st century and beyond. Also the report declares that warming of the climate system is unequivocal and that it is "very likely" (> 90% probability) that anthropogenic (human-made) GHG have caused most of the observed global temperature rise since the middle of the 20th Century (UNWTO, 2007a; IPCC, 2007a, UNWTO, 2009). The global mean temperature has increased approximately 0.76°C between 1850–1899 and 2001–2005, as shown in Figure 2.7. The IPCC predicts that global average surface temperatures will increase between 1.8ºC – 4.0ºC by 2100 (IPCC, 2007a).

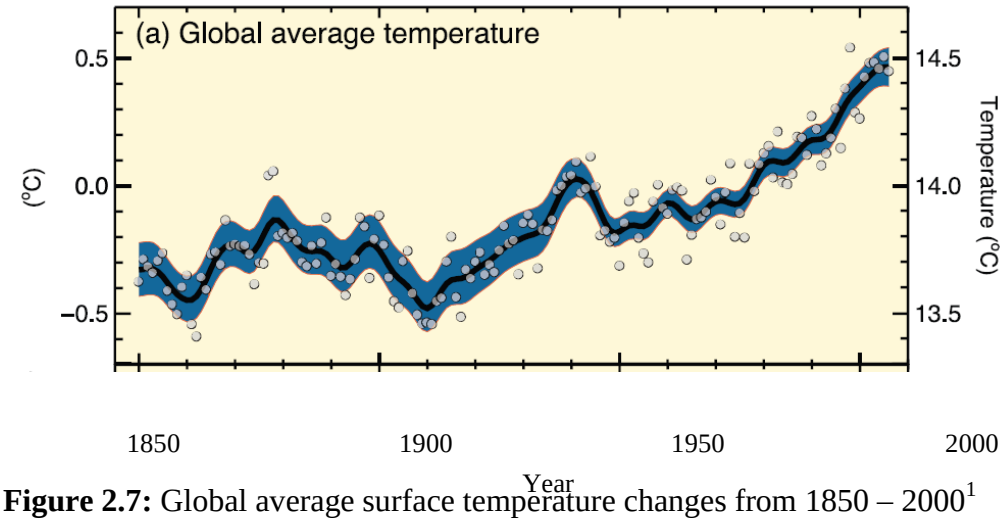

Figure 2.7: Global average surface temperature changes from 1850 – 2000[1]
Source: IPCC, 2007b:6

The IPCC has concluded that changes in a number of weather extremes are probable as a result of projected climate change, including: higher maximum temperature and more hot days over nearly all land areas (very likely), greater tropical storm intensity and peak winds (likely), more intense precipitation events over many land areas (very likely), and longer and more severe droughts in many mid-latitude continental interiors (likely) (IPCC, 2007a). The global average surface temperature has changed substantially from 1850 – 2000.

These impacts have resulted to widespread melting of snow and ice, rising global average sea level and extreme weather events. It is evident that anthropogenic warming could result to abrupt and irreversible impacts, depending upon the rate and magnitude of the climate change (IPCC, 2007a; IPCC, 2007b). Unfortunately, even if GHG concentrations were to be stabilized, anthropogenic warming and sea level rise would

[1] *All changes are relative to corresponding averages for the period 1961–1990. Smoothed curves represent decadal average values while circles show yearly values. The shaded areas are the uncertainty intervals estimated from a comprehensive analysis of known uncertainties*

continue for centuries due to the time scales associated with climate processes and feedbacks (IPCC, 2007b). This shows the urgency of fair and equitable mitigation and adaptation efforts in order to prevent irreparable damage to the planet.

2.6: Relationship between climate change and tourism

Although scholarship on tourism and climate change extends over a period of 27 years (Wall *et al.*, 1986), very little progress to advance the understanding of the implications was made over the next decade (Scott and Becken, 2010). The interface between climate and tourism is multifaceted and highly complex, with multiple interactions. First, tourism is a very energy-intensive sector that contributes GHG emissions derived especially from the transport and accommodation of tourists (Pentelow and Scott, 2011; Scott and Lemieux, 2011). According to a study by Peeters and Dubois (2010), tourists were found to cause 4.4% of global CO_2 emissions. The study projects these emissions to grow at an average rate of 3.2% per year up to 2035. Secondly, tourism can be an important mitigator of climate change through efforts such as conservation and reforestation (Goosling *et al.,* 2012). Thirdly, climate is an essential ingredient in the tourism experience and therefore a principal resource, as it codetermines the suitability of locations for a wide range of tourist activities (Hamilton *et al.,* 2005a; Scott and Lemieux, 2011). Changes in the climate system will therefore be a new and important element shaping tourism. The relationship can be depicted as in Figure 2.8. The IPCC Forth Assessment Report recognizes the scarcity of information on these relationships (IPCC, 2007a). This study focuses on the last relationship, exploring the importance of

weather parameters to tourists and how the changing climate system is and will affect tourism.

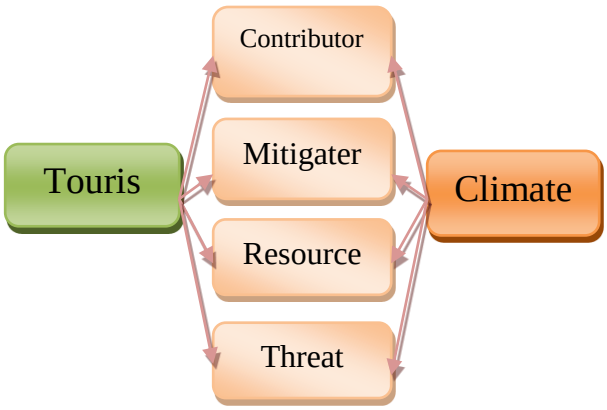

Figure 2.8: The relationship between climate and tourism
Source: researcher, 2013

2.6.1: The Challenge of Climate Change for Tourism

With its close connections to the environment and climate itself, tourism is considered to be a highly climate-sensitive economic sector (Simpson *et al.*, 2008). According to UNWTO (2009) and Goosling *et al.* (2012), four broad categories of climate change impacts will affect tourism destinations, their competitiveness and sustainability (as shown in Figure 2.9), which are:

1. Direct climatic impacts
2. Indirect environmental change impacts
3. Impacts of mitigation policies on tourist mobility
4. Indirect societal change impacts

Indirect impacts relate to environmental change and increased operation costs. Climate change will also impact on mitigation policies on tourists mobility and have indirect societal change impacts.

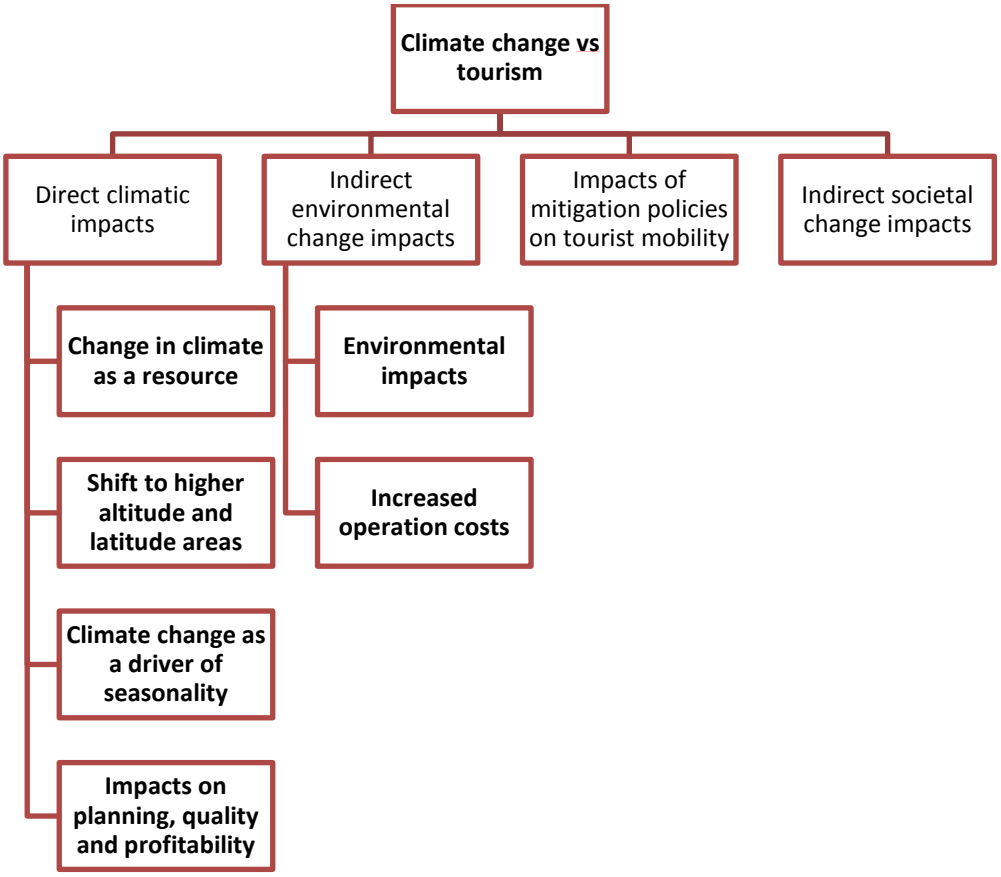

Figure 2.9: The relationship between climate change and tourism

Source: Developed from UNWTO (2007a); Scott and Becken (2011).

2.6.1.1: Direct climate change impacts on tourism

1. **Change in climate as a resource**

Many studies highlight the importance of both weather and climate to tourism (Jopp *et al.*, 2010; Goosling *et al.*, 2012). Weather and climate are an intrinsic component of the

vacation experience and have been found to be a central motivator for travel. Consequently, changes in the spatial and temporal distribution of climate resources will have important consequences for tourism demand at various scales. This is because tourists base their decisions on perceived and experienced climatic conditions. In addition, specific weather conditions affect whether tourists can participate in certain activities, their level of satisfaction and even their safety (Scott and Lemieux, 2011).

2. Shift to higher altitude and latitude areas

Research on tourism demand indicates that a gradual shift of attractiveness of climatic conditions for tourism and consequently a shift in international tourism demand towards higher latitudes and altitudes is very likely (Hamilton *et al.,* 2005b; UNWTO, 2007a; Boko *et al.,* 2007). For example, a study carried out by Scott *et al.* (2012), using a global scale simulation model, projected that tourists from temperate nations that currently dominate international travel will spend more holidays in their home country or nearby regions. Consequently, relative demand for international travel to sub-tropical and tropical nations was projected to decline. Also studies on climate and tourism demand using econometric models have shown temperature to be statistically significant in determining demand for a variety of tourism products (Hamilton *et al.,* 2005a; Weaver, 2011).

However, care should be taken in judging such projections. It is evident that, 'climate' is more complex than just temperature as tourists consider a range of meteorological variables in their decision-making (Scott *et al.,* 2012), and global scale simulation models of tourism demand are highly simplified and have important limitations,

including a wide range of tourist-response related uncertainties (Weaver, 2011; Scott *et al.*, 2012). In addition, the perception of contemporary visitors may not be shared by future generations (Scott *et al.,* 2007), who might emphasize completely different components of the tourism product.

3. **Climate change as a driver of seasonality**

Some destinations that close during the rainy seasons might not know when to close if the current climate seasons changes continue.

4. **Impacts on planning, quality and profitability**

Climate plays an important role in the planning, financial success and quality of visitor experience at special events that take place in outdoor venues, for example, music concerts, cultural festivals, sporting events – football, golf, auto racing. Consequently, many outdoor events are held at certain times of the year in order to take advantage of certain climatic conditions or reduce climate risk (Scott and Lemieux, 2011).

2.6.1.2: Climate-induced environmental changes

1. **Environmental impacts**

Environmental change due to climate change, extreme events and pressure on resources is posing challenges for tourist destinations, and these challenges are projected to increase in the future. A wide-range of climate-induced environmental changes are having and will have profound and varying effects on tourism at the destination and regional level such as: changes in biodiversity loss; water availability (Kundzewicz *et al.*, 2007); increased natural hazards; reduced landscape aesthetic; altered agricultural

production (Easterling *et al.*, 2007); coastal erosion and inundation, damage to infrastructure and the increasing incidence of vector-borne diseases (UNWTO, 2007a).

2. Increased operation costs

Climate change also has an important influence on operating costs, such as heating-cooling, snow-making, irrigation, food and water supply, and insurance costs in many destinations

2.6.1.3: Impacts of mitigation policies on tourist mobility

Much of global passenger transport is linked to tourism. The sector is therefore of interest in studying global mobility trends and transport-related emissions. Globally, tourism's emissions have been estimated at around 4.5% to 5% of overall CO_2 emissions, with 75% of these the result of tourist mobility and 25% due to on-site consumption, including accommodation (21%) and tourist activities (4%) (Dubois *et al.*, 2009; Peeters and Dubois, 2010). The study by Peeters and Dubois (2010) emphasizes that this increase is problematic as globally a reduction of emissions by 3–6% is required to avoid 'dangerous' climate change. In addition, various models produced could not give results that show a future tourist travel system consistent with CO_2 emission reductions of up to 70% by 2050 with respect to 2005, as recommended.

Climate change mitigation requires the transformation of energy and transportation systems worldwide, with implications for the cost of travel and tourist mobility. Tourism is dependent on transport for tourist access to destinations. Research predicts that tourist mobility and flows will be affected by national or international mitigation

policies that seek to reduce GHG emissions through increased transport costs and changed environmental attitudes which might change travel patterns (Jopp *et al.,* 2010).

Given the rapid growth in tourism, with 1.6 billion international tourist arrivals predicted by 2020 (up from 903 million in 2007), it is clear that the sector will contribute to rapidly growing emission levels, and increasingly interfere with global climate policy. This is especially true under climate stabilisation and ‘‘avoiding dangerous climate change” objectives, implying global emission reductions in the order of 50% to 80% by 2050, compared to 2000 (Dubois *et al.,* 2009). Policy makers have a wide range of measures to intervene in the transport market, to stimulate a more sustainable situation (Pentelow and Scott, 2011). Governments, for instance, could introduce subsidies for cleaner modes of transport and taxation on more heavily polluting vehicles.

The aviation sector is in the forefront in implementing measures to reduce aviation GHG emissions. Aircraft efficiency is increasing through aircraft design, engine efficiency and operational practices (Pentelow and Scott, 2011). However, the growth in demand for aviation is forecast to exceed technological improvements and, therefore, aviation emissions as a share of total emissions are expected to increase (OECD & UNEP, 2011). Consequently, national tourism economies of many long-haul destinations such as Africa could be adversely affected (Boko *et al.,* 2007).

Mitigation policies, especially tax and market-based instruments, may lead to an increase in the costs of travel as well as increase awareness of climate change and travel emissions. Most countries have not adopted strict emission reduction goals. However, some regions such as the European Union and a few countries have introduced carbon taxes on their flights (OECD & UNEP, 2011). Several studies on climate change mitigation and tourism focus on air travel, which is most energy intense tourism sub-sector. Studies examining the potential impact of current aviation sector mitigation policies have found little effect on overall international tourism demand (Pentelow and Scott, 2011). However, possible future effects are still unknown.

Leisure travellers appear more price sensitive than business travellers, and short-haul travelers more than long-haul (Jopp *et al.,* 2010). The reason for this is that there are more choices and possibilities for substitution for shorter trips compared with long ones, while the commitments of business travellers makes them more willing to accept higher prices so that they have flexibility and certainty in their travel arrangements. Consequently, there is no evidence to suggest that mitigation policies for international aviation would have even a moderate impact on tourism demand in the immediate future (Pentelow and Scott, 2011). Most studies, however, project a small decrease in the growth of international tourist arrivals versus a scenario with no emission reduction policies, in all cases demand for air travel and international tourism continues to increase (Gossling *et al.,* 2012). These policies might adversely affect longhaul and leisure-based destination like Kenya in the near future. In order to remain competitive, such destinations should strive to tap into the domestic, regional and business markets.

2.6.1.4: Demand Implications of Climate-induced Societal Change

Reductions in global, regional or national GDP resulting from climate change will definitely reduce consumer discretionary wealth available for tourism and have negative repercussions for anticipated future growth in tourism demand (Gossling *et al.,* 2012). In addition, clarity in the marketplace empowers consumers to take decisions in line with sustainable lifestyle options. According to WTTC (2010), the growing trend is towards consumers becoming willing partners with companies in supporting environmental responsibility. Some consumers are starting to make choices between companies based on actual emissions performance data, and are judging companies on their environmental credentials. This may have profound effects on what direction future tourism will take.

According to the Stern report, unmitigated climate change will eventually damage future economic growth and cause political instability of some nations (Stern, 2006). The report further indicates that climate change has the potential to have an adverse effect on the global economy and consequently pose a security risk in some regions. Furthermore, climate change is considered a national and international security risk that will steadily intensify, particularly under greater warming scenarios. Also, climate change associated security risks have been identified in a number of regions where tourism is highly important to local/national economies. Tourists, particularly international tourists, are averse to political instability and social unrest. A security-related decline in tourism would exacerbate deteriorating economic performance in

these destinations, potentially undermining development objectives in some nations. However due to lack of long-range scenarios for global tourism beyond the year 2030 (UNWTO, 2011), it has not been possible to examine the implications of climate change for the socio-economic conditions that are the foundation of long-range tourism scenarios.

2.7: Climate change in Africa

Despite its insignificant contribution to global warming, Africa is one of the most vulnerable regions to the adverse impacts of climate change (Hope, 2009). Many areas in Africa are recognized as having climates that are among the most variable in the world on seasonal and decadal time scales (Boko *et al*., 2007; Kumssa and Jones, 2010).

In terms of future trends, for the period 2080–2099 annual mean surface air temperature is expected to increase by an average of between 3^{0}C and 4^{0}C compared to the 1980–1999 period (Boko *et al.*, 2007). Similar projections for the same period indicate an increase in rainfall in tropical and Eastern Africa of more than 7%, (Christensen *et al.*, 2007; Hope, 2009). Land surface temperature anomalies for the African continent in the past century at decade intervals (1904–2004) shows that the annual mean maximum and mean minimum temperatures have been generally increasing (Hope, 2009), as shown in Figure 2.10. The figure shows that the climate of Africa is definitely warmer that it was a century ago.

The overexploitation of land resources including forests, increases in population, desertification and land degradation pose additional threats (Kumssa and Jones, 2010).

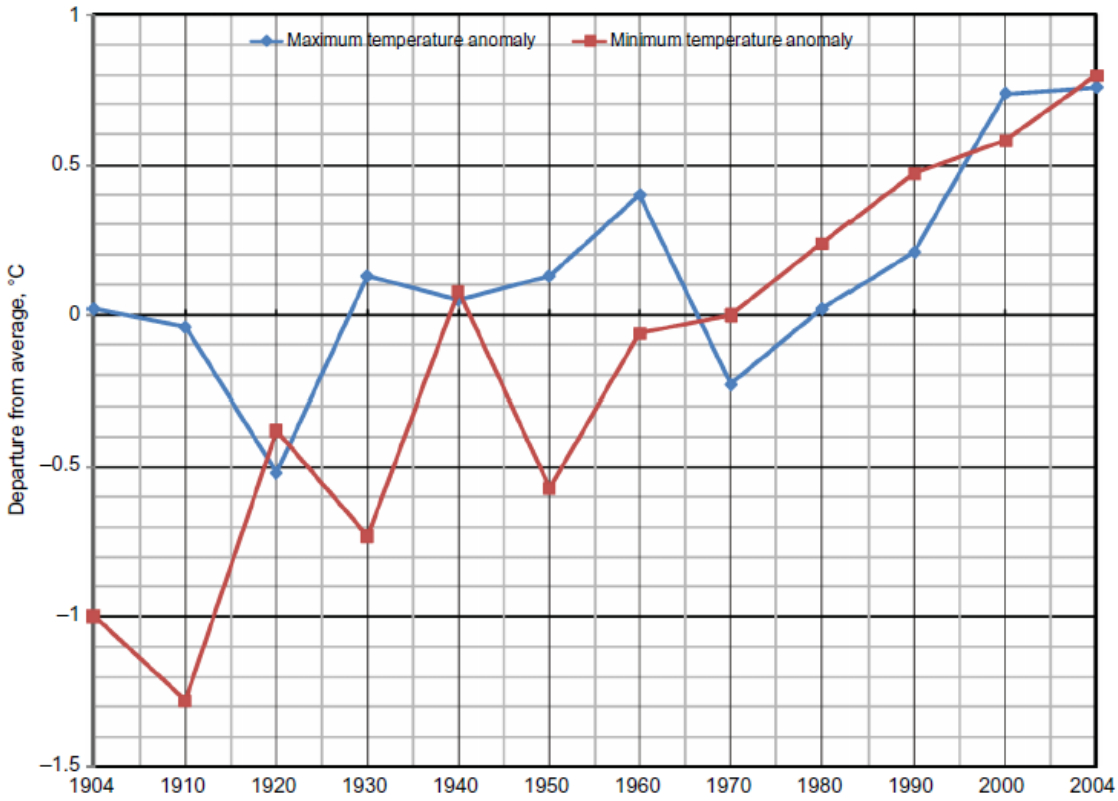

Figure 2.10: Annual mean maximum and mean minimum land surface temperature anomalies for the African continent in the past century at decade intervals (1904–2004). *Source: Hope (2009).*

Climate change is an added stress to already threatened habitats, ecosystems and species in Africa, and is likely to trigger species migration and lead to habitat reduction (Kumssa and Jones, 2010). Future sea level rise has the potential to cause huge impacts on the African coastlines including the already degraded coral reefs on the Eastern coast (Kumssa and Jones, 2010).

National communications indicate that the coastal infrastructure in 30 percent of Africa's coastal countries, including the Gulf of Guinea, Senegal, Gambia, Egypt, and along the East-Southern African coast, is at risk of partial or complete inundation due to accelerated sea level rise. Future sea level rise also threatens lagoons and mangrove forests of both eastern and western Africa, and is likely to impact urban centres and ports, such as Cape Town, Maputo, and Dar Es-Salaam (UNFCCC, 2007). The poor and marginalized have historically been most at risk, and are most vulnerable to the impacts of climate change.

Glacial retreats on major mountains in Africa such as Mount Kilimanjaro and Kenya are posing challenges to the environment. Scientists have reported 80% decrease in the volume of glacial ice caps on the mountain in the past century. Scientists warn that if Mount Kilimanjaro continues to lose its glaciers at the current rate, they may disappear within the next decade (Kumssa and Jones, 2010). This will reduce water catchment downstream hence adversely affecting biodiversity important for tourism.

In addition, vulnerability to climate change impacts will be most severe when and where there are other non-climate stresses such as environmental degradation, poverty, unequal access to resources, food security and risks from natural hazards (Yohe *et al*., 2007), as shown in Table 2.1.

Table 2.1: Impacts of climate change in Africa relevant to tourism

Impacts	Vulnerabilities	Adaptive capacity
Temperature – Higher warming (x1.5) throughout the continent and in all seasons compared with global average. – Drier subtropical regions may become warmer than the moister tropics. **Precipitation** – Decrease in annual rainfall in much of Mediterranean Africa and the northern Sahara, with a greater likelihood of decreasing rainfall as the Mediterranean coast is approached. – Decrease in rainfall in southern Africa in much of the winter rainfall region and western margins. – Increase in annual mean rainfall in East Africa. – Increase in rainfall in the dry Sahel may be counteracted through evaporation. **Extreme Events** – Increase in frequency and intensity of extreme events, including droughts and floods, as well as events occurring in new areas.	**Terrestrial Ecosystems** – Drying and desertification in many areas particularly the Sahel and Southern Africa. – Deforestation and forest fires. – Degradation of grasslands. – 25–40% of animal species in national parks in sub-Saharan Africa expected to become endangered. **Coastal Zones** - Coastal erosion is already destroying infrastructure and tourism facilities – Threat of inundation along coasts in eastern Africa and coastal deltas, such as the Nile delta and in many major cities due to sea level rise, coastal erosion and extreme events. – Degradation of marine ecosystems including coral reefs and mangroves off the East African coast. – Cost of adaptation to sea level rise could amount to at least 5–10% GDP. - A 30% loss of corals resulted in reduced tourism in Mombasa and Zanzibar, and caused financial losses of about US$12-18 million - 80% of glaciers on Mt Kilimanjaro are gone - Water-pollution-related diseases in low-lying regions (coastal areas) **Research** - Large gaps in research on climate variability and change **Generally** - Poleward shift of centres of tourist activity and a shift from lowland to highland tourism	Africa has a low adaptive capacity to both climate variability and climate change exacerbated by existing developmental challenges including: – low GDP per capita – widespread, endemic poverty – weak institutions – low levels of education – low levels of primary health care – little consideration of women and gender balance in policy planning – limited access to capital, including markets, infrastructure and technology – ecosystems degradation – conflicts

Source: Boko et al. (2007), Christensen et al. (2007) and UNFCCC (2007).

2.8: Climate change in Kenya

Kenya is located on the eastern part of the African continent. The country covers an area of about 582,650sq km including 13,400sq km of inland water and a 536km coastline and lies approximately between latitudes 6º north and 6º south and between longitudes 34º and 42º east on the east coast of Africa. The equator bisects the country in almost two equal parts. The altitude varies widely from sea level to about 5000 meters above sea level on the central highlands (Mutimba *et al.,* 2010; McSweeney *et al.,* 2010).

The country's climate is influenced by nearness to the equator, topography, the Indian Ocean, and the Inter- Tropical Convergence Zone (ITCZ). The country is hot and humid at the coast, temperate inland and very dry in the north and northeast parts of the country. The hottest period is from February to March and coldest in July to August. The mean annual rainfall shows a wide spatial variation, ranging from about 200mm in the driest areas in northwestern and eastern parts of Kenya to the wetter areas with rainfall of 1200-2000 mm in highlands (McSweeney *et al.,* 2010). Kenya's climate is fairly warm throughout most of the country, with temperatures ranging from 27°C - 31°C in hotter coastal region to 10°C - 24°C in colder regions such as the highlands (Mutimba *et al.,* 2010). The central highland regions are substantially cooler than the coast (McSweeney *et al.,* 2010).

Table 2.2 shows the changes in various indicators in Kenya from 1965 to 2010. Population growth rate in Kenya has been increasing gradually from 1965 to 1990. However, the subsequent years have seen a gradual fall in population growth.

Table 2.2: Statistics on changes in various indicators from 1965 to 2010

Indicator Name	**1965**	**1970**	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
Population growth (annual %)	3.26	3.48	3.69	3.80	3.72	3.38	2.90	2.61	2.69	2.69
Electricity production from oil, gas and coal sources (% of total)			29.6	26.4	6.0	7.1	10.2	50.6	27.5	30.5
Electricity production from renewable sources, excluding hydroelectric (% of total)			10.7	8.6	7.3	16.3	12.5	17.8	22.0	23.8
CO2 emissions (kt)	2468	3084	4976	6197	3770	5823	7554	10418	8562	
Methane emissions (kt of CO2 equivalent)						20324		22284	25616	27477
CO2 emissions from transport (million metric tons)			1.5	1.9	2.3	2.7	2.5	2.2	2.7	4.7
Agricultural land (% of land area)	44.31	44.36	44.93	44.95	46.30	47.04	47.82	46.86	47.44	48.23
Forest area (% of land area)						6.52		6.29	6.19	6.09
Terrestrial protected areas (% of total land area)						11.6	11.8	11.8	11.8	11.8
Marine protected areas (% of territorial waters)						5.2	6.0	10.5	10.5	10.5
Terrestrial and marine protected areas (% of total territorial area)						11.5	11.6	11.7	11.7	11.7
Roads, paved (% of total roads)						12.8	13.8	12.1		14.3

Source: World Bank 2013

Electricity production has been majorly from hydropower and other renewable energy. However, the amount produced from oil has been fluctuating along the years due to several factors such as the changes in levels of water due to droughts. This has resulted to relatively low levels of greenhouse gas emissions. Carbon Dioxide emissions have increased from 2468kt in 1965 to 8,565kt in 2005. This can be associated with the economic development that has been witnessed over the years. This is relatively low compared to the emissions from Africa and the world which in 2009 were over 700,000kt and over 32kt million respectively. Methane emissions in Kenya also have increased. Carbon Dioxide emissions from transport have also increased from 1.5 metric tons in 1975 to 4.7 in 2010. A part of this transport is related to the tourism sector.

Agriculture land has increased from 44% to 48%. Some of this land was formally wildlife dispersal areas. Paved road network has been increasing over the years to 14.3% of total roads in 2010. Most of the natural attractions such as national parks are found in areas with unpaved roads.

Table 2.3 shows statistics on the threatened species in Kenya and the world in 2012. Kenya contains a substantial number of threatened species such as 34 birds out of 3776 in the world; 68 fish out of 6286 in the world, 128 plants out of 11,275 and 28 mammals out of 3086 in the world. Many of the threatened mammals are an important attraction for tourists.

Table 2.3: Statistics on threatened species in Kenya and the world in 2012

Indicator Name	Kenya	World
Bird species, threatened	34	3776
Fish species, threatened	68	6286
Plant species (higher), threatened	128	11275
Mammal species, threatened	28	3086

Source: World Bank 2013

National parks occupy 7% of the total land area in Kenya, though a large population of wildlife is found outside the national parks. Climatic conditions affect abundance and type of wildlife, beaches, mountains and scenic features, all of which attract tourists (GoK, 2013). Biological diversity is crucial for ecological stability including regulations of climate, recreation and scientific advancement. Change in biodiversity will likely affect the tourism industry (Mutimba *et al.,* 2010), which is a major foreign exchange earner for some of the countries like Kenya.

Kenya is endowed with over 1500km of coastline that is home to some of the most diverse natural resources country-wide, such as mangroves and coral reefs (SEI, 2009). The coastal environment and habitats support some of the most diverse resources (Fischlin and Midgley, 2007) in the country. These include mangrove forests, coral reefs, sea grass beds and rocky and sandy shores (Hinkel and Klein, 2009). Climate change is expected to alter the physical, biophysical and biochemical characteristics of marine eco-systems in Kenya (SEI, 2009). The Kenyan coast is one of the most vulnerable to sea level rise in the world (Awuor *et al.,* 2007). The global mean sea level has risen substantially as shown in Figure 2.11.

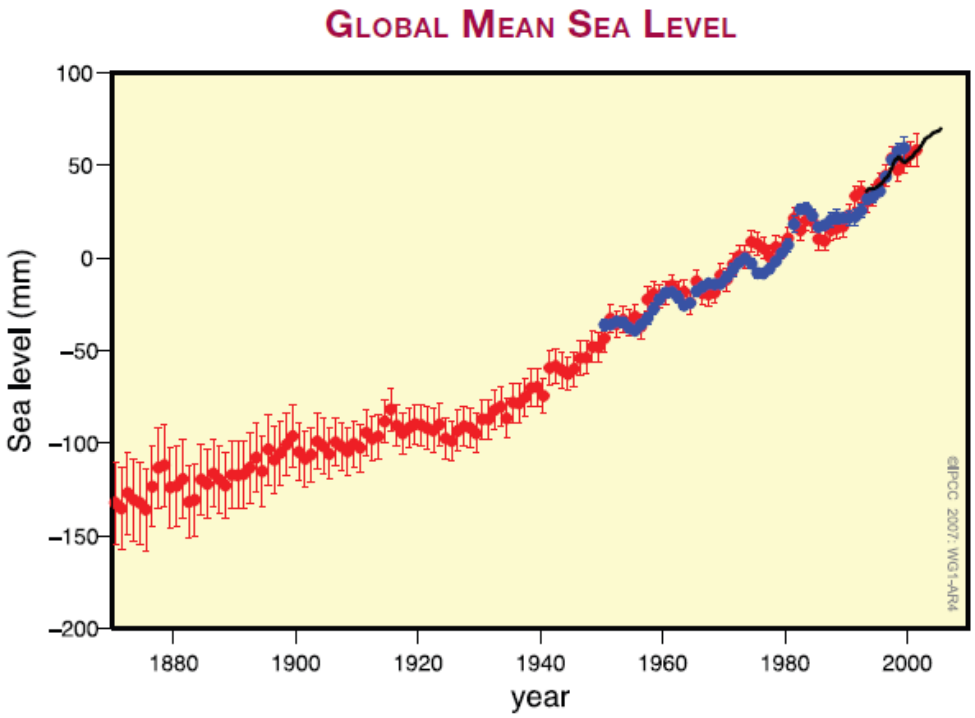

Figure 2.11: Global mean sea level from 1870 - 2000
Source: Solomon et al., 2007: 49

One of the most important tourist destinations in the country, Mombasa, a coastal city with sandy beaches and lots of marine life is highly vulnerable due to its low attitude especially the coastal plain covering between 4 to 6 kms wide and lying between sea level and about 45m above sea level (Awuor *et al.*, 2007). This low-lying area is likely to be submerged with a rise in sea level (Fischlin and Midgley, 2007). The key impacts of sea level rise have been identified as: lowland inundation and wetland displacement; shoreline erosion; salt water intrusion into estuaries and freshwater aquifers; altered tidal range in rivers and bays; changes in sediment pattern and budget; and decreased light penetration to benthic organisms, which will definitely impact on tourism (Awuor *et al.*, 2007; Fischlin and Midgley, 2007). In addition, tourism developments on low-lying areas are highly vulnerable (SEI, 2009). Table 2.4 summarizes climate related

disasters that have occurred in Mombasa in the recent past, according to a report by Danda (2006) and Awuor *et al.* (2007). Such disasters affect tourism at varying degrees.

Table 2.4: Climate-Related Disasters typology, trends and impacts relevant to tourism

Disaster type	**When it is/was experienced**	**Established incidence rate or return period**	**Impact profile**
El-Nino	1947, 1961 and 1997	Approximately 5 years	Increased disease incidents (cholera, typhoid cases) -Loss of human lives from starvation (not quantified) -Poor economic productivity
Floods	Frequently (almost annually)	unpredictable	Houses destroyed -Property lost -Human lives lost -Increased disease incidents (cholera, typhoid cases) - poor drainage structures or systems affected
Tsunami	2006	Unpredictable	-several boats reportedly destroyed - human life reportedly lost
Drought	1998 2005/6 2008-2011	Every 4-5 years	-Agricultural activities affected. - Droughts also cause Famine
Hunger/Famine	Every year	Every year	-Loss of human lives from starvation (not quantified) -Poor economic productivity

Source: Adapted from Danda, (2006) and Awuor et al., 2007

The Kenya coast is already affected by climate related disasters especially floods, droughts and strong winds. These climate-related disasters are projected to increase in frequency and intensity with long-term climate change (Hinkel and Klein, 2009).

A study by the Stockholm Environment Institute on the Economics of climate change in Kenya revealed that the future economic costs of the impacts of climate change on market and non-market sectors might be close to 3% of GDP per year by 2030 and potentially much higher than this (more than 5% of GDP per year) by 2050 (SEI, 2009; Mutimba *et al.,* 2010). There is no doubt that protection of ecosystems and plant diversity has the potential of enhancing climate change mitigation capacity. It is apparent that destruction of ecosystems essential for the survival of wildlife would be a great loss not only to Africa, but to the planet.

Tourism is very important to poverty reduction and economic development in developing nations (UNWTO, 2009). In addition, it has been identified as a leading economic sector in the achievement of Vision 2030 and attainment of the Millennium Development Goals (MDGs). Though Kenya is a net carbon dioxide sink, and tourism sector contribution to GHG emissions is low relative to the country's overall emissions (GoK, 2013), the country's geography, substantial arid and semi-arid area, coastal tourism resources and unique biodiversity and natural heritage mean that the country is particularly vulnerable to climate change. Research has shown that natural resources have been adversely affected by climate change globally (Jopp *et al.,* 2010). In addition, longhaul travel is being targeted by climate change mitigation policies such as carbon taxes (Goosling *et al.,* 2012), a move that is likely to impact negatively on Kenya's tourism development agenda.

Climate change, as it relates to tourism, is an important issue that requires national and global attention. A recent climate change response strategy report by the government of Kenya pointed out that in Kenya, tourism is one of the most vulnerable sectors. Others include agriculture, infrastructure, health, and natural resources especially biodiversity (GoK, 2010), all of which affect tourism in varying degrees. More frequent and severe floods and droughts, rising temperatures (1^{0}C or 15% rise between 1960 and 2003), declines in annual rainfall, rising sea levels, and reduced water availability are already a reality (Mutimba *et al.*, 2010).

Kenya has made several strides in addressing climate change issues. First, the country ratified the UNFCCC on 30th August 1994, thereby signifying her determination to join the international community in combating the problem of climate change. In addition, the country submitted to the UNFCCC its first National Communication in 2002, and is in the process of preparing the second (GoK, 2002). The National Communication provides information on national circumstances, vulnerability assessment, financial resources and transfer of technology, and education, training and public awareness essential in planning to reduce emissions and mitigate and adapt against climate change. In addition, in 2010, Kenya published a countrywide climate change response strategy detailing how the country endeavours to respond to the impacts of climate change in major sectors of the economy (GoK, 2010). The country has also recently developed the National Climate Change Action Plan 2013-2017.

2.9: Social injustice of the impacts of climate change

One of the central questions in climate change debates concerns fair burden-sharing, i.e. justice in the distribution of costs of undertaking climate-managing policies. This has been perceived to be very important since the world is governed by a complex mosaic of geopolitical rivalries, competition for markets and resources. Climate change tends to upset the existing fragile social balance between the haves and have-nots. It must therefore, be evaluated not merely as an environmental issue, but as a matter of social justice (Grasso, 2007). Several studies have explored this view (Tol *et al.*, 2004; Grasso, 2007; Hope, 2009; Kumssa and Jones, 2010; Duus-Otterstrom and Jagers, 2012). Though the poorer countries, and within these, the poorest people, face the most dire, even catastrophic consequences, paradoxically, they are the least responsible for climate change as they emit the least amount of GHGs (Tol *et al.*, 2004; Kumssa and Jones, 2010). Less than 3% of the world's total emissions of greenhouse gases emanate from the African continent (Hope, 2009). They are also the ones unable to cope with these consequences (Kumssa and Jones, 2010).

On the other hand, industrialized countries who are currently the least affected by climate change are historically the biggest emitters of GHGs (Hamilton *et al.*, 2005b). They are responsible for approximately 7 out of every 10 tonnes of CO_2 that have been emitted since the start of the industrial era (Hope, 2009). This has been intrinsic to the unsustainable ways of growth, production and consumption that they have pursued over the years. In the course of their industrial development and the relentless pursuit of affluence and a lifestyle of excessive consumption, the developed countries and their

transnational corporations have not only exploited and used a disproportionately large share of natural resources around the world, but have appropriated a grossly disproportionate share of the global atmospheric space, which is a common resource that is to be equitably shared by all (Duus-Otterstrom and Jagers, 2012). Therefore, the developed countries have left hardly any environmental space for the developmental needs of the rest of the world and hence they owe the rest of the world a climate debt. This climate debt is twofold; first, for overusing and substantially diminishing the Earth's capacity to absorb GHGs; and second, for the adverse effects of these emissions (Grasso, 2007). Consequently, the global community must be prepared to analyse the new set of burden-sharing equation (Duus-Otterstrom and Jagers 2012).

Justice and equity should play a major role in favouring collective action against climate change, because the more the various dimensions of such action are just, the more any international climate initiative is feasible in principle (Grasso, 2007). Unless the current skewed global production and consumption patterns are changed, the development needs of the developing countries are likely to be compromised by the imposition of unilateral environmental standards on them (Duus-Otterstrom and Jagers, 2012). The ecological injustice, the persistent global poverty and resource over consumption are very much a moral challenge and not simply an economic and environmental issue. Any efforts to curb climate change should be fair and equitable and must reflect on historical responsibility (Tol *et al.,* 2004; Kumssa and Jones, 2010) and capability in order to achieve 'a just and cohesive society enjoying equitable social

development in a clean and secure environment' as stipulated in Kenya Vision 2030 (GoK, 2008).

The nature of the environmental issues tackled by international forums has increasingly shifted to issues of global common property (ozone) and climate change (Scott and Becken, 2010). Emphasize has been placed on the need to link environmental and development objectives, the need for more financial and technological resources to support environmental programmes in developing countries, the need for capacity building for both negotiating and implementation and the need for longer time horizons for the implementation of new regulations (Kumssa and Jones, 2010).

2.10: Climate change policy

The Kyoto Protocol that came into force in 2005, was the first major step in international climate negotiations. The Protocol legally bound industrialized countries to emissions cuts. Through the introduction of the Kyoto Protocol, developed countries found it cheaper to buy carbon credits elsewhere than cut emissions at home (Scott and Becken, 2010). The developing countries on the other hand, saw carbon credits as a means of earning income despite the fact that it would limit their future growth options (Kumssa and Jones, 2010).

Currently, both emission cuts and funding have not been very successful. Instead of being supplemental to domestic efforts, carbon trading is being used as the main means of meeting emission reduction targets and carbon credits have become a profitable

commodity to be traded in the market. Meanwhile, emissions in the industrialized countries have been actually increasing (Spash, 2010; Goosling *et al.,* 2012).

Historically, very little financing for adaptation has been directed toward the African region (Kumssa and Jones, 2010). Only 2 percent of projects under Clean Development Mechanism (CDM), the main carbon market resulting from the Kyoto Protocol, are in Africa, and if South Africa is excluded, only 0.6 percent of these are in Sub-Sahara Africa. Africa is not considered dirty enough, or to consume enough to compete successfully for carbon trading. Although CDM has encouraged conservation of natural forests, concerns have been raised in cases where it has encouraged introduction of exotic plantations with consequential effects on biodiversity and hence tourism (Spash, 2010; Goosling *et al.,* 2012). In addition the schemes have been accused of having undesirable ethical and psychological impacts and to crowd out voluntary actions (Spash, 2010).

Over the years, the industrialized countries have sought to impose a new global agreement which would allow them to set their own targets and rules. The Copenhagen Accord, recognized the need to limit global temperature rise to 2°C but required no binding commitments nor aggregate targets for emissions reductions to achieve this goal (Scott and Becken, 2010; Kumssa and Jones, 2010). They emphasized on voluntary cuts with each country setting its own targets. The rich countries have been pressuring developing countries to 'associate themselves with the accord'. Several developing countries have submitted their proposed emission cuts (Kumssa and Jones, 2010).

The tourism sector has an important place in climate change debate, given its global social and economic value, its role in sustainable development and its strong relationships with climate (Simpson *et al.,* 2008). During recent conventions, tourism has been represented through the UNWTO (Scott and Becken, 2010). The topics discussed mainly relate to equity and development, deforestation, adaptation and integration across agencies and targets for emission reduction. All these issues are relevant for tourism. It is insisted that developed countries must be responsible for reduction in GHG emissions and adequate financing and technology transferred to developing countries for adaptation. On the other hand, climate change mitigation must not reduce the developing countries' opportunities for economic growth. However, the discussion largely centers on climate policies that may result in reduced travel and are therefore potentially counterproductive to tourism development, and by implication, the growth of the economies of the developing countries (Becken, 2008).

Over the last decade, response of the global tourism industry to the challenge of climate change has considerably increased. The First International Conference on Climate Change and Tourism took place in Djerba in 2003, hosted by UNWTO, together with World Meteorological Organization (WMO), and the Government of Tunisia (Scott and Becken, 2010). The conference offered an opportunity for scientists to exchange views on the opportunities, consequences, and risks presented to the tourism sector as a result of climate change.

Discussions aimed at developing awareness among tourism stakeholders, highlighting both current and anticipated climate change impacts affecting tourism destinations and the need to carefully consider the consequences of climate change mitigation policies (Simpson *et al.*, 2008, UNWTO, 2007a). The Second International Conference on Climate Change and Tourism, was held in Davos, Switzerland, in 2007. The event built on the results of the Djerba conference and came up with four urgent issues that tourism needs to address (Scott and Becken, 2010). It was decided that tourism needs to mitigate GHG emissions, adapt to climatic changes, improve use of technology and secure financial support to help developing countries (Becken, 2008, UNWTO, 2007a; Kumssa and Jones, 2010).

Nations with tourism dependant economies are becoming increasingly concerned about the inclusion of aviation in greenhouse gas mitigation policy for international bunker fuels and more recently adaptation policy proposals. For example there have been concerns that international climate policy will negatively affect the tourism economy. In response to the European Union's announcement that aviation would be incorporated into its Emissions Trading System, many nations have aired their concerns about the possible effects on long haul, often tourism-dependent destinations (Scott and Becken, 2010). The central concern is that such policies will increase the cost of traveling by air, therefore reducing visitor arrivals.

It is encouraging though that several tourism conventions such as the London Conclusions of 2007 and the Kuala Lumpur declaration of 2011 on climate change and

tourism have emphasized the need to address climate change without losing sight of other priorities, especially poverty alleviation and tourism contribution to the Millennium Development Goals (UNWTO, 2007b; UNWTO, 2011). Such conventions have further emphasized that there should be no discrimination against developing countries by creating obstacles to their economic development; and financial resources should be secured for those especially vulnerable to climate change. In addition, the London Conclusions stated that the tourism sector should not be disadvantaged through the imposition of a disproportionate burden either on tourism as a whole or on vital components such as aviation (UNWTO, 2007b).

In general, most of these conventions have provided a common platform for climate negotiations. However, as discussed earlier, most have been criticized for their generic nature and lack of clear emission targets. In addition, climate change has the potential to have an adverse effect on the global economy and consequently pose a security risk in some regions. Climate change is considered a national and international security risk that will steadily intensify, particularly under greater warming scenarios (Kumssa and Jones, 2010).

2.11 Response to climate change and variations

Responses designed to reduce climate change risks fall into two categories: *mitigation* and *adaptation*. Mitigation is defined by the IPCC as 'anthropogenic intervention to reduce the sources or enhance the sinks of GHG', while adaptation is the **'**adjustment in natural or human systems in response to actual or expected climatic stimuli or their

effects, which moderates harm or exploits beneficial opportunities' (Klein *et al.*, 2007: 750). Consequently, mitigation has global benefits and will reduce climate-related risks only in the longer-term. On the other hand, adaptation typically works on the scale of an impacted system and such measures would be effective immediately and yield benefits by reducing current and future vulnerability to climate change and variability (Klein *et al.*, 2007; Jopp *et al.*, 2011).

2.11.1: Vulnerability

Many geophysical, biological and social systems are at risk from climate change. Over the recent past, policy-makers and the scientific community have increasingly turned their attention from climate change impacts to vulnerabilities (Patt *et al.*, 2009; Jopp *et al.*, 2011). The IPCC concentrates on vulnerability assessment in its third and fourth assessment reports (McCarthy *et al.*, 2001; IPCC, 2007). The fourth assessment report defines vulnerability as

> *… the degree to which geophysical, biological and socio-economic systems are susceptible to, and unable to cope with, adverse impacts of climate change* (Schneider *et al.*, 2007: 783).

Currently, vulnerability debate has been at the heart of climate change research (Schneider *et al.*, 2007; Moreno and Becken, 2009; Jopp *et al.*, 2010). The concept of vulnerability has been applied in many disciplines such as geography, water, risk-hazard, ecology, health and food systems (Sullivan *et al.*, 2005).

The IPCC report states that vulnerability is a function of the character, magnitude and rate of climate change and variation to which a system is exposed, as well as the

sensitivity and adaptive capacity of that system (Parry *et al.*, 2007; Patt *et al.*, 2009). Jopp *et al.,* (2010) further states that although vulnerability is often discussed in relation to biophysical impacts, such as sea-level rise, flooding or coastal erosion, it is important that socio-economic impacts are also considered. For example, what is the likely effect of climate change-induced impacts on destination appeal, tourist numbers, seasonality and cost of travel? Several studies have found that certain destinations will be more vulnerable to climate change risks than others. Systems that are highly exposed to climate change impacts, sensitive to their impacts, and less able to adapt are consequently more vulnerable (Moreno and Becken, 2009; Jopp *et al.*, 2010), as shown in Figure 2.12.

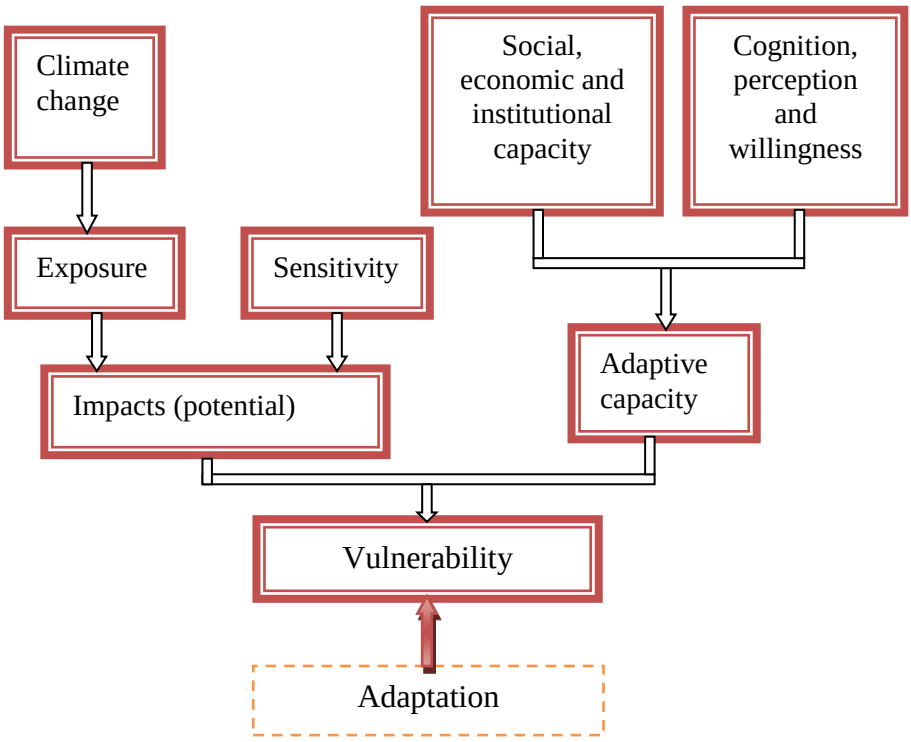

Figure 2.12: Vulnerability to climate change as a function of exposure, sensitivity and adaptive capacity
Source: Schneider *et al.(*2007*).*

The figure is in line with several studies (Schneider *et al.*, 2007; Jopp *et al.*, 2010) that have concluded that the vulnerability of a system such as tourism to climate change is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, the sensitivity and adaptive capacity of that system (IPCC, 2007). In other words, human and natural systems are viewed as intimately coupled, and differentially exposed, sensitive, and adaptable to threats (Polsky *et al.*, 2007).

However, as Polsky *et al.* (2007) points out that, exposure, sensitivity and adaptive capacity are not perfectly separable and need to be negotiated depending on the context of analysis. The authors further expounds that:

(a) Exposure to the weather or climate-related hazard, includes the character, magnitude and rate of climate variation. An impact describes a specific change in a system caused by its exposure to climate change.

(b) Sensitivity is the degree to which tourism is affected, either adversely or beneficially, by *climate variability* or change. Both exposure and sensitivity determines the current and future climate change.

(c) Adaptive capacity describes the general ability of institutions, systems and individuals in the tourism industry to adjust to potential damages, to take advantage of opportunities and to cope with the consequences. It encompasses the strategies, policies and measures that have the potential to expand future coping capacity. Adaptive capacity is dependent on the social, economic and institutional capacity as well as the perception and willingness of the stakeholders to adapt. ***Adaptation***

baselines are the adaptation measures and actions in place in a region or community to reduce the burden of a particular health outcome. ***Coping capacity*** include the adaptation strategies, polices and measures that could be implemented now. Specific adaptation plans arise from a region or community's coping capacity. Adaptation can be anticipatory (actions taken in advance of climate change effects) or responsive and can encompass both spontaneous responses to climate variability and change by affected individuals and planned responses by governments or other institutions.

Further, as shown in Figure 2.13, Vulnerability to present and future global change is highly dependent on the initial situation (Jopp *et al.,* 2010). The adaptive capacity of the system determines the future potential impacts which could be either avoidable or unavoidable. For the sake of determination of vulnerability, it will be viewed as the residual impacts of climate change after implementation of adaptation measures (McCarthy *et al.*, 2001).

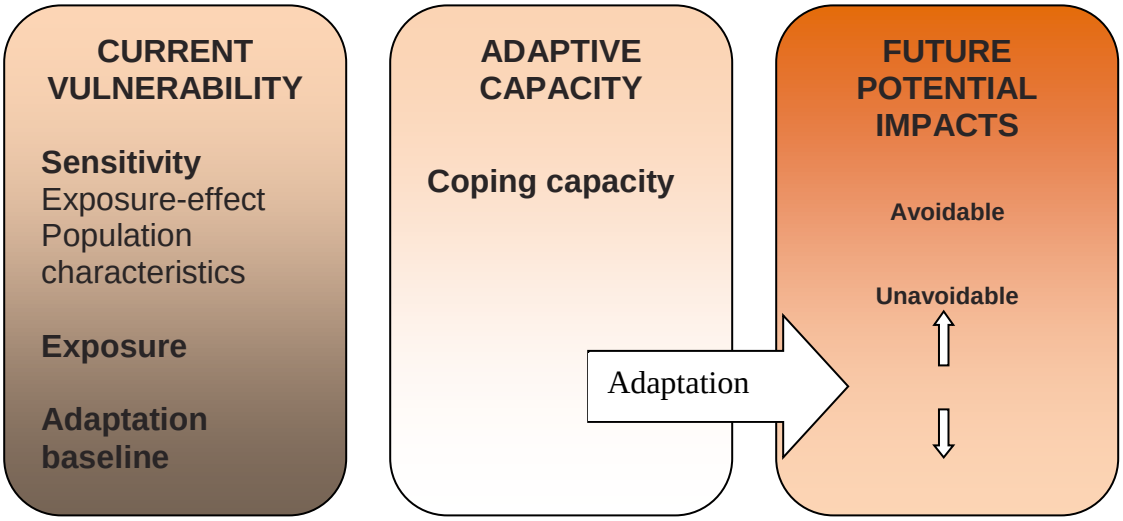

Figure 2.13: The relationships between vulnerability, adaptive capacity and potential impacts
Source: WHO, 2003

2.11.2: Adaptation

IPCC fourth assessment report defines adaptation as

> *…adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities* (IPCC, 2007b:869).

According to Boko *et al.* (2007), adaptation occurs in physical, ecological and human systems involving changes in social and environmental processes, perceptions of climate risk, practices and functions to reduce potential damages or to realize new opportunities. It takes place through adjustments to reduce vulnerability or enhance resilience in response to observed or expected changes in climate and associated extreme weather events. Historically, adaptation to climate change has received less attention than mitigation. This was mainly because prevention was seen as better than a cure, and the effects of mitigation are more measurable than adaptation. However,

currently, adaptation is seen as necessary and complementary to mitigation efforts (Jopp *et al.,* 2010). It is the principal way to deal with the unavoidable consequences of climate change in the short term. Adaptation is a mechanism to manage risks, adjust economic activity to reduce vulnerability, and to improve business certainty.

Unlike mitigation efforts, where the benefits will be felt globally, adaptation benefits come to those that bear the cost. This means adaptation primarily benefits local communities through targeted responses to local or regional climate change issues. Therefore, adaptation is best implemented at the regional/local destination level, as this is where both the costs are usually incurred and the benefits largely felt (Simpson *et al.,* 2008; Jopp *et al.,* 2010). Societies adapt to both observed and expected climate change through anticipatory and reactive actions. However, many societies especially in developing countries still remain vulnerable to present-day climatic risks, which may be exacerbated by future climate change (GoK, 2013). Kenya has prioritized adaptation through mainstreaming such plans in national policies and developing the National Climate Change Response Strategy (NCCRS) and the National Climate Change Action Plan 2013-2017 (NCCAP).

In the tourism context, climate change adaptation can be defined as a process whereby governments, business, and civil society aim to moderate, cope with, and benefit from the consequences of climate change in order to manage risk and reduce vulnerability (Jopp *et al.,* 2010). Although some governments such has Kenya have given prominence to tourism in their climate change plans (GoK, 2010; Gov, 2013), generally

the tourism sector has often been overlooked by governments and policy makers when examining adaptation options, with sectors such as agriculture and water receiving more attention (Scott *et al.,* 2009; Goosling *et al.,* 2012). Therefore, knowledge of appropriate climate change adaptations for tourism is very limited. Some researchers state that adaptation research in the tourism-recreation sector is 5-7 years behind that of other sectors that have been actively engaged in adaptation research (Scott *et al.*, 2009).

There is a need to further incorporate adaptation planning into decision-making throughout the tourism industry, and a real need for effective communication between the climate change science community and tourism operators at the regional and local scale (Scott *et al.,* 2008; Jopp *et al.,* 2010). It is essential to emphasize that regardless of the nature and magnitude of climate change impacts, all tourism businesses and destinations will need to adapt to climate change in order to minimize associated risks and capitalize upon new opportunities, in an economically, socially and environmentally sustainable manner.

2.11.3: Tourism adaptive capacity

Adaptive capacity in the tourism context can be defined as the ability or potential of a tourism system to respond successfully to climate variability and change, which includes adjustment to behaviour, resource and technology use (Simpson *et al.*, 2008). It varies with different stakeholders such as tourists, tourism businesses, attractions and destinations (Becken & Hay, 2007).

It involves changing processes, practices or structures, either automatic or planned, by individuals, households, governments and other stakeholders. It is now recognized that regardless of mitigation efforts, there is an inevitable need for societies around the world to adapt to unavoidable changes in climate (IPCC, 2007b) hence there is urgent need for vulnerability and adaptation assessment.

Tourism has shown great propensity for adaptation to shocks and hazards, which is evidenced by its ability to cope with a variety of recent pressures such as terrorism, disease outbreaks, tsunamis, and political upheavals. (DeLacy, 2009). Tourism operators have also adapted to provide tourism services in every climatic zone on the planet from deserts and tropics to the high mountains and polar regions. However, the capacity to adapt to climate change varies substantially between regions, destinations, sub-sectors , and individual businesses within the tourism industry (Scott *et al.,* 2008; Jopp *et al.,* 2010). While individual adaptation will be dependent on personal knowledge and values, a destinational adaptation approach is more complex due to the large number the stakeholders involved.

2.11.4: Types of adaptation in tourism

Understanding the implications of climate change for tourism, both good and bad, is necessary to gain a complete picture of possible impacts and plan accordingly (Scott and Lemieux, 2011). Most studies confirm that the potential negative impacts of climate change for the tourism sector clearly outweigh the positives (Simpson *et al.,* 2008). Table 2.5 shows these types of adaptation what they involve, requirements and some examples.

Table 2.5: Adaptation types in tourism

Adaptation type	**What does it involve?**	**What does it require?**	**Examples?**
Technical adaptation	This involves utilizing technology and being innovative in order to determine methods of coping with climate change and vulnerability.	This often requires specialised equipment and/or the use of new technologies and innovations. Also, due to the cost and complexities of many technical adaptation options, this type of adaptation often requires government backing.	Desalination plants or alternative energy sources.
Business management adaptation	Involves techniques used by tourism operators, regional governments, and tourism industry associations to reduce vulnerability to climate change.	This may require destination managers to change their marketing approach to try and increase or decrease travel during certain times, and/ or redirect tourists to different locations, or encourage them to engage in different activities.	Marketing techniques such as new pricing strategies, product/ market diversification, and positioning can all be utilised.
Behavioural adaptation	This form of adaptation is normally associated with the tourist, as they have the ability to decide on the tourism activities they engage in and where and when they do so. This ability for spatial, temporal, and activity substitution subsequently provide tourists with substantial adaptive capacity.	Although behavioural adaptation is generally undertaken by the tourist, there are some strategies that destination managers can use to affect behaviour. This can be achieved by using the previous two types of adaptation (technical and business management) to manipulate the behavior of tourists.	Adjusting the type of clothing worn, changing the activities engaged in, adjusting the timing of the visit, changing the destination altogether.

Source: adapted from Jopp et al. (2010)

It is important for destination managers to identify any opportunities brought about by climate change. Moreover, a negative impact in one part of the tourism system may constitute an opportunity elsewhere (Simpson *et al.,* 2008; Scott and Lemieux, 2011). For example, a decrease in long haul flights from the UK to Kenya, due to emissions concerns, may be offset by an increase in Kenyan domestic travel.

A number of studies on adaptation options in the tourism sector are evident (IPCC, 2007b; Scott & Simpson, 2008; Scott *et al.,* 2008; Jopp *et al.,* 2010). Three major types of adaptation for tourism stand out - technical, business management and behavioural. Technical involves use of technology and innovation to respond to the impacts of climate change. Business management involves changes in operations and marketing to reduce seasonality and reduce other vulnerability. Behavioural adaptation involves tourists' spatial, temporal, and activity substitution; which could be manipulated using technical and business management adaptation.

It is important to note that climate adaptations by each of the major actor groups in the tourism sector are not taken in isolation as a single discrete action. In order to place adaptation within a sustainable development context, a cooperative approach to adaptation is required, which would normally involve various stakeholders and often include multiple adaptation strategies (Jopp *et al.,* 2010).

2.11.5: Adaptive capacity in tourism

Tourists have the greatest adaptive capacity (depending on three key resources: money, knowledge and time) with relative freedom to avoid destinations impacted by climate change or shifting the timing of travel to avoid unfavourable climate conditions even at very short notice (Gossling *et al.*, 2012). Generally, tourists have considerable choice concerning whether or not to participate, where to go, what activities to participate in, and when to travel. Suppliers of tourism services and tourism operators at specific destinations have less adaptive capacity. Large, who do not own the infrastructure, are in a better position to adapt to changes at destinations, because they can respond to clients demands and provide information to influence clients' travel choices. Destination communities and tourism operators (such as hoteliers) with large investment in immobile capital assets (e.g., hotel, resort complex, marina or casino) have the least adaptive capacity, as shown in Figure 2.14. (UNWTO, 2007a) since they are fixed in location with sunk capital that cannot readily be liquidated and re-invested.

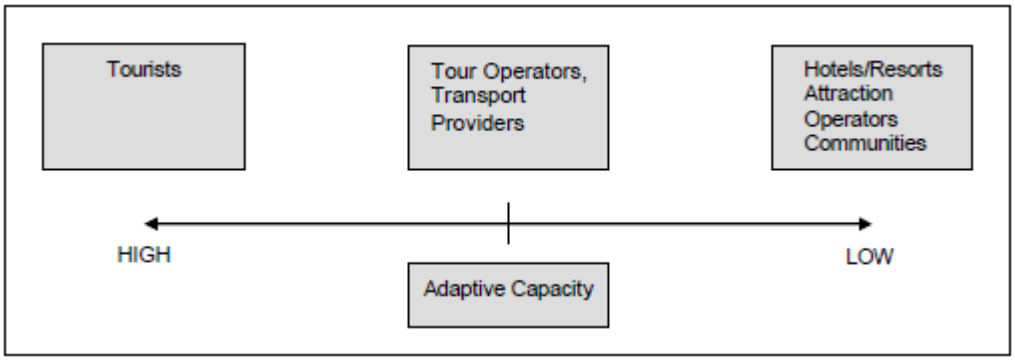

Figure 2.14: Relative adaptive capacity of the tourism stakeholders
Source: UNWTO-UNEP-WMO (2008)

A destination's ability to be proactive and make well-informed, long-term decisions is essential in the development and implementation of appropriate adaptation strategies that reduce a destination's vulnerability (Jopp *et al.,* 2010). Therefore, understanding tourist perceptions and reactions to the impacts of climate change is essential to anticipating the potential geographic and seasonal shifts in tourism demand, as well as the decline or increase of specific tourism markets. (Hamilton *et al.,* 2005a; UNWTO, 2008 Gossling *et al.,* 2012). This is more so important because impacts are determined by climate change at two different sites, that is, in the countries of origin as well as the destination countries.

It is important to note that adaptation is not acceptance of climate change. Rather, it provides urgent relief from the actual impacts of climate change that is evident in the vulnerable areas until global mitigation efforts are sufficiently developed. Adaptation can significantly reduce many potentially dangerous impacts of climate change and reduce the risk of any key vulnerability.

2.11.6: Vulnerability and adaptation assessment

Before destination adaptation strategies can be developed, a vulnerability assessment of the destination to climate change risks needs to be undertaken that investigates both biophysical and socio-economic implications (Jopp *et al.,* 2010).

Most studies analyze vulnerability from the demand side (Dubois *et al.,* 2009) (Hamilton, *et al.,* 2005b). However, a complete analysis should be done on both demand and supply side (Richardson and Witkowski, 2010) as shown in Figure 2.15.

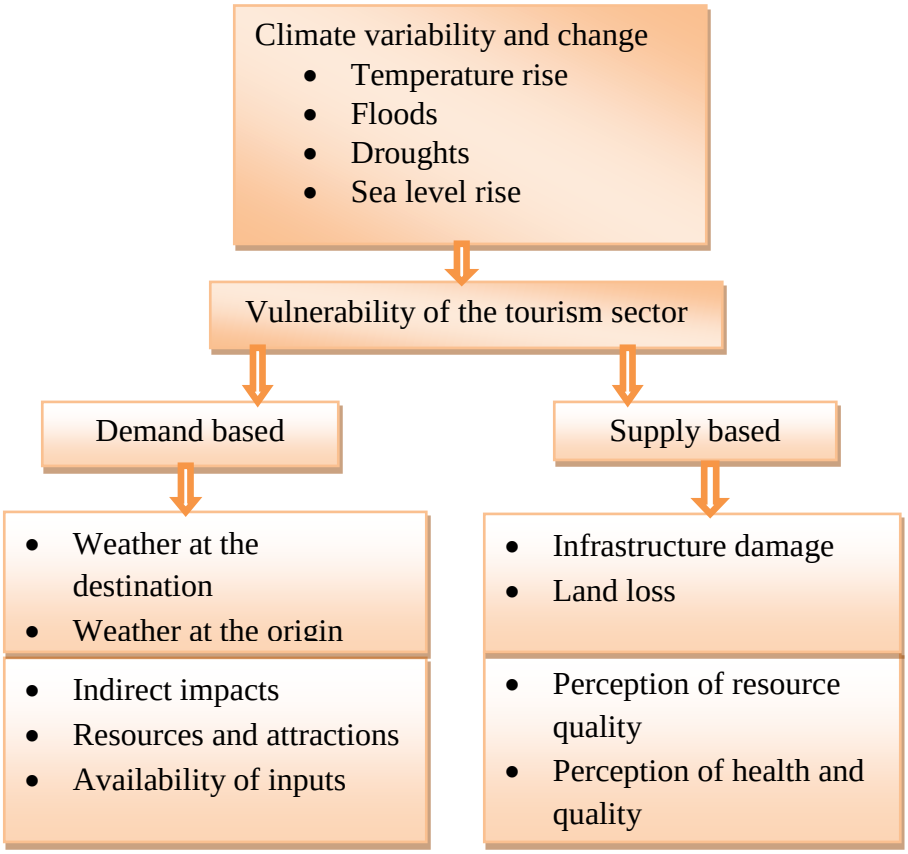

Figure 2.15: Conceptual framework for assessment of vulnerability of tourism to climate change.
Source: Richardson and Witkowski, 2010

Vulnerability assessments are crucial to understand vulnerability as well as adaptive capacity and resilience on which the development of adaptation strategies, policies and measures are based. Even in North America, which is one of the better studied regions, substantial knowledge gaps exist. For example, Field *et al.* (2007: 634) notes that,

> *Although coastal zones are among the most important recreation resources in North America, the vulnerability of key tourism areas to sea-level rise has not been comprehensively assessed.*

Such assessment is extremely significant for policy makers and industry stakeholders as it can provide increased understanding of the relative vulnerabilities of destinations and attractions to climate change.

Source: adapted from (Richardson & Witkowski, 2010)

The sources of vulnerability of climate change on tourism are based on the rise of temperatures, flooding, droughts, sea level rise and related impacts. Impacts are categorized as either direct or indirect, depending on whether they affect tourism product itself or indirectly on tourism support products. These impacts affect tourism both on the supply and demand side. Supply side relates to impacts on production of tourism product such as quality and availability of tourism resources, activities, infrastructure and services and land loss. The vulnerability of infrastructure relates to transportation systems (for example port, airport, highways), telecommunications, and tourism-related business (e.g., hotels, restaurants, tour operators). The vulnerability of land loss relates to the risks of flooding, inundation, and erosion, which has significant implications for islands and coastal areas. Indirect sources of supply-based vulnerability include impacts to resources (e.g., coral reef, beaches, forests, wildlife), attractions (e.g., natural, manufactured), and the availability of inputs (e.g., accommodations, food, beverages, labor) (Richardson & Witkowski, 2010).

On the other hand, vulnerability of the demand for tourism services relates to the consumption of tourism services such as tourist perceptions of weather, resources, amenities, or costs. This may be directly affected by weather in the host country as well

as the country of origin (Hamilton *et al.,* 2005a; Dubois *et al.,* 2009; Gossling *et al.,* 2012;). Research has shown that rising temperatures and changes in precipitation in the host country may affect visitor preferences and the overall comfort and enjoyment of activities (Jopp *et al.,* 2010). For example warmer temperatures in the high attitude areas may reduce demand for trips to low attitude areas. Indirect sources of demand-based vulnerability include tourist perceptions of the quality of resources (e.g., coral reefs, beaches, wildlife, other natural resources) as well as perceptions about health and safety conditions (e.g., risk of vector-borne diseases, tropical cyclones) (Richardson & Witkowski, 2010). Demand may also be influenced by rising costs of transportation, attractions, accommodations, and food, particularly if mitigation measures include emissions charges.

Approaches to vulnerability assessment

Approaches to vulnerability assessment have been developed over the past several decades in the fields of natural hazards, food security, poverty analysis, sustainable livelihoods and related areas (Patt *et al.,* 2009). Methodologies and theories of vulnerability assessment in tourism are limited and mostly address demand side. Most early impact and adaptation studies used 'top-down' approach where global climate projections were downscaled regionally. However these have been criticized for treating adaptation as a residual at the end of analysis and for over-simplifying the role of adaptation in responding to multiple stresses (Becken, 2009). Other studies ignore adaptation altogether, hence exaggerating the impacts of climate change. These approaches tend use Global Circulation Models (GCM) and Regional Circulation

Models (RCM), which gives an assessment of vulnerability for a time period in the future (Sullivan *et al*., 2009).

An alternative approach that focuses on social vulnerability is characterized as a "bottom-up" approach whereby the unit of study is local, and the temporal scale tends to be more immediate and near term than in top-down approaches as decision-making on adaptation must address both current and future vulnerabilities and actions (Carter and Mäkinen, 2011). Consequently, vulnerability to climate is addressed largely as a problem of climate variability now.

The great majority of assessments that follow this approach are found in developing countries, where vulnerability to present-day climatic variability is commonly perceived to be more of a threat than long-term climate change. This approach offers opportunities for integrating climate change considerations into existing decision-making and management contexts (Carter and Mäkinen, 2011). Application of this approach has not been explored in developing countries where most climate change impacts are more evident, as shown in Figure 2.16.

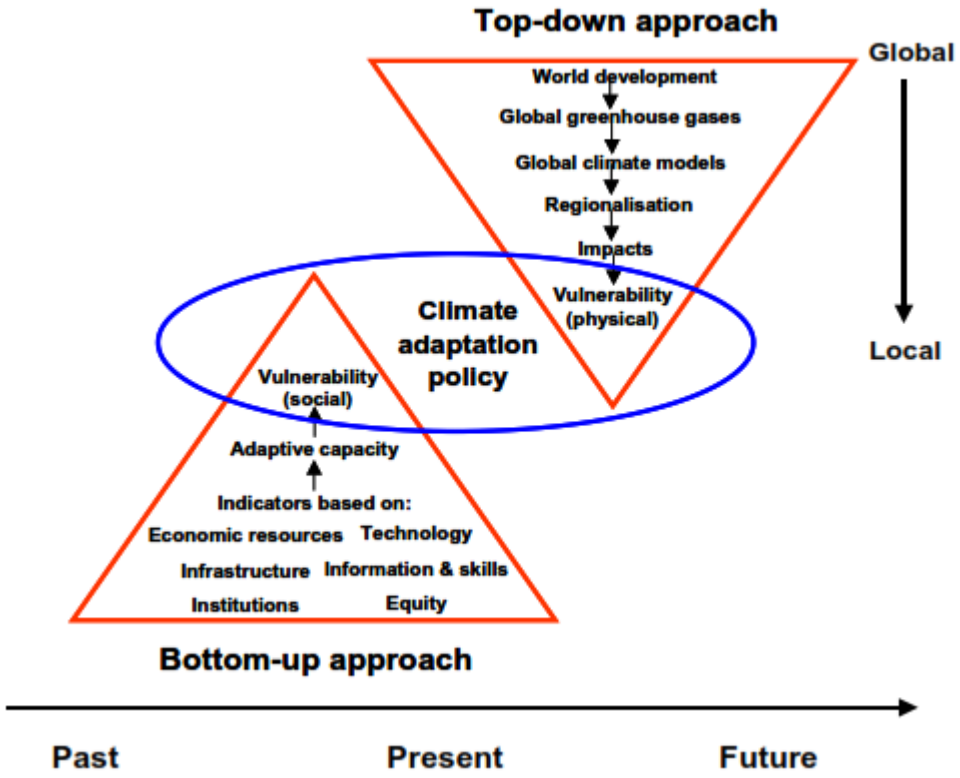

Figure 2.16: Top-down and bottom-up approaches for addressing climate adaptation policy
Source: Carter and Mäkinen (2011).

2.11.7: Tools for vulnerability assessment

Some assessment studies have incorporated climate into tourism demand models to study the effects of climate change (Maddison, 2001). These are based on the assumption that temperature is the most important component shaping tourist movements. Other studies (Amelung *et al.*, 2007; Amelung and Viner, 2006) have used more elaborate tourism climate indices. These climate indices, which usually incorporate several weather parameters such as temperature, precipitation and wind, attempt to reflect destinations' climate suitability for tourism, using greater temporal

and spatial detail. The main disadvantage of these approaches is the limited application to other forms of tourism besides sightseeing.

One of the most commonly used tool for vulnerability assessment is the Climate Vulnerability Index (CVI). For example, Sullivan *et al.* (2009) uses the CVI to evaluate vulnerability of water resources to climate change. CVI is a holistic approach which integrates the physical, social, economic and environmental issues.

Polsky *et al.* (2007) has developed the Vulnerability Scoping Diagram (VSD) as a tool for visualization and comparison between different vulnerability assessments. The diagram is composed of three layers: the innermost layer relates to the three fundamental dimensions of vulnerability, namely exposure, sensitivity and adaptive capacity. The next layer specifies the components of each vulnerability dimensions, i.e. the "abstract characteristics" that typify the dimensions on which to evaluate each of the three vulnerability dimensions for a given system. Finally, the outer ring shows the indicators, or the observable characteristics that are used to measure the components. The VSD is an important tool in providing a starting point for understanding the details of vulnerability in a single exposure unit, as shown in Figure 2.17.

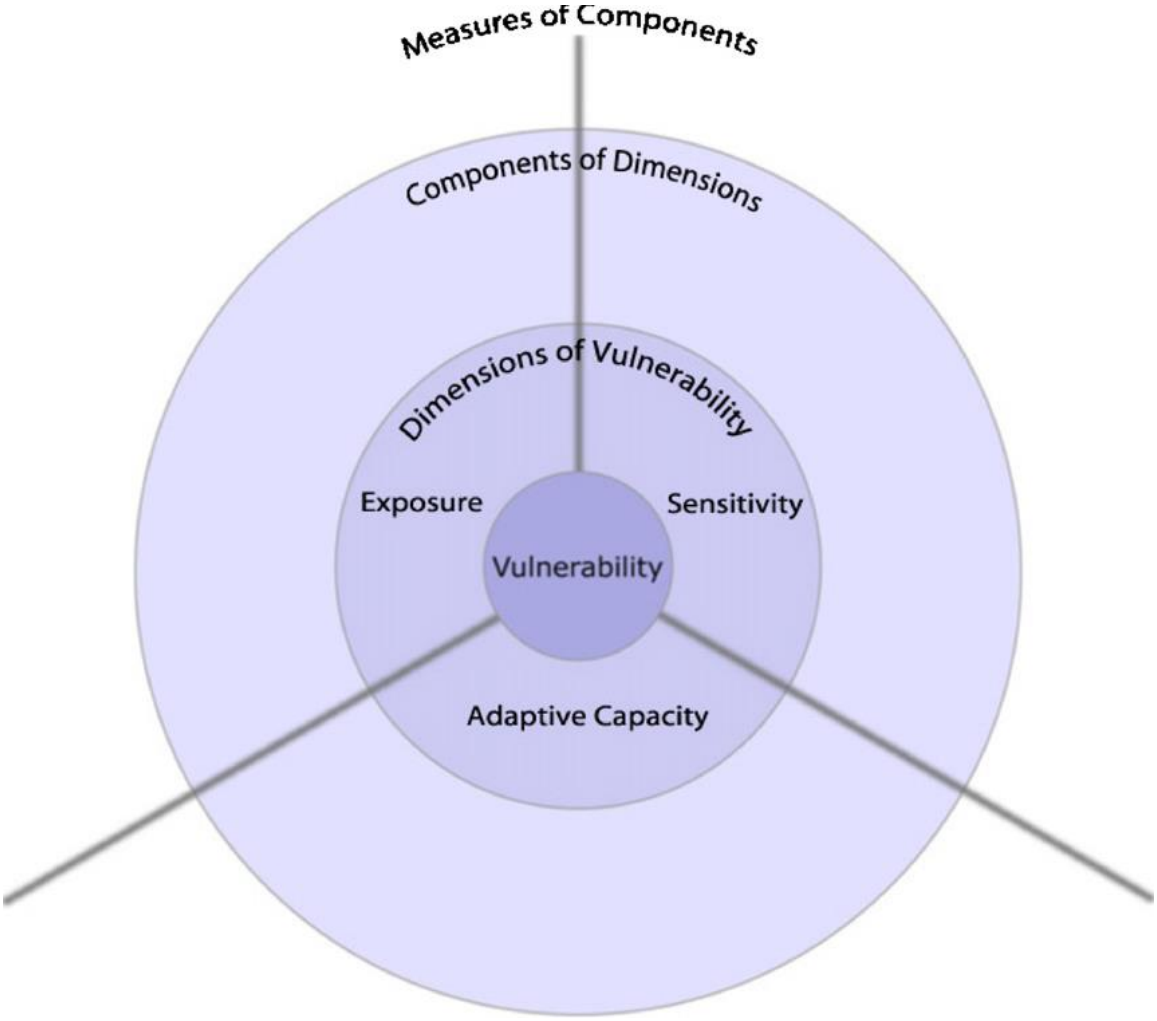

Figure 2.17: General form of the VSD (Hazard & Exposure Unit Unspecified)
Source: Polsky et al. (2007)

2.11.8: Methodology for vulnerability assessment

Many researchers have analyzed vulnerability of tourism to climate change using a variety of methodologies. However, according to Moreno and Becken (2009), there has been no consistency on use of these methodologies. They further identify a lack of generally accepted guidelines to assess a tourism destination's vulnerability to climate change and propose a methodology for assessing the vulnerability of coastal tourism areas to climate change. The methodology involves a five-stage process to vulnerability

assessment, involve: (1) system analysis, (2) identification of activity and hazard sub-systems, (3) vulnerability for the different sub-systems at risk, (4) integration for the destination as a whole and scenario analysis, and (5) communication (Moreno and Becken, 2009; Jopp *et al.*, 2010).

Jopp *et al.* (2010), suggests a methodology of assessment of vulnerability of climate change on tourism that involves three main steps, which are: defining the tourism system; establishing the risks and opportunities and determining the adaptive capacity of the destination. According to the authors, tourism is a highly diverse and complex sector, involving many stakeholders, and therefore a clear understanding of the system is important. After an analysis of the system, key risks, opportunities and the adaptive capacity of the destination are determined.

The IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations (Carter *et al.*, 1994) provides guidance to countries that wish to assess their vulnerabilities to climate change. The UNEP Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies (Feenstra *et al.*, 1998) further elaborates the IPCC Guidelines. These methodologies require a lot of data input that is not available in most developing countries.

A more elaborative assessment is IPCC's framework for the identification and assessment of key vulnerabilities that has identified a number of climate change impacts, vulnerabilities and risks that merit particular attention by policy-makers due to

their unique characteristics that might make them '*key*' (Schneider *et al.*, 2007). A focus on key vulnerabilities is meant to help policy-makers and stakeholders assess the level of risk and design pertinent response strategies. A key vulnerability has the potential for significant adverse affects on both natural and human systems. Tourism is one of the systems that may be *adversely* affected by climate change, sometimes resulting into serious and/or irreversible consequences (Schneider *et al.*, 2007), for example, in natural and cultural attractions. The report identifies seven criteria from literature that may be used to identify key vulnerabilities which are: magnitude of impacts; timing of impacts; persistence and reversibility of impacts; likelihood (estimates of uncertainty) of impacts and vulnerabilities and confidence in those estimates; potential for adaptation; distributional aspects of impacts and vulnerabilities; and importance of the system(s) at risk.

2.12 Theoretical Model

This study is based on a number of theoretical models, which are systems theory, chaos-complexity theory and Integrated Assessment. Tourism is often wrongly characterized as a linear system and has been approached from single disciplines (Becken, 2009). These models fail to capture the true complexity of tourism. However, tourism is a complex phenomenon – involving many different but related players such as tourists, tour operators and local populations who interact with each other at different temporal and spatial scales (Becken, 2009; Hein *et al.*, 2009). Small changes in the climate system might significantly affect the tourism system, both through direct impacts on the physical resources and indirectly through for instance such problems as water

availability. Since inter-dependencies make tourism operations difficult to predict, thinking about tourism as a system provides a holistic view and a better understanding. Due to the inherent interdependence and uncertainty between tourism and climate, more recent research has treated tourism and climate change as complex systems (Becken, 2009).

It is apparent that weather and climate are important elements in the success of tourism destinations. Both tourism and climate operate individually and jointly as open systems that are non-linear and non-deterministic and therefore, it is important to have a clear understanding of the whole tourism system. Defining the tourism system, involves establishing the context of the destination under review, both the supply and demand sides, and determining who the key stakeholders are (Hein *et al.,* 2009). Tourism is a highly complex and diverse sector involving stakeholders from a range of different sub-sectors, which can be sufficiently analyzed using the systems approach. A variety of stakeholders including tourism businesses, public sector organizations, community groups, accommodation providers, transportation providers, those involved in forward and backward linkages to the tourism value chain and tourists themselves form the system (Jopp *et al.,* 2010). Other components of the system include the suppliers, tourism staff, the local community, local, national, and international tour operators and agents, transport systems, and both domestic and international tourists themselves (Hein *et al.,* 2009). A destination adaptation approach will also be complex, due to the complexity of the tourism system and the large number of stakeholders involved in that system (Moreno and Becken, 2009).

In addition, the tourism system is influenced by numerous external factors that may influence all, or part, of the tourism system, including environmental, economic, political, legal, social, cultural, and technological factors. On the other hand, interaction between the tourism system and the climate system adds yet another layer of complexity to destination management (Jopp *et al.*, 2010).

This research, further, uses chaos-complexity model to analyze climate change impacts on tourism. The open and complex nature of these systems mean that it is extremely difficult to predict, manage and control future changes. Therefore, chaos-complexity theory provides an alternative framework for analyzing tourism and climate change relationship. This theory is based on biological models of living systems, which tend to be unstable whereby non-linear relationships are more prevalent and externalities and individual differences are seen as the driving force for variety, adaptation and complexity. New connections and structures are created leading to a different complex order.

Many researchers now conclude that complexity and uncertainty are at the core of the climate change and tourism relationship (Becken, 2009; Amelung *et al.*, 2007). Tourism-climate relationship involves multiple elements interacting at different spatial and temporal scales. To address this complex interaction, Integrated Assessment (IA) offers a holistic methodology to frame and analyze complex problems. In this research, the principles of systems theory, chaos-complexity theory and IA are incorporated by

combining knowledge from different disciplines and research methods ranging from social to natural sciences.

2.13 Key knowledge gaps on climate change and tourism research

Overall, the discussion has shown that while there are various insights to be gained from existing studies, these are also severely limited by geographical, thematic, or socio-cultural focus and methods (Scott *et al.,* 2012; Gossling *et al.,* 2012).

Although uncertainties remain regarding the probabilities and consequences of climate change impacts, it is clear that tourism, which is intrinsically linked with climate and weather, is especially vulnerable. However, there has been little research that focuses specifically on vulnerability of the tourism system (Moreno and Becken, 2009; Jopp *et al.,* 2010). However, there is growing evidence of greater tourism and climate change research. Tourism is given greater emphasis in the IPCC climate change reports and the UNWTO-UNEP-WMO (2008) report. Despite the significant growth in research on tourism and climate change there are considerable gaps in the previously published research regarding the knowledge of climate change adaptation and mitigation.

The ability of the tourism industry to cope with a range of natural and manmade shocks suggests a relatively high adaptive capacity in the sector. However, knowledge of the capacity to cope successfully with future climate regimes and the broader environmental impacts and societal ramifications remains rudimentary (Scott and Becken, 2010). Research has shown that climate change adaptation research remains far less developed than in other economic sectors, with risk appraisals among tourism

operators consistently finding low awareness of climate change and little evidence of strategic planning in anticipation of future changes in climate.

Another major limitation is the geographic scope of research, which has largely focused on tourism in Western countries. Addressing the major gaps on how climate change will affect the natural and cultural resources critical for tourism in Africa (Boko *et al.*, 2007; GoK, 2010), the Caribbean and Pacific Islands, South America and large parts of east Asia must be a priority, considering the relative importance of tourism to the economies of some of these nations. Questions related to the north–south social inequities of climate policy also require greater attention (Scott and Becken, 2010).

Research on tourism's contribution to climate change is still hampered by issues relating to data availability, accessibility and compatibility. Data quality hampers the ability to provide meaningful predictions and scenarios for future developments. On the other hand, methodology used ranges from qualitative in-depth approaches with a few interviewees to broad quantitative surveys with thousands of respondents. A combination of these would be more appropriate (Scott and Becken, 2010) in order to give both detailed attitudinal results as well as analytical figures on the impacts.

Flexibility is crucial to ensure successful adaptation since uncertainty remains regarding future global mitigation and resultant emissions scenarios, as well as likely climate change-induced physical, biological, economic, and social impacts (Scott and Lemieux,

2011). This is even more important in the tourism sector since little is known about the potential response of visitors to climate change impacts.

There have been efforts to encourage tourists to change their behaviours in order to reduce travel-related GHG emissions and hence reduce tourism's carbon footprint. However this area is just starting to be explored by tourism researchers (Scott and Becken, 2010). In addition, policy analysis in relation to climate mitigation and tourism is very rudimentary and at this point does not provide meaningful insight as to which policies might be effective in achieving emissions reductions without undermining tourist activities as such (if this is possible at all).

Tourists have shown a high capacity to alter travel decisions by substituting the timing, place and type of holiday (UNWTO-UNEP-WMO, 2008). Consequently, in order to accurately project future impacts of climate change, information on tourist climate preferences and tourist perceptions of the environmental impacts of global climate change at destinations remain critical. Tourist perceptions of environmental change are particularly important for destinations that are sensitive to climatic change. Part of tourism's vulnerability to climate change depends on how tourists respond to adverse climatic conditions (Jopp *et al.*, 2010). If specific climatic events or changes are likely to severely affect tourist arrivals, satisfaction or safety, this would increase tourism's vulnerability substantially. Information is scarce on how consumers will respond to the environmental and social impacts of climate change; how travellers will react to increased travel costs or knowledge of the climate impacts of their holiday choices or

media campaigns and how factors like proximity to major markets or destination loyalty will influence the climate change vulnerability of destinations (Scott and Becken, 2010).

A growing body of opinion suggests businesses do not engage with research on climate change as these considerations are seen to be outside their time and business management horizons. Though it is evident that tourism businesses heavily rely on the natural climate, some key issues need to be addressed such as:

(a) To what extent do tourism businesses' survival depend on climate?

(b) How do the seasonal patterns of business environment link with climate variability and change?

(c) Which parts of the climate system influence tourism businesses?

(d) What is the extent of that influence?

(e) What extreme events affect tourism businesses and how often do they occur?

(f) What would happen to businesses if the frequency of changed seasons and extreme events were to increase?

(g) How are tourism businesses adapting to the positive and negative climate variability events?

(h) What do such strategies mean economically, socio-culturally and environmentally?

(i) How do tourists perceive such impacts?

(j) What is the likely nature of potential adaptation strategies given the future projections of climate change?

(k) What are the constraints on adaption options in terms of access to relevant information, cost, ability to recognize adaptation options, and to actually adapt?

In particular, research need to address the following questions:

(1) How well can the sector work internally and with other sectors to avoid the loss of attractions and the loss of quality of attractions in order to reduce the cost of adaptation and the cost of replacing tourism capital?

(2) How effectively can the tourism sector recognise new tourism opportunities or new features of existing attractions and communicate these to potential visitors and provide the necessary facilities to ensure a satisfying visitor experience?

This study, therefore, seeks to address some of these gaps on data and information availability by assessing vulnerability and adaptation in a developing nation context, where the impacts of climate change are most evident.

The study constructs a conceptual framework for vulnerability assessment of tourism to climate change which takes into account both supply- and demand-side perspectives. Consequently, the proposed conceptual framework provides a holistic approach to adaptation that aims to increase resilience and resistance to climate change by implementing appropriate adaptation strategies that reduces vulnerability, while increasing readiness to capitalize on opportunities presented by climate change.

CHAPTER THREE: METHODOLOGY

This chapter begins with a description of the research design adopted in this study, with a detailed analysis of the epistemology, theoretical perspective, methodology and methods. The chapter then gives a overview of the location of the study, target population, sampling techniques, the sample size, research instruments, pre-test of research instruments, reliability, data collection techniques, data management and analysis; logistical and ethical considerations and conceptual framework and variables.

3.1: Research Design

Crotty (1998) identifies four key elements that inform each other in the research process to help ensure the soundness of research and make outcomes convincing, and to justify the choice of methodology and methods. This process involves methods, methodologies, theoretical perspective and epistemology, as shown in Figure 3.1. Methods are the techniques or procedures used to gather and analyze data related to some research question or hypothesis. In contrast, a methodology is the strategy, plan of action, process, or design lying behind the choice and use of particular methods and linking the choice and use of methods to the desired outcomes. A methodology can, but not always, be seen to reflect a theoretical perspective: which is the philosophical stance informing the methodology and thus providing a context for the process and grounding its logic and criteria. Finally, informing a theoretical perspective is an epistemology that is, the theory of knowledge embedded in the theoretical perspective and thereby the methodology.

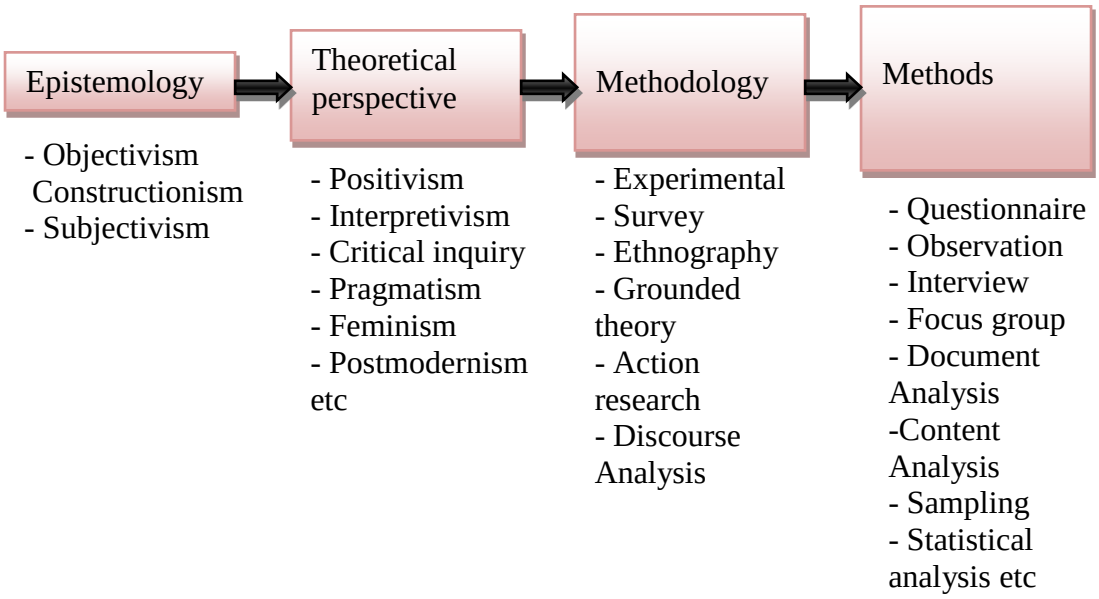

Figure 3.1: Research framework based on epistemology
Source: Adapted from Crotty, 1998

3.1.1: Research Epistemology

Epistemology, according to Crotty (1998:8), is about *how we know what we know*. He further explains that epistemology is concerned with providing a philosophical grounding for deciding what kinds of knowledge are possible and how we can ensure that they are both adequate and legitimate. Epistemology is the theory of knowledge underlying the research. The three epistemological constructs outlined in Crotty's conceptual framework are objectivism, subjectivism and constuctionism.

Objectivists *hold that meaning, and therefore meaningful reality, exists as such apart from the operation of any consciousness* (Crotty 1998:8). In other words, meaning is already inherent within the object being examined and the properties of that object can be measured and quantified. For this reason, objectivism has been used widely in sciences especially experimental methodologies and quantitative methods used in the

natural or physical sciences. An objectivist, for example, would argue that there is truth or reality that exists independent of our consciousness of it and it is up to us to discover the reality. The absolute position of objectivists has been challenged and the claims of objective reality are now more tempered by a degree of probability and the tentativenss of present knowledge and understandings. In addition, humans are limited by underlying values and biasness, cultural influences and the provisional nature of knowledge and understanding (Crotty, 1998).

The epistemology of subjectivism, according to Crotty, suggests that *meaning does not come out of an interplay between subject and object, but is imposed on the object by the subject. Here the object as such makes not contribution to the generation of meaning* (Crotty, 1998:9). One of the key difficulties of using subjectivist in social world is that emphasizing the subjective meaning of social action, the relationships between individual's perceptions, interpretations and action, and the influence of external factors are neglected.

In contrast to objectivism and subjectivism, constuctionism can be easily applied in the social world since it states that

> *Truth, or meaning, comes into existence in and out of [one's] engagement with the realities in [one's] world. There is no meaning without a mind. Meaning is not discovered, but constructed. In this understanding of knowledge it is clear and that different people may construct meaning in different ways, even in*

> *relation to the same phenomenon. In this view of things, subject and object emerge as partners in the generation of meaning (Crotty, 1998:8).*

A constructionist would contend that there can be no meaning apart from our consciousness, and truths or meanings can only be constructed by us through our interactions with the objects around us (Crotty, 1998). From the paradigm of constructionism, the individual is not a passive recipient of a set meaning, but an active, resourceful and reflective participant in the construction of meaning. Constructionism tends to be biased towards qualitative research methods although use of triangulation is also common. In order to allow for the use of triangulation, the epistemology of constructionism was used in this study.

3.1.1.1: Theoretical perspective

Crotty defines the theoretical perspective of his research design framework as *the philosophical stance informing the methodology and thus providing a context for the process and grounding its logic and criteria* (Crotty, 1998:3). The theoretical perspective is the particular philosophical position which provides a context for the research. There are several theoretical perspectives, which include positivism, interpretivism, critical inquiry, postmodernism, transformative paradigm, pragmatism and feminism. Arguably the most influential have been positivism and interpretivism (Crotty, 1998). Positivism argues that the social world exists externally to the researcher, and that its properties can be measured directly through observation. Positivism has been criticized since science does not begin from observation, but from theory, to make observations intelligible. A major anti-positivist stance is

interpretivism, which looks for *culturally derived and historically situated interpretations of the social life-world* (Crotty, 1998:67). Interpretivism is closely linked to constructivism.

The transformative paradigm includes critical theorists, participatory action researchers, Marxists, feminists, racial and ethnic minorities, and persons with disabilities, among others. Transformative researchers acknowledge that the constructivist paradigm makes different claims with regard to reality, epistemology and methodology, and theories of causality than do postpositivists.

Tashakkori and Teddlie (2003) identify pragmatism as one of the paradigms that provides an underlying philosophical framework for mixed methods research. These philosophers rejected the scientific notion that social science inquiry was able to access the "truth" about the real world solely by virtue of a single scientific method. Thus their belief systems were closely aligned in this sense to constructionists. Rather than positioning oneself as a distanced observer, relational researcher, or socially and historically contextualized researcher, the pragmatist is free to *study what interests you and is of value to you, study it in the different ways that you deem appropriate, and utilize the results in ways that can bring about positive consequences within your value system* (Tashakkori & Teddlie, 1998:30). The criterion for judging the appropriateness of a method, with its implied relationship between the researcher and the researched, is if it achieves its purpose (Maxcy, 2003). Neopragmatists wrote extensively of the importance of using mixed methods and avoiding being constrained by a single,

monolithic method, as they perceived the "scientific method" to be according to the postpositivist thinkers (Maxcy, 2003). Rather, they see mixed methods as offering a practical solution to the tensions created in the research community concerning the use of quantitative or qualitative methods. Put simply, pragmatism allows the researchers to choose the methods (or combination of methods) that work best for answering their research questions. For this reason, this study adopts the pragmatism theoretical perspective.

3.1.1.2: Methodology

Methodology refers to the overall strategy or plan of action for conducting research. A research strategy is a general plan of action that will give direction to the research, enabling one to conduct it in a systematic manner. The research strategy used in this study is survey research. Other common strategies are case study, ethnography, phenomenological research, experimentation and archival studied. Survey strategy is closely associated with the deductive approach. In this strategy, a sample of informants is selected from a population and administered with questionnaires. This is popular with attitudes, behaviours and perceptions research. This study uses the analytical type of survey strategy which enables the study to answer research questions and test hypotheses.

3.1.1.2.1: Methodology of Vulnerability Assessment

This study adapted a methodology from a study carried out by the World Health Organisation (WHO) on assessment of health vulnerability and adaptation to climate

change (WHO, 2003). The methodology incorporates the ideas of complexity, trans-disciplinarity and integrated assessment, and includes scenario analysis and modeling. It emphasizes stakeholder involvement and addresses both supply and demand sides. The methodology has been adapted to fit into tourism research.

The following methodology was used to assess vulnerability and adaptation of the Kenya tourism to climate change.

1. Identify issues & determine the scope

The first step was to specify the issues and the scope of the assessment. A number of activities are carried out such as:

- Definition of the economic, environmental and social context of the destination.
- The relevant tourism products are described and prioritized according to their relevance.
- Analysis of current climate system and how this is linked with tourism.
- The main stakeholders are identified and involved in the process.

2. Describe the current vulnerability of impacts

This step involves:

- Identification of key vulnerability components and quantitative indicators to measure them. One of the most commonly applied tool for identifying and visualizing these vulnerability components and indicators is the Vulnerability Scoping Diagram developed by Polsky *et al.* (2007)
- Validation of vulnerability components and indicators within exposure, sensitivity and adaptive capacity in consultation with stakeholders. Semi-

quantitative approaches could be used where each indicator is divided into categories such as high, moderate and low.

3. Describe current and future adaptation strategies

- Identify and describe current strategies, policies and measures that reduce the burden of climate change on tourism
- Identify the adaptation practices being practiced at the destination
- This stage further identifies what strategies, policies, and measures should begin to be implemented to increase the range of possible future interventions. Also determine the adaptive capacity of the destination. Criteria should be established in advance for evaluating possible adaptation measures.

4. Synthesize the results and draft a scientific assessment report

This step synthesizes the information collected in the previous steps to identify the level of vulnerability of tourism to climate change changes. The most vulnerable activities, resources, infrastructure, services and facilities are identified and their degree of certainty given. Once synthesized, the information should be peer-reviewed and published.

3.1.1.3: Methods

This study used the explanatory sequential design which is a type of mixed methods design (Creswell and Clark, 2007). Mixed methods research is becoming increasingly articulated, attached to research practice, and recognized as the third major research approach or research paradigm, along with qualitative research and quantitative research (Johnson *et al.*, 2007). Mixed methods design involves collecting, analyzing,

and mixing qualitative and quantitative approaches at many phases in the research process, from the initial philosophical assumptions to the drawing of conclusions (Bazeley, 2009). It is based on the idea that the use of quantitative and qualitative approaches in combination can give better output than either approach alone, and offset the weaknesses of either method. Mixed methods research has increasingly gained popularity because of the complexity of problems that need to be addressed, the rise of interest in qualitative research, and the practical need to gather multiple forms of data for diverse audiences (Creswell *et al*., 2003; Teddlie & Tashakkori, 2009). Mixed design options that are most commonly used in practice include (a) explanatory sequential design (b) convergent parallel design (c) exploratory sequential design (d) embedded design (e) transformative design (f) multiphase design.

The explanatory sequential design used in this study occurs in two distinct interactive phases. The first phase involves the collection and analysis of quantitative data, which has the priority for addressing the study's questions (Creswell and Clark, 2007). The second phase involves the subsequent collection and analysis of qualitative data. The qualitative phase of the study is designed so that it follows from the results of the first, quantitative phase. The researcher interprets how the qualitative results help to explain the initial quantitative results (Bazeley, 2009). The overall purpose of this design is to use a qualitative strand to explain initial quantitative results (Creswell *et al*., 2003) such as quantitative significant (or nonsignificant) results, positive-performing exemplars, outlier results, or surprising results. In other words the design is most useful when the researcher wants to assess trends and relationships with quantitative data but also be

able to explain the mechanism or reasons behind the resultant trends (Bazeley, 2009). Its two-phase structure makes it straightforward to implement, because the researcher conducts the two methods in separate phases and collects only one type of data at a time (Johnson *et al*., 2007).

Consequently, this study relies on the presentation of statistical results represented with numbers (quantitative) and facts through words (qualitative). Surveys and interviews were used to collect data. Mixed-method design is chosen since it combines depth (qualitative) and breadth (quantitative), overcomes the weaknesses of both methods and enables multilevel analysis and strengthens validity through triangulation (Creswell *et al*., 2003). Explanatory sequential approach to mixed methods is used where sample survey of case studies is carried out with selected subgroups to generate opinions and then qualitative studies are done to explain the questions and results arising from the statistical analysis (Bazeley, 2009). Figure 3.2 shows the sequence in the explanatory sequential design used in this study.

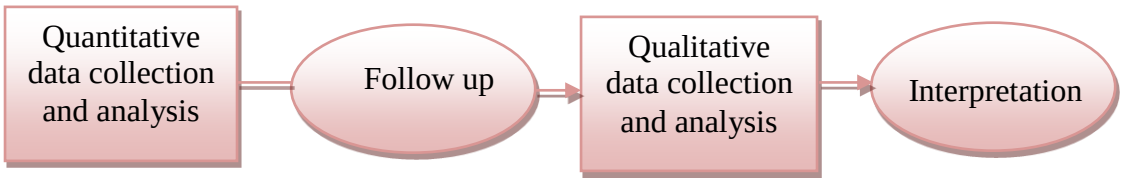

Figure 3.2: Explanatory sequential design
Source: Adapted from Maxwell and Loomis (2003) and Bazeley (2009)

Quantitative study helps in generalizing the results, statistical representation, estimation of magnitude and distribution of impacts and in statistical control of bias and external factors (Johnson *et al*., 2007; Hall and Howard, 2008). The level of interaction was

independent whereby the quantitative and qualitative research questions, data collection, and data analysis were separate. Figure 3.3 shows a flow chart of the various steps involved in the explanatory sequential design used in this study.

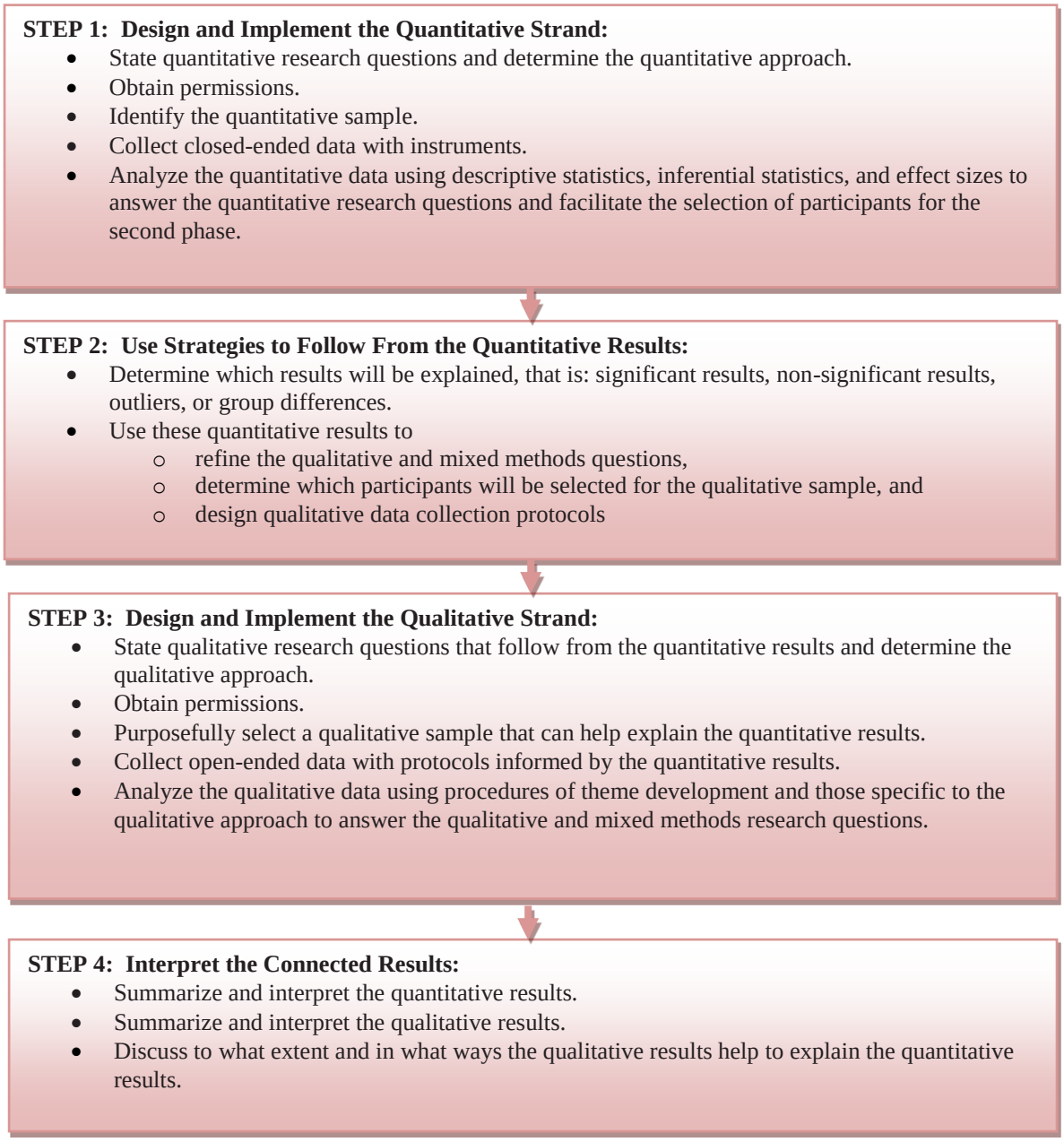

Figure 3.3: Flowchart of the procedures in implementing the explanatory sequential design used in this study
Source: Adapted from Maxwell and Loomis (2003) and Bazeley (2009)

The study started with the collection and analysis of quantitative data, which has the priority for addressing the study's questions. This was done in order to identify significant predicators of climate change in the selected regions. This was followed by the subsequent collection and analysis of qualitative data.

Qualitative phase of the study was designed so that it followed from the results of the first, quantitative phase, to explain the results and relationships obtained. This was then followed by an explanation of how the qualitative results help to explain the initial quantitative results (Bazeley, 2009). Consequently, this study triangulated by using both qualitative and quantitative methods, multiple case studies, multiple strategies for collecting data and multiple respondents (Kalof *et al*., 2008).

Although this design requires a lengthy amount of time for implementing the two phases (Maxwell and Loomis, 2003), it was deemed useful for climate change research in order to adequately address its complex nature.

Finally, there was the actual method used, such as questionnaires, interviews, or participant observation. This study used questionnaires and interview schedules to collect information from tourism and climate change stakeholders and experts. In addition, the study carried out document analysis to reveal deeper meanings that are not possible using questionnaires and interviews.

Table 3.1: Research framework used in this study

Epistemology	Theoretical perspective	Methodology	Methods
Constructivism	Pragmatism	Survey research	Mixed methods Questionnaire Observations Discussions Data deduction Document analysis Statistical analysis

Source: researcher 2013

The strength of Crotty's scheme is that it provides a format for a researcher to conceptualize and clarify the foundation for a research project. Using the scheme as a guide, researchers can consciously and deliberately consider how the ideas underlying their project fit together within the different layers, and ensure consistency between them. This will help provide a research project with intellectual rigour (Altinay and Paraskevas, 2008).

3.2: Location of the Study

This study was based in three tourist regions in Kenya: Nairobi, Central and Coast. According to the Ministry of Tourism (GoK, 2013), Kenya is divided into ten tourist regions, which are Nairobi, Central, Southern, Rift, North Rift, Western, Northern, North Eastern, Eastern and Coast. The classification is based on the geographical location and uniqueness. Tourism is concentrated in a few regions such as Nairobi, Coast, Southern and Central. As can be seen from Figure 3.4, park visitation in the three regions (Nairobi, Coast and Central) averages to over 40% of the total park visitation in the country.

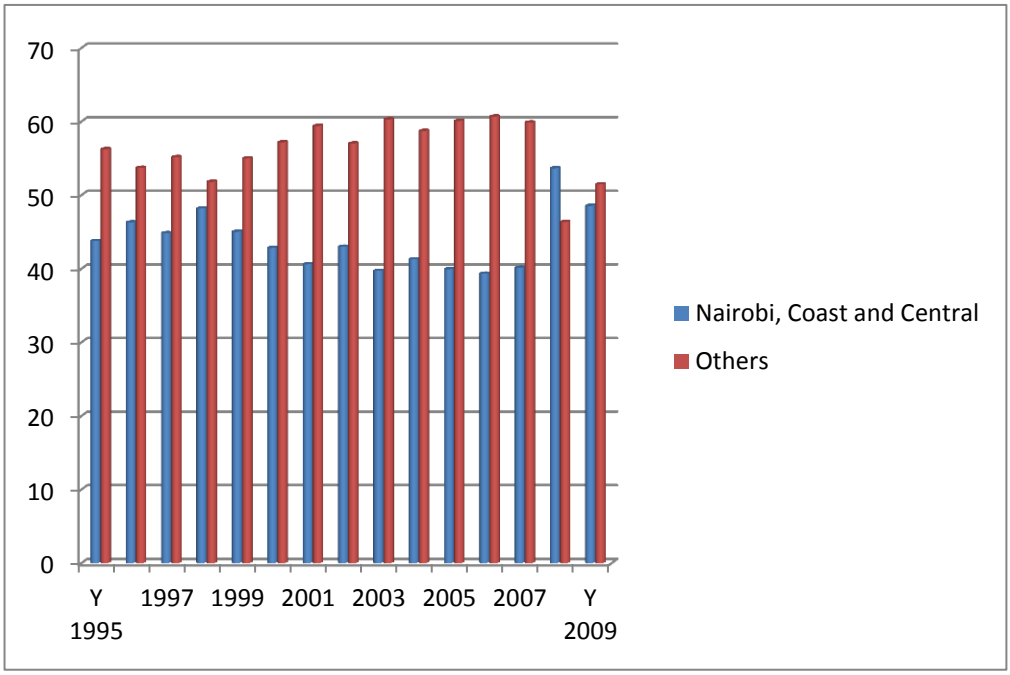

Figure 3.4: Number of tourists visiting parks in Kenya from 1995 to 2009
Source: KNBS, 2011

In addition, as shown in Table 3.2, these three regions (Nairobi, Coast and Central) contain over 80% of beds occupied from 2002 to 2010.

Table 3.2: Hotel Beds Occupied By Region, 2002 – 2010

Year	Nairobi, Coast and Central Regions	Other Regions	Total	Percentage in Study Area
2002	3016	390	3406	89
2003	2147	459	2606	82
2004	3149	642	3791	83
2005	3579	847	4426	81
2006	4842	1080	5922	82
2007	5642	1298	6939	81
2008	2958	742	3699	80
2009	5079	1069	6148	83
2010	5392	1270	6662	81

Source: KNBS, 2011

In addition, the three regions are very diverse in terms of climate, as shown in Figure 3.5.

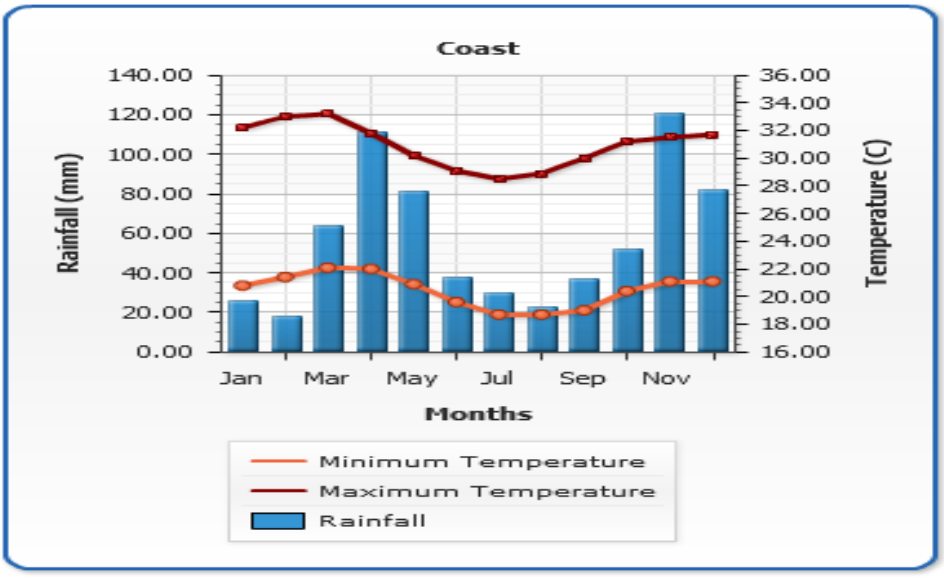

Figure 3.5: The average temperature and rainfall in Nairobi
Source: World Bank, 2013

The Coast region experiences the highest maximum temperature of 33°C and the lowest minimum temperature of 19°C. The region receives the highest rainfall of 120mm in November, but also a substantial quantity in April of 110mm.

Nairobi region experiences the highest maximum temperature of 28°C in February and a minimum temperature of 11°C in July and August. The region receives the highest rainfall of 180mm in April, as shown in Figure 3.6.

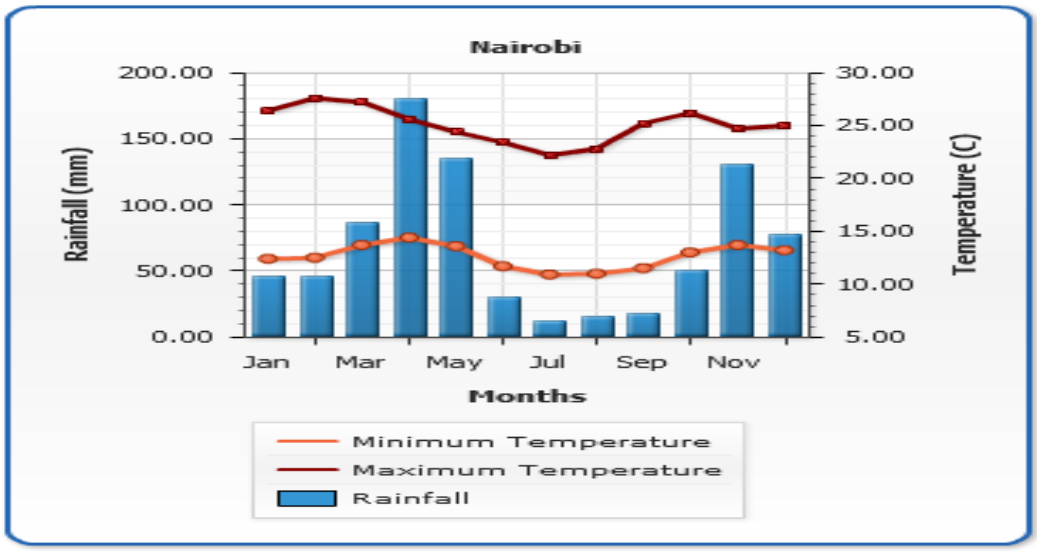

Figure 3.6: The average temperature and rainfall in Nairobi
Source: World Bank, 2013

The Central region is relatively colder with highest maximum temperature of 25°C in February and March and the lowest minimum temperature of 8°C in July to September. The region receives the highest rainfall in April of 240mm, as shown in Figure 3.7.

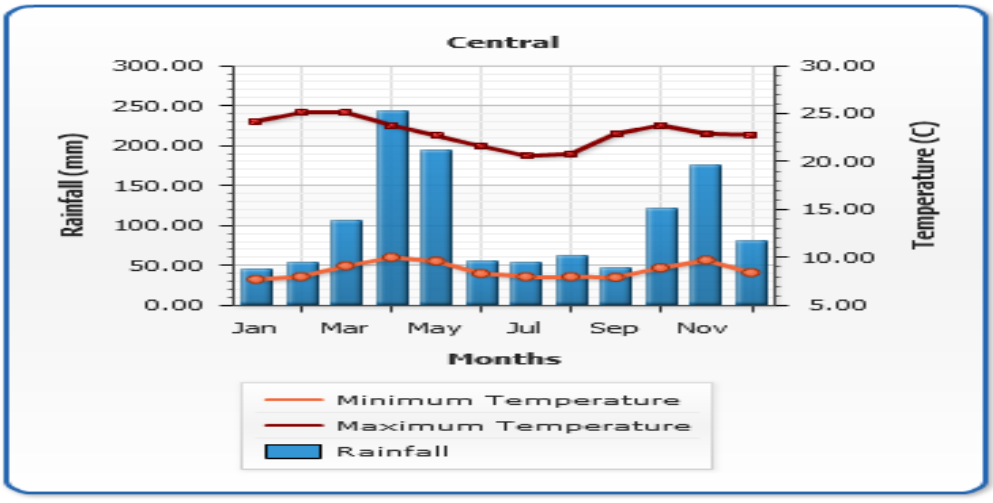

Figure 3.7: The average temperature and rainfall in Nairobi
Source: World Bank, 2013

Therefore these three regions are very diverse in terms of the main climatic indicators: temperatures and rainfall.

3.3: Target Population

In order to achieve the overall objective of the study several methods were used to assess vulnerability and adaptation which include; stakeholders and expert judgment. The general indirect and direct impacts of climate change to tourism were assessed using stakeholders and expert judgment. The target population constitutes of two groups; stakeholders and experts. Stakeholders included all tourists and managers in tourist hotels (3-5 star) in Central, Coast and Eastern tourist regions in Kenya. According to Ministry of Tourism classification (GoK, 2003), there are twenty four tourist hotels at the Coast, eighteen in Nairobi and seven in Central.

The managers are expected to have information for both supply and demand of tourism and how these are affected by climate change. In addition, since hotels are permanent investments in a destination, they are considered to be one of the most vulnerable components of the tourism industry. In addition, tourists staying in tourist hotels in Kenya formed part of the population. This group was selected since they greatly influence the success or failure of a tourist destination, and they are the most adaptive to the impacts of climate change (Scott *et al.,* 2008).

The second group making up the population constituted the experts. Experts' knowledge and experience, provided key insights on the present and future vulnerability. 'Expert' is used in this case to mean individuals with specialized

knowledge, in this case on topics relating to the impacts of climate change on tourism, with demonstrated experience and involvement in climate-change-related projects and/or publications.

Participation of stakeholders ensured that the findings are solidly grounded in experience and hence improve decision-making. In addition, stakeholder participation establishes credibility and stakeholders are more likely to 'own' the results, increasing the likelihood of successful adaptation (Carter *et al.*, 2007). Stakeholders provided information about how they adapt or have adapted in the past and their responses were easily confirmed through direct observations.

Subjective judgments of experts on technical topics related to climate change were used to confirm the findings from the tourism stakeholders. A main strength of expert elicitation in decision-making and identifying future research needs is that it does not seek to identify consensus within a group, but rather, it highlights the current diversity of ideas within an expert community that may not be voiced in more public fora (Hargerman *et al.*, 2010).

3.4: Sampling Techniques

The study used multistage sampling. This was deemed appropriate since Kenya is geographically vast. The first stage, involved cluster or area sampling to come up with a representative sample of Kenya where the total area of Kenya was divided into ten (10) non-overlapping geographical clusters consisting of the tourist regions according to the

Ministry of Tourism description (MoT, 2013). The second stage involved purposively selecting three (3) regions based on tourism popularity, attractions diversity and climatic conditions. These regions are Nairobi, Coast and Central tourist regions (MoT, 2013). In the third stage, twenty (20) 3-5 star (tourist) hotels were stratified random sampled out of the total 49 tourist hotels in the three regions. As can be seen in Table 3.3, the three regions studied contain 58% of all the total hotels from the ten circuits.

Table 3.3: Number of hotels in Kenya tourists circuits

No.	**Region**	**No. of tourist hotels**	**No. of sampled hotels**
1	Coast	24	9
2	Nairobi	18	7
3	Central	7	4
Sub-total		**49**	**20**
4	Southern	15	
5	Eastern	5	
6	Northern	5	
7	North Rift	3	
8	Rift	7	
9	Western	0	
10	North Eastern	0	
Total		**84**	**20**

Within these selected hotels four hundred (400) tourists and forty (40) hotel managers were randomly selected. After gathering the results from tourists and the hotel managers, triangulation was done using in-depth interviews on key tourism and / or climate change experts. Twenty (20) experts were purposively selected. Criteria for inclusion of experts were both substantive and practical. Substantive criteria involved demonstrated expertise and involvement in climate change and tourism research. This was confirmed through academic publications, involvement in national, regional or

global scale climate change and/or tourism issues. Practical criteria for inclusion involved resources for travel since the interviews were conducted in person. The sample size was deemed sufficient to achieve saturation of concepts which means that additional interviews could not yield new concepts, or perspectives within the context of the topics being discussed (Hagerman *et al.,* 2010). It is important to note that that due to the purposive selection of participants this sample is not representative of all individuals with relevant expertise in Kenya.

3.5: Sample size

The following formula, proposed by Cochran (1977) was used in coming up with the tourists sample:-

$$n = \frac{Z^2 \text{ x } p \text{ x } q}{d^2}$$

Where in this study:

n is the required sample size

Z is the critical value from the Z distribution which is 0.96

d is the marginal error estimate of 0.05

p is the confidence level of 0.5 (Which would produce the highest sample size requirement since no information is available for p to allow for a conservative estimation of the sample size) while q=1-p

Therefore:

$$n = \frac{1.96^2 \text{ x } 0.5 \text{ x } 0.5}{0.05^2}$$

n = 384.16

Therefore, the minimum sample size required is 385.

A sample of 400 respondents was selected in order to cater for possibilities of non-response. For the first group of respondents, three regions were purposively selected which were Nairobi, Coast and Central. From the regions, a total of 20 out of 49, 3-5 star hotels were randomly selected, from which 40 hotel managers and 400 tourists were also randomly selected. Box 3.1 shows a summary of the respondents sampled.

Box 3.1: Sample size

Target population		**Sampled population**	
Nairobi region	18 hotels	Nairobi region	7 hotels
Coast region	24 hotels	Coast region	9 hotels
Central region	7 hotels	Central region	4 hotels
Target population	49 hotels	Target population	20 hotels

Samples respondents

Hotel managers sampled - 40 (2 per hotel)
Tourists sampled - 400 (20 per hotel)

Source: research, 2013

The second group making up the sample constituted the experts mainly from the government, civil society, private sector and academia, as shown in Box 3.2.

Box 3.2: A list of experts consulted

Ministry of Environment and Mineral Resources (MEMR)
Nation Environment Management Authority (NEMA)
Ecotourism Kenya (EK)
Ministry of Tourism
Kenya Wildlife Service
Kenya Forest Service
Kenya Tourist Board
Kenya Climate Change Working Group Partners (KCCWG)
The United Nations Environment Program (UNEP) Nairobi
Kenya Meteorological Department
Kenyatta University Tourism lecturer (2 lecturers)
Moi University Tourism lecturer (3 lecturers)
Kenyatta University Environment lecturer (2 lecturers)
University of Nairobi Environment lecturer (3 lecturers)

Source: researcher, 2013

3.6: Research Instruments

The main research instruments were semi-structured questionnaires and interview schedules.

3.6.1: Semi-structured questionnaires

A set of questionnaires were administered to tourists and hotel managers. Questionnaires administered to tourists sought to determine the demand side vulnerability of tourism to climate change by exploring the perceptions of tourists on climate change impacts and weather parameters, as well as their adaptation plans. Questionnaires filled by hotel managers determined the impacts affecting the supply side by exploring the impacts affecting tourism resources, their magnitude of these impacts and adaptation measures and plans.

Although it costs more than mail survey, a direct face-to-face survey method was used because of the expected improved response rate. Research assistants gave a brief on climate change issues and how the respondents are expected to interpret the various technical questions. Then the respondents filled the questionnaires on their own, although the research assistants were available for further clarifications.

3.6.2: In-depth interview schedules

In-depth interviews solicited for deeper information from experts on climate change and its relationship with tourism. Screening questionnaires that established the participants' relevance to the topic were filled by a number of tourism stakeholders and climate change experts. A number of topical issues on climate change and tourism were

discussed and taped, such as climate change impacts affecting Kenya, tourism resources and general adaptation. The sessions lasted for one and half to two hours each. A list of questions guided the in-depth interviews.

3.7: Pre-test of Research Instruments

A pre-test study involved filling of questionnaires by three purposively selected 3, 4 and 5 - star hotels in the Southern region, who were not included in the sample. From each hotel, 2 managers and 5 tourists were randomly selected. In addition, two specialists in climate change and tourism were interviewed. Results were analyzed and appropriate corrections effected whereby the main factors were subjected to a Cronbach Alpha Test Statistic to assess their suitability in addressing the questions stated. Factors that scored a Square Mean Correlation (SMC) of less than 0.5 were dropped.

3.8: Validity

To ensure construct validity, the study was based on a number of theories. The research was carried out by both male and female interviewers to reduce bias levels. The study compared results of repeated questionnaire measurements to test their stability. In addition, during the personal interviews, a tape recorder was used to reduce the risk of wrongly-interpreted answers during transcription of interviews, and to be able to double-check the answers after the interview.

3.9: Reliability

To ensure equivalence of results, research assistants were appropriately trained and motivated.

3.10: Data Collection Techniques

Through the use of structured and unstructured questionnaires and oral interviews, data related to impacts of climate change, vulnerability and adaptation were collected from selected stakeholders and experts in the tourism sector in Kenya. The questionnaire survey was mainly interviewer-completed and consisted primarily of 'closed' questions. A few open-ended questions were included in order to give the respondents a chance to freely express their attitude and perceptions hence providing qualitative insights to the survey.

In order to assess the current and future vulnerability and adaptation of the tourism sector to climate change, the study builds on both primary and secondary data sources. Primary data was collected from tourism industry stakeholders and tourism and climate change experts. Secondary data included published journals, reports from various organizations including United Nations, World Travel and Tourism Council, World Bank, World Economic Forum and government reports. Document analysis of Kenya government tourism and climate change related documents was done to show an overview of the importance placed on climate change in tourism and other related sector developments in the country.

3.11: Data Management and Analysis

Data was collected using semi-structured questionnaires. Questionnaires that were not fully filled were not used in the analysis. An identification number was assigned to each questionnaire, respondent, group and site. Then the resultant data was validated

before entry into a computer programme. Coding involved assigning numbers for each response.

The data was organized by question and consistencies and differences were identified. Questionnaire and interview data was entered into a computer package. A number of techniques were used to analyze quantitative data: frequency, percentage, mean and standard deviation as tools of descriptive data analysis; and Chi-square and one way analysis of variance (ANOVA) for comparisons and bivariate analysis.

Qualitative data analysis, on the other hand, involved organizing, categorizing and identifying key themes emerging from data collected and documented. Key themes were marked from key ideas. Numbers were used to tag key themes. The data was sorted appropriately and similar data was grouped into categories by using different descriptive phrases according to the respective themes. Data was combined into new piles. Piles were combined and others were divided into subcategories. The search function was used to gather chunks of text together to copy and paste. A word processor file was completed that included columns for the ID number, identifiers, categories, codes and text. While the small sample of experts limited quantified frequencies of agreement or disagreement, coarse measures of commonality were indicated for some key topics by indicating how many experts expressed a given view.

3.12: Logistical and Ethical Considerations

In carrying out the fieldwork, the following ethical considerations were taken into account: informed consent, privacy and confidentiality and accuracy. The researcher informed the respondents the purpose and aim of the study, the possible consequences and the use of the information. Participation in the study was voluntary. To ensure confidentiality of the results, the questionnaires were coded and therefore respondents were not identified. To ensure high level of accuracy, the research avoided as much as possible omissions, fabrications and contrivance. In addition, research authorization letters were sought from Kenyatta University and the Ministry of Education before data collection commenced.

3.13: Conceptual framework and variables

Tourism, like any market, is defined by supply and demand, by push and pull factors. Destinations compete for the most lucrative tourists, and tourists compete for the best deals (Hamilton *et al.,* 2005a). Climate change has the potential to impact on both the supply- and demand-sides of the tourist product (Moore, 2010).

General impacts of climate change affect both supply and demand sides of the tourism industry. Both sides also are affected by different direct and indirect impacts. Direct impacts on the supply side include impacts on resources, activities, infrastructure, services, facilities and the business profitability and survival. Direct impacts on the demand side include tourists perception of weather and impacts on tourists comfort, activities and satisfaction, as shown in Figure 3.8.

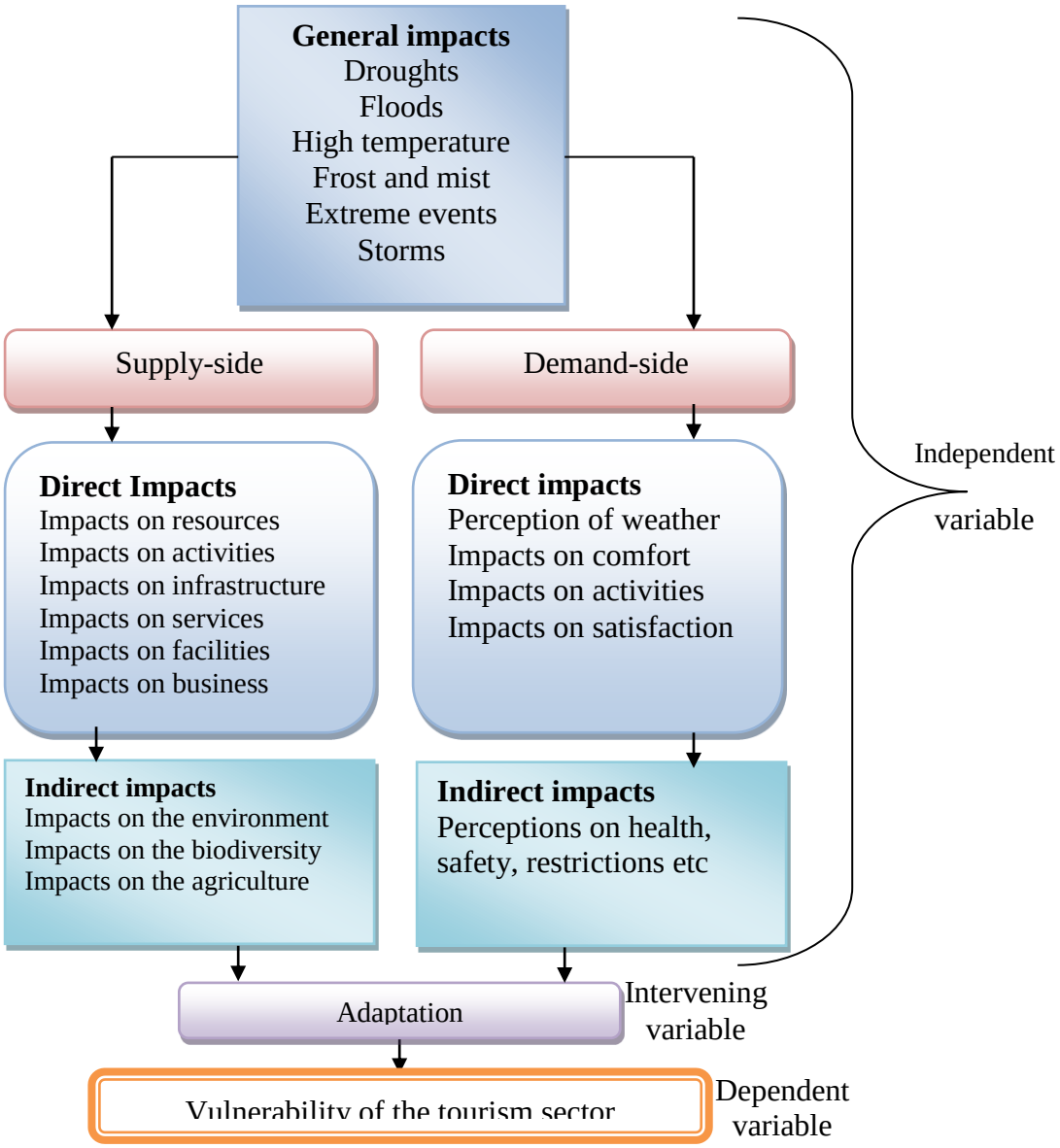

Figure 3.8: Conceptual framework of the assessment of vulnerability of tourism to climate change
Source: author, 2013

As already observed, indirect impacts on the supply side include impacts on the environment and biodiversity important for tourism and also impacts on other sectors related to tourism such as agriculture. Indirect impacts on the demand side include real and imagined impacts on safety and health. Also this includes restrictions of resources

such as water. The nature and magnitude of occurrence of these impacts determines a destination's vulnerability. However, the level of vulnerability is determined by the adaption practices, opportunities and limitations in the destination. One of the most important types of adaptation is policy formulation and implementation.

CHAPTER FOUR: FINDINGS AND DISCUSSION

Results are based on three main sources of primary data which were:

(a) Questionnaires filled by hotel managers

(b) Questionnaires filled by tourists

(c) Interviews with key tourism and / or climate change experts

Three major tourists regions in Kenya were selected which were Nairobi, Coast and Central. The survey took place from January 2012 to July 2013. A total of 20 hotels were randomly selected out of the total 49, but only 18 successfully responded. The other 2 were not willing to respond. Amongst the successful 18, 6 were from Nairobi, 9 from Coast and 3 from the Central region. A total of 40 hotel managers were sampled (2 from each hotel) but 36 successfully responded. In addition, 400 tourists were sampled but 352 successfully responded. 8 questionnaires were not fully filled and therefore were not involved in further analysis. Using the minimum sample requirement of 385, the response rate was 91%, which is above the recommended rate of 70%, as shown in Box 4.1.

Box 4.1: Successful respondents per category

Successful respondents (hotels)		**Respondents in each hotel**	
Nairobi region	6 hotels	Stakeholders sampled	- 40 (2 per hotel)
Coast region	9 hotels	successful	- 36
Central region	3 hotels	Tourists sampled	- 400 (20 per hotel)
Total successful	***18 hotels***	successful	- 352

Further, content analysis was done to reveal the extent to which tourism policy has addressed climate change issues and climate change policy has addressed tourism issues.

Results Themes

Results from the questionnaires from tourists and hotel managers are divided into four themes which are: background information; vulnerability of tourism to climate change; adaptation; policy and conceptual model for vulnerability assessment. These themes were:

Theme 1: General information

Theme 2: Indicators of Climate Change affecting tourism

Sub theme 1: General indicators of Climate Change

Sub-theme 2: Indirect indicators of climate change on tourism

Sub- theme 3: Direct indicators of climate change on tourism

Sub-theme 4: Magnitude of indicators of climate change on the main components of tourism

Sub-theme 5: Nature of the indicators of climate change affecting Tourism

Sub-theme 6: Importance of weather parameters for tourism

Theme 3: Adaptation of the Tourism sector to the indicators of Climate Change

Theme 4: Review of Climate Change Policy

Theme 5: Conceptual model for vulnerability assessment

Views from the hotel managers and tourists were collected using two different questionnaires. The results were analyzed using various descriptive and inferential statistical methods. On the other hand, interview results, which were views from twenty (20) tourism and / climate change experts were presented in flow charts, tables and direct quotations. Areas of convergence in the charts were shown using shaded boxes while areas of non-convergence were shown using unshaded boxes. The results from tourists are presented under **part 1**, those from hotel managers under **part 2** and those from interviews under **part 3** in each theme.

4.1: Theme 1: General information

This theme contains the general information of the hotels, general managers, tourists and the tourism and / or climate change experts. Results are presented using tables, charts and graphs.

4.1.1: Part 1: Tourists Background information

The tourist respondents achieved gender balance with 52% males, as shown in Table 4.1. Their age mainly concentrated on the 31 – 40 years (28%) and 51-60 years (33%) year bracket. Most had studied up to tertiary or university level (83%). Most of them were married (53%). Their reasons for travel were business (53%), leisure (33%) and Visiting Friends and Relatives (VFR) (12%). Among the tourists who were successfully contacted, 49% were in Coast, 33% in Nairobi and 16% in Central.

Table 4.1: Tourists Background Information

General Information (n= 352)	Freq.	Percent
Gender		
Male	185	52.6
Female	167	47.4
Age (in years)		
< 20	5	1.4
21-30	54	15.3
31-40	100	28.4
41 - 50	39	11.1
51 - 60	116	33.0
> 60	38	10.8
Education level		
None	0	.0
Primary	6	1.7
Secondary	50	14.2
Tertiary/ University	294	83.5
Other	2	.6
Marital Status		
Married	189	53.7
Single	129	36.6
Divorced	34	9.7
Reason for travel		
Business	188	53.4
Leisure	119	33.8
Visiting Friends and Relatives	45	12.8
Region interviewed		
Nairobi	118	33.5
Coast	175	49.7
Central	59	16.8

The majority of the tourists respondents came from Kenya (31%) followed by the rest of African (20%), then Europe (16%) then North America (13%) and Asia (13%), as shown in Figure 4.1. This was in line with the national statistics where the largest group of tourists come from Europe, Africa and Kenya (KNBS, 2011). However the difference in the proportions could be attributed to the recent efforts in promoting

domestic and regional tourism, which could have resulted into higher number of tourists coming from Kenya and Africa than those coming from Europe.

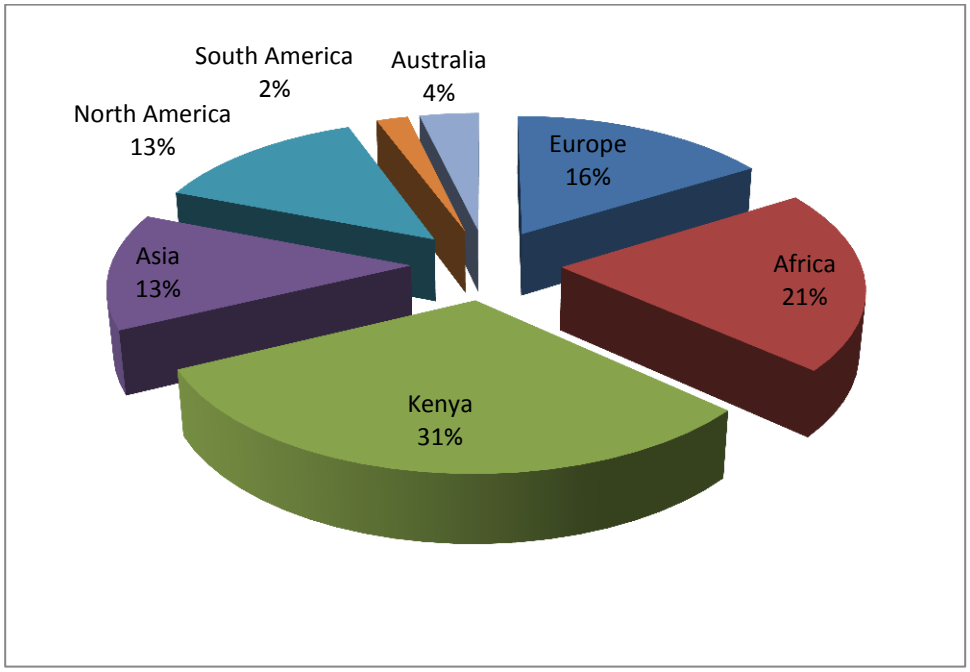

Figure 4.1: Tourists source markets

4.1.2: Part 2: Hotel managers general information

Hotel managers consisted of 36 respondents from 18 hotels from three regions across Kenya, as shown in Table 4.2. Males consisted of 75% while the majority were between the age of 21 and 40 years (91%), with tertiary education (94%) and have worked for less than 4 years (80%). These shows that the majority of hotel managers are of middle age, highly educated but have worked in the hotels for relatively short time.

Table 4.0.2: Hotel managers general Information

General Information (n = 36)	Frequency	Percentage
Gender		
Male	27	75.0
Female	9	25.0
Age (in years)		
< 20	1	2.8
21 - 40	33	91.7
41 - 60	1	2.8
> 60	1	2.8
Education		
Secondary	2	5.6
Tertiary	34	94.4
Length of working in the circuit (in years)		
< 4	29	80.6
5 - 9	3	8.3
10 - 14	3	8.3
15 - 19	1	2.8

4.1.3: Part 3: Experts background information

A total of 20 tourism and / or climate change experts were interviewed. This consisted of 10 tourism and 10 climate change experts. The interviews lasted for 1 to 2 hours and covered a variety of tourism and climate change issues, seeking to explore the relationship between climate change and tourism. The interview respondents are summarized in Table 4.3. The experts were therefore drawn from a variety of institutions and specialties.

Table 4.3: Experts on climate change and tourism interviewed

Name of organization	**Area of expertise**	**Assigned code**
Ministry of Environment and Mineral Resources (MEMR)	Climate change	Government 1
Ministry of Tourism	Tourism	Government 2
Kenya Meteorological Department	Climate change	Government 3
Kenya Wildlife Service	Tourism	Government 4
Nation Environment Management Authority (NEMA)	Climate change	Government 5
Kenya Tourist Board	Tourism	Government 6
Kenya Forest Service	Tourism	Government 7
Ecotourism Kenya (EK)	Tourism	NGO 1
Kenya Climate Change Working Group Partners (KCCWG)	Climate change	NGO 2
The United Nations Environment Program (UNEP) Nairobi	Climate change	UN 1
Kenyatta University	Tourism	Academia 1
Kenyatta University	Tourism	Academia 2
Moi University	Tourism	Academia 3
Moi University	Tourism	Academia 4
Moi University	Tourism	Academia 5
Kenyatta University	Climate change	Academia 6
Kenyatta University	Climate change	Academia 7
University of Nairobi	Climate change	Academia 8
University of Nairobi	Climate change	Academia 9
University of Nairobi	Climate change	Academia 10

4.2: Theme 2: Indicators of Climate Change affecting tourism

This theme sought to explore the indicators of climate change affecting tourism in the three main tourist regions in Kenya. This was assessed from both the demand and supply perspectives. The theme is divided into three subthemes: general indicators,

indirect indicators and direct indicators. A likert scale was used in the questionnaire and the results were later triangulated using in-depth interviews.

4.2.1: Sub theme 1: General indicators of Climate Change

This subtheme is divided into three parts; general indicators according to tourists, hotel managers and experts.

4.2.1.1: Part 1: General indicators of climate change (tourists views)

The study sought to assess the general indicators of climate change experienced by tourists visiting three regions in Kenya. The indicators of climate change on tourism were measured based on 5 attributes, using a Likert scale from strongly disagree (1) to strongly agree (5). Tourists were requested to respond to the following question:

Question: I have experienced or seen the following indicators of climate change during my visit to Kenya.

Tourists rating of various general indicators of climate change averaged between moderate and agree. The majority (38%) agreed that the temperature was too high, while 27% strongly agreed. Therefore, 65% either agreed or strongly agreed that there were too high temperatures. Only 20% disagreed and strongly disagreed that there was high temperatures. This resulted to a mean of 3.68, which shows that the average response was very close to agree. Similar pattern was seen on evidence of floods, where 36% of the respondents agreed that they experienced flooding during their visit

in Kenya. However a mean of 3.1 shows that the average was close to neither agreeing nor disagreeing. Though the majority of the respondents (45%) neither agreed nor disagreed that there were strong winds, a mean of 3.25 shows that the average was more towards agree. Therefore, tourists visiting Kenya slightly agreed that there was evidence of too high temperatures, very strong winds and floods in the country. Drought, an important indicator of climate change was left out since the year in which the study took place (2012) did not experience droughts. Generally, the highest rated climate change indicator was *too high temperatures*. Though this is not an indicator that climate has actually changed, it shows that tourists are sensitive to these general indicators, as shown in Table 4.4.

Table 4.4: General impact of the Climate Change by tourists

Main Levels	Sub-Levels	Freq.	Percent	Mean Score	Std
Too high temperature	Strongly disagree	17	4.8	3.68	1.177
	Disagree	56	15.9		
	Moderate	46	13.1		
	Agree	135	38.4		
	Strongly Agree	98	27.8		
Floods	Strongly disagree	27	7.7	3.13	.966
	Disagree	52	14.8		
	Moderate	133	37.8		
	Agree	129	36.6		
	Strongly Agree	11	3.1		
Very strong winds	Strongly disagree	19	5.4	3.26	1.138
	Disagree	59	16.8		
	Moderate	161	45.7		
	Agree	36	10.2		
	Strongly Agree	77	21.9		

Temperatures in Africa are generally high throughout the year since the continent lies in tropical and subtropical latitudes. On the other hand, there has been a long-term decline in rainfall on the African continent since the 1960s (Hope, 2009; Kumssa and Jones, 2010). In recent decades, Eastern Africa has also been experiencing dramatic rainfall patterns, with increasing rainfall in the northern sector and declining rainfall in the southern sector (Hope, 2009).

4.2.1.1.1: General indicators of climate change rated by source market

The evidence of general indicators of climate change were analyzed according to the source markets of tourists. This was deemed necessary since ones normal environment determines how they perceive weather around them (Goosling *et al.,* 2012). At least 50% of the respondents from all source markets except Africa (other than Kenya) either agreed or strongly agreed that they had experienced *too high temperatures* during their visit. This is in contrast with less than 20% from all the destinations except Africa (30%) and Australia (46%) who either disagreed or strongly disagreed that they experienced *too high temperatures*. More than 30% of the respondents at least agreed that they experienced floods except those from South America (27%) and Africa (18%). Less than 28% at least disagreed of having seen any evidence of floods. Only less than 20% of the respondents agreed that they experienced strong winds during their visit in Kenya from all destinations except those from Asia (52%) and North America (46%).

Table 4.5: General climate change indicators according to source markets

Impact	Europe	Africa	Kenya	Asia	North America	South America	Australia	
Too high temperature								<0.001
Agree and strongly agree	73	43	74	76	68	57	53	
Disagree and strongly disagree	14	30	20	15	14	14	46	
Floods								0.009
Agree and strongly agree	57	18	51	34	27	42	38.5	
Disagree and strongly disagree	17	27	20	17	25	28	38	
Very strong winds								0.006
Agree and strongly agree	22	26	27	52	46	28	23	
Disagree and strongly disagree	17	33	19	15	19	28	38	

Chi-square test revealed that perceptions of all the indicators could be associated with the source market (p-value < 0.05). Generally, countries that experience higher temperatures such as Australia, South America and the rest of Africa agreed the least that there was evidence of *too high temperatures* as compared to those that experience very cold temperatures such as North America, Asia and Europe. This association was unusual for Kenya probably since the tourists have gradually experienced temperature rises over the years. Ratings of the other general climate change indicators were not very high since the year when the survey was done (2012) experienced normal climatic conditions, as shown in Table 4.5.

A closer look at these indicators by source market shows that generally, Africa and Australia recorded the lowest means, meaning that tourists from these two regions do not consider Kenya as being affected by general climate change indicators as much as the rest of the regions. This is summarized in Figure 4.2.

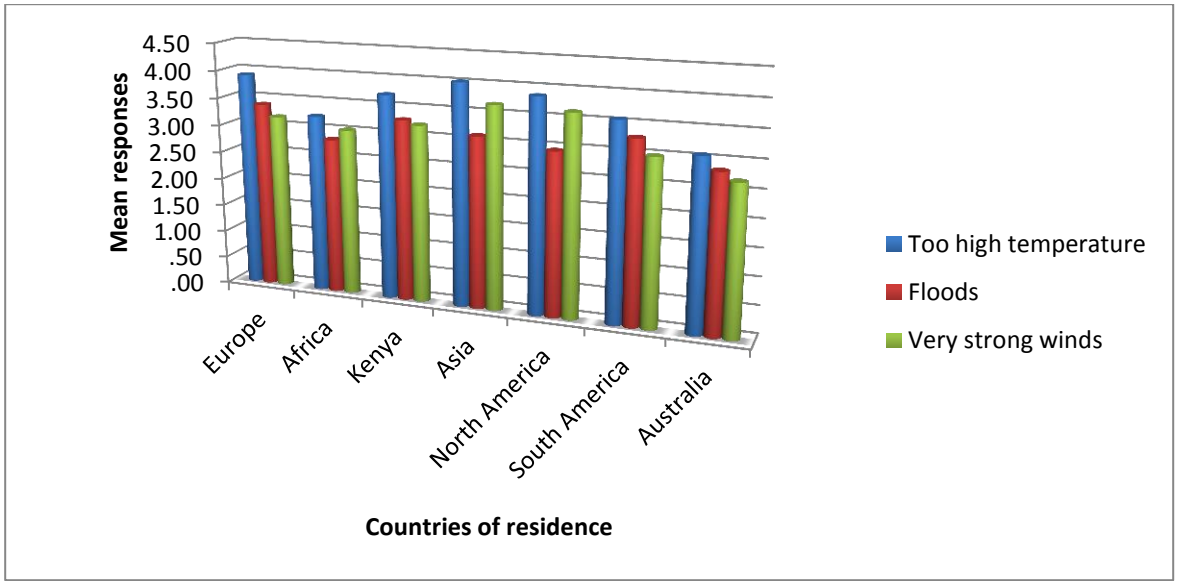

Figure 4.2: General climate change indicators according to source markets

In many destinations tourism is closely linked with the natural environment. There is considerable evidence demonstrating the intrinsic importance of weather and climate for tourist decision-making, including motivations, destination choice and timing of travel, as well as experience (Scott and Lemieux, 2010). In addition, climate affects a wide range of the environmental resources that are critical attractions for tourism, such as snow conditions, wildlife productivity and biodiversity, water levels and quality (Goosling *et al.*, 2012).

4.2.1.1.2: General indicators of climate change by purpose of visit

Leisure tourists agreed the most that they had experience *too high temperatures* and *floods* during their visit to Kenya, followed by business tourists and then tourists visiting friends and relatives (VFR). However, a different trend was seen with the *very*

strong winds variable whereby business tourists agreed the most on the existence of these indicators. Overall, strongest evidence of all indicators was confirmed by the leisure tourists. This could be because leisure tourists are mostly outdoors where they may easily experience the various indicators, as shown in Table 4.6. This closely relates with Scott and Lemieux (2010) study which concludes that there is considerable evidence demonstrating the intrinsic importance of weather and climate for tourist decision-making.

Table 4.6: General indicators of climate change by purpose of visit (tourists views)

General indicators N = 352	**Business** Mean (Std. Dev)	**Leisure** Mean (Std. Dev)	**VFR** Mean (Std. Dev)	**Total** Mean (Std. Dev)	**p-value**
Too high temperature	3.6 (1.4)	3.9 (0.8)	3.4 (1.2)	3.7 (1.2)	0.04
Floods	2.9 (0.9)	3.7 (0.8)	2.5 (1.0)	3.1 (1.0)	0.000
Very strong winds	3.4 (1.3)	3.1 (0.7)	3.2 (1.1)	3.3 (1.1)	0.018
Total	**3.3 (1.2)**	**3.6 (0.8)**	**3.0 (1.1)**	**3.4 (1.1)**	

4.2.1.1.3: General indicators by age (tourists view)

Perceptions of general indicators varied by age positively. The difference in perceptions among different age groups was significant (p-value of 0.018). Older tourists agreed more than younger tourists that there was evidence of various general indicators in Kenya. This could mean that older tourists are more sensitive to general climate change indicators than younger tourists, as shown in Figure 4.3.

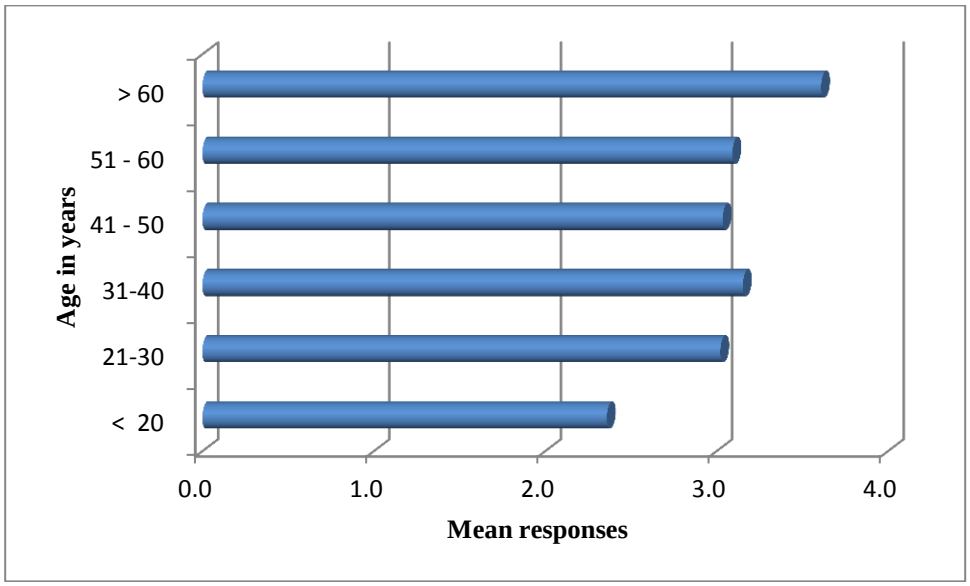

Figure 4.3: General indicators scores by age (tourists view)

Similar results can be found in Goosling *et al.*, 2012 whereby there is evidence of differences in preferred beach temperatures among young adult travellers from different countries as well as differences in climate preferences among young adult and senior travellers in Germany, the Netherlands, and Canada. However, in these studies the direction of preference is not specified.

4.2.1.1.4: General indicators by marital status

Married tourists expressed stronger perceptions of general indicators than the single and divorced tourists. The difference in perception was significant with ANOVA p-value of 0.005. Similar studies have shown that single professionals are far more resilient to weather than families with children (Goosling *et al.*, 2012). This is summarized in Table 4.7.

Table 4.7: General indicators by marital status

General indicators	Married	Single	Divorced	Total	p-value
	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	
Too high temperature	3.8 (1.1)	3.7 (1.2)	3.2 (1.4)	3.7 (1.2)	0.055
Floods	3.4 (0.9)	2.8 (0.9)	2.9 (1.1)	3.1 (1.0)	0.000
Very strong winds	3.1 (1.1)	3.5 (1.2)	3.0 (1.2)	3.3 (1.1)	0.002
Total	**3.4 (1.0)**	**3.3 (1.1)**	**3.0 (1.2)**	**3.4 (1.1)**	

4.2.1.1.5: General indicators by hotel rating

Tourists staying in three star hotels were the most sensitive to general indicators of climate, followed by those staying in four star hotels then in five star hotels. This could be due to the variety of air conditioning facilities available in the respective hotels with the five star hotels most likely having more or better such facilities, as shown in Table 4.8.

Table 4.8: General indicators by hotel rating (tourists views)

General indicators	Five	Four	Three	Total	p-value
	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	
Too high temperature	3.1 (1.2)	3.6 (1.0)	4.0 (1.2)	3.7 (1.2)	0.000
Floods	2.9 (1.2)	3.4 (1.0)	3.1 (0.8)	3.1 (1.0)	0.001
Very strong winds	2.8 (0.9)	3.1 (0.7)	3.6 (1.3)	3.3 (1.1)	0.000
Total	**2.9 (1.1)**	**3.3 (0.9)**	**3.4 (1.1)**	**3.2 (1.1)**	

Studies show that the most vulnerable regions are in developing countries, which generally also have less adaptive capacity (Scott *et al.*, 2011; Goosling *et al.*, 2012). Such a shift will adversely affect tourism in Africa and other low latitude areas. This

will be a particular challenge for their tourist destinations and their host communities. Generally, the economic benefits of tourism in Africa, which according to 2010 statistics accounts for 5% of worldwide tourism (UNWTO, 2010), may reduce with climate change if the continent continues to rely on natural resources and longhaul tourists.

4.2.1.2: Part 2: General climate change indicators (hotel managers perspective)

In order to ascertain the general climate change indicators occurring in Kenya, hotel managers, whom have lived in the country for a substantial period of time, were requested to respond to the following question:

Question: How would you rate the current climate change indicators affecting tourism in this area in terms of: (general indicators)

A likert scale with 1= Very Low and 5 = Very High was used. Strong results were seen with hotel managers respondents whereby over 67% of hotel managers rated the four main climate change indicators very highly, as shown in Table 4.9.

Table 4.9: General Climate change indicators

General indicators (n = 36)	Rating	Freq	Percent	Mean	Std dev.
Increase in temperatures	Very Low	1	3		
	Low	0	0		

	Moderate	7	19	4.39	0.994
	High	4	11		
	Very High	24	67		
Changes in rainfall patterns	Very Low	0	0		
	Low	0	0		
	Moderate	5	14	4.53	0.736
	High	7	19		
	Very High	24	67		
Droughts	Very Low	1	3		
	Low	2	6		
	Moderate	6	17	4.31	1.117
	High	3	8		
	Very High	24	67		
Floods	Very Low	3	8		
	Low	2	6		
	Moderate	3	8	4.22	1.312
	High	4	11		
	Very High	24	67		
More intense storms	Very Low	4	11		
	Low	5	14		
	Moderate	27	75	2.64	0.683
	High	0	0		
	Very High	0	0		

The indicators were *increase in temperatures, changes in rainfall patterns, droughts* and *floods*. The responses averaged at least 4.2 with a standard deviation of at most 1.3. Only *more intense storms* variable rated relatively moderate (75%) with a mean of 2.6. Hotel managers, most of whom were Kenyans rated the main climate change indicators very highly. This could be attributed to the fact that they have lived in Kenya for a long time and therefore have experienced these changes over time. From these results, it is evident that storms have not affected the country.

Some regions of the world are more vulnerable to climate change than others (Kumssa and Jones, 2010). Despite the fact that developing countries have contributed the least to GHG emissions, these regions have experienced most climate change impacts in the last few decades. For example Sub-Saharan Africa (SSA) has contributed the least to the global accumulation of GHG emissions (less than 4%), but is the most vulnerable to the impacts of climate change. Therefore, climate change is not simply an environmental, but a social justice matter (Hope, 2009; Kumssa and Jones, 2010).

4.2.1.2.1: Distribution of Mean Score of General Indicators by Hotel rating

Box plot on these general indicators showed that mean of four star hotels was lower than three and five star hotels, as shown in Figure 4.4.

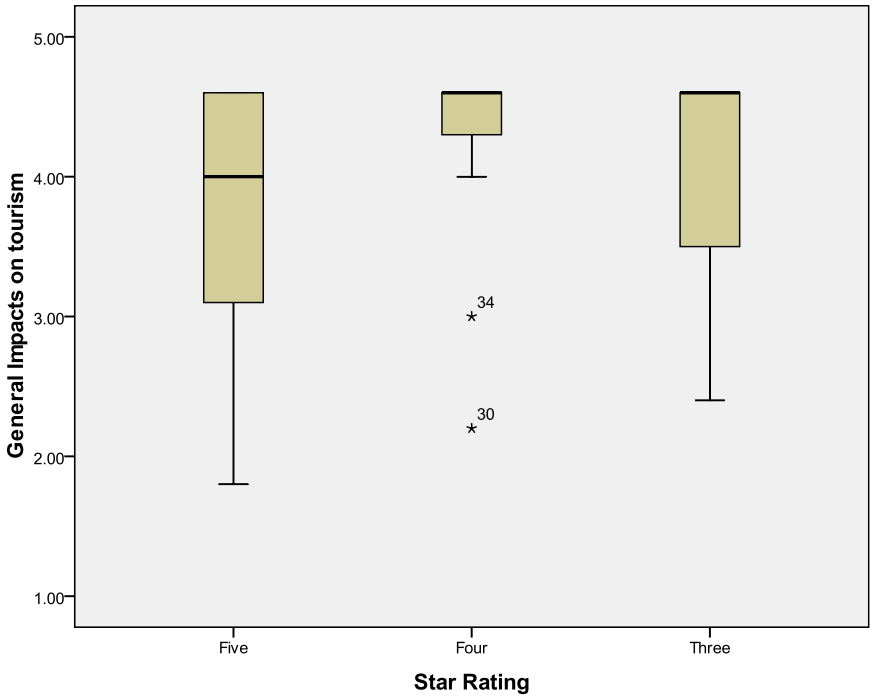

Figure 4.4: Distribution of Mean Score of General Indicators by Hotel rating

However, ANOVA test showed that there was no significant difference in mean score rating in the general indicators by hotel rating (p=0.481). This means that the indicators were felt uniformly despite the rating of the hotel. Therefore, as indicated by Scott and Lemieux (2011), climate poses a severe risk to tourism in relation to extreme events such as floods, droughts and heat waves, which put both tourists and tourism businesses at risk and increase financial costs.

4.2.1.2.2: Distribution of Mean Score of General Indicators by Region

Box plot of the general indicators by region showed that Coast region has the highest mean score, followed by Nairobi and then Central. This is depicted in Figure 4.5.

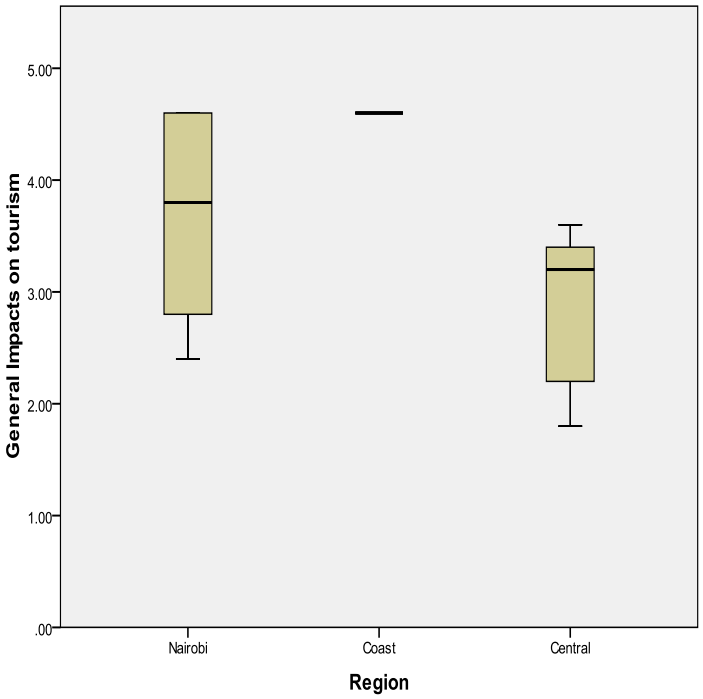

Figure 4.5: General Impact by Region of Mean score (hotels)

This is further implied by the ANOVA test that the general impact of climate change was significantly different across the three study regions, with the impact being highest

in Coast followed by Nairobi (p-value < 0.001). This means that the general indicators varied significantly across the three regions, with the coldest regions experiencing the least indicators. Gossling *et al.,* (2012) exerts that climate change will become an increasingly pivotal issue affecting tourism development and management because the impacts of climate change on tourism operations and destinations are closely entwined with tourist behavior.

4.2.1.3: Part 3: General indicators of climate change on tourism (experts views)

After gathering the results from tourists and the hotel managers, triangulation was done using indepth interviews on key tourism and / or climate change experts, as summarized in Figure 4.6.

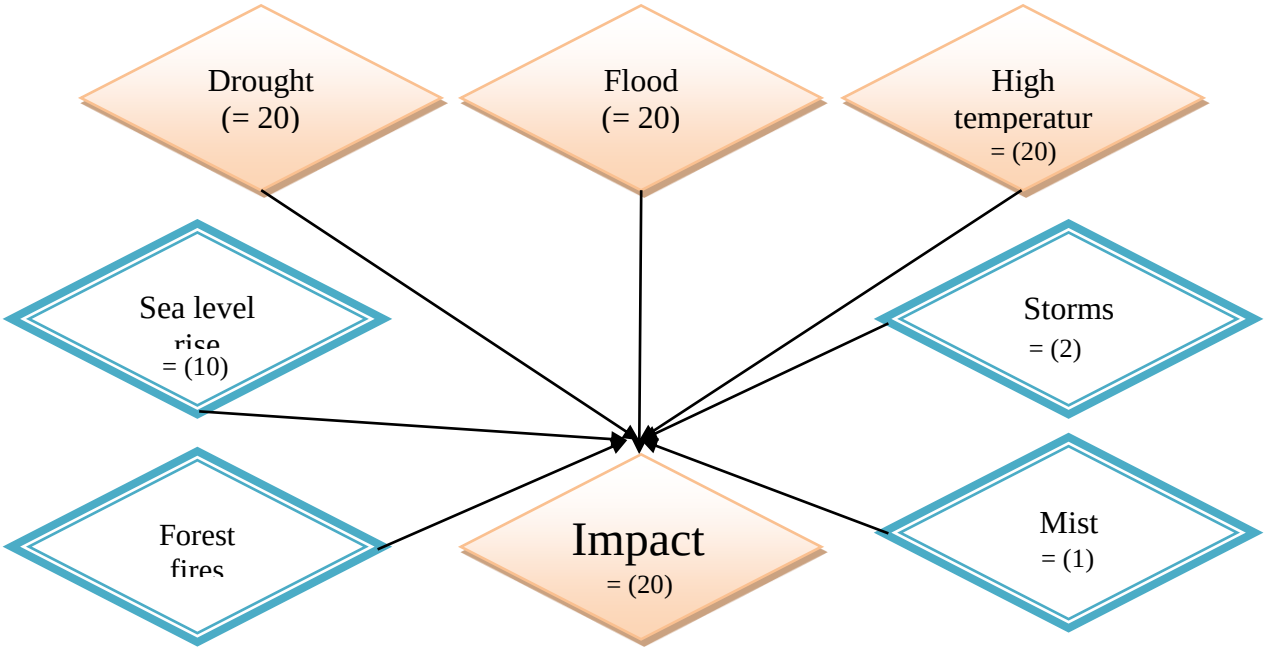

Figure 4.6: General indicators of climate change on tourism (experts views) N= 20

Among the 20 stakeholders interviewed, all of them said the three main general indicators of climate change were already occurring in Kenya in a severe and intense manner. These indicators were droughts, floods and high temperatures. This formed the area of convergence between the three groups of respondents: tourists, hotel managers and experts. However, other factors were mentioned by a few numbers of respondents and formed areas of non-convergence. 10 experts said that there was evidence of sea level rise, 2 mentioned forest fires and storms and only 1 mentioned evidence of increased mist. This is a confirmation that the existence of climate change indicators reported by tourists and hotel managers was actually true according to the experts. The main indicators were further described by experts as shown in the subsequent sections.

Direct climatic impacts are and will affect tourism activities directly in terms of changing the quality of climate as a tourism resource; changing the flow direction of tourism; causing seasonality and affecting planning, quality and profitability of the tourism industry (Goosling *et al.*, 2012).

4.2.1.3.1: Description of droughts

The indicator that featured most prominently in the discussions was droughts. All of the interviewees said that there was evidence of severe droughts, 17 said that the droughts were frequent and 18 that they were prolonged, as shown in Figure 4.7. The unshaded shapes show areas of non-convergence as additional information generated through the

interview. Generally, climate change has the potential to exacerbate adverse conditions but also may generate more favourable climates in some places (Scott *et al.*, 2011).

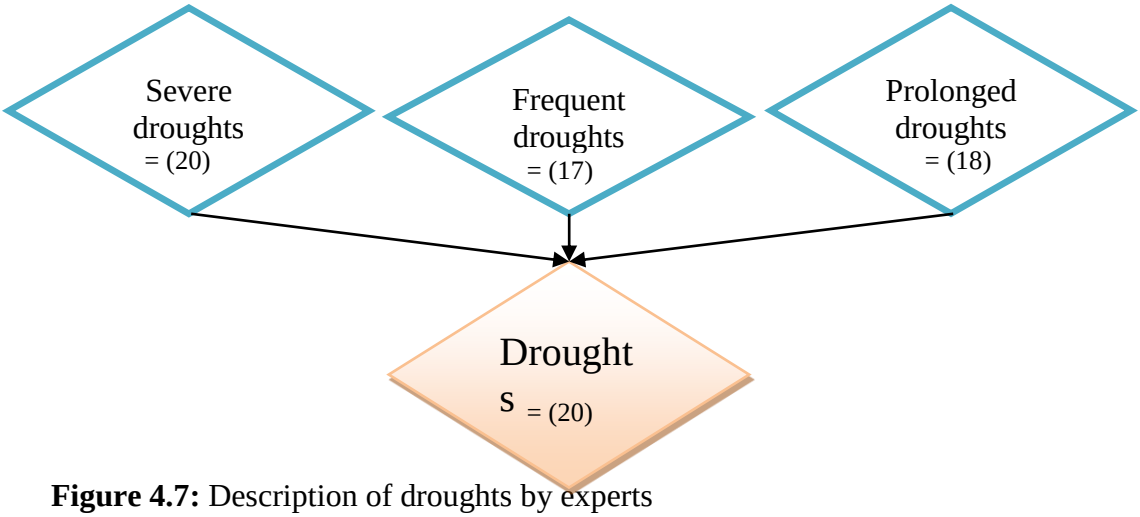

Figure 4.7: Description of droughts by experts

4.2.1.3.2: Droughts impacts perceptions

All the interviewees except one said that the droughts had resulted to variations in weather patterns, 12 said that droughts had caused a reduction of water levels and 18 said that droughts had caused habitat loss, as shown in Table 4.10. The length of the season is of crucial importance for private sector operators of tourist facilities. Climate is a principal driver of global seasonality in tourism demand (Hamilton *et al.*, 2005b; Gossling *et al.*, 2012).

Table 4.10: Droughts impacts

Drought results	**Number of times cited**
Variation in weather patterns	19
Reduced levels of water	12
Habitat loss	18

4.2.1.3.3: Floods impacts perceptions

The interviewees described floods using a number of factors. All the interviewees said that there were prolonged floods, heavy rainfall, unpredictable rainfall and frequent floods. Only 8 of them mentioned river flow variations caused by flooding, as shown in Figure 4.8. The unshaded shapes shows areas of non-convergence, which is additional information explaining the floods indicator. Gossling *et a.l,* (2012) has shown that climate-induced environmental change may adversely impact mountain destinations visitation depending on the purpose of the visit.

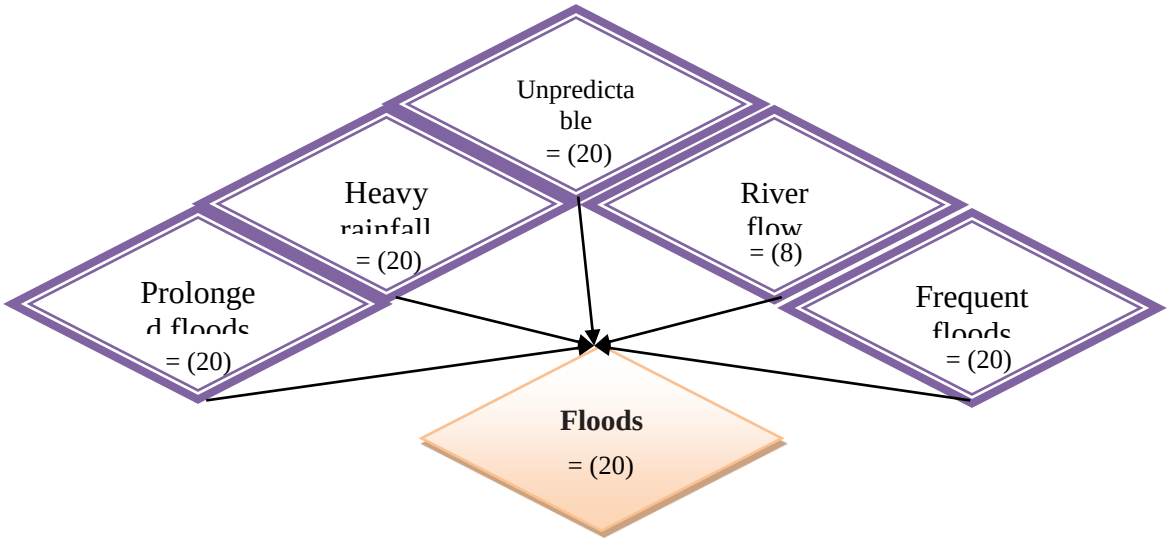

Figure 4.8: Floods impacts description

4.2.1.3.4: High temperatures

In relation to high temperatures, all the interviewees said that there was uncomfortable weather and hot weather conditions. However, 16 of them mentioned that there were

weather variations. This is summarized in Figure 4.9. The unshaded shapes show additional information which are areas of non-convergence.

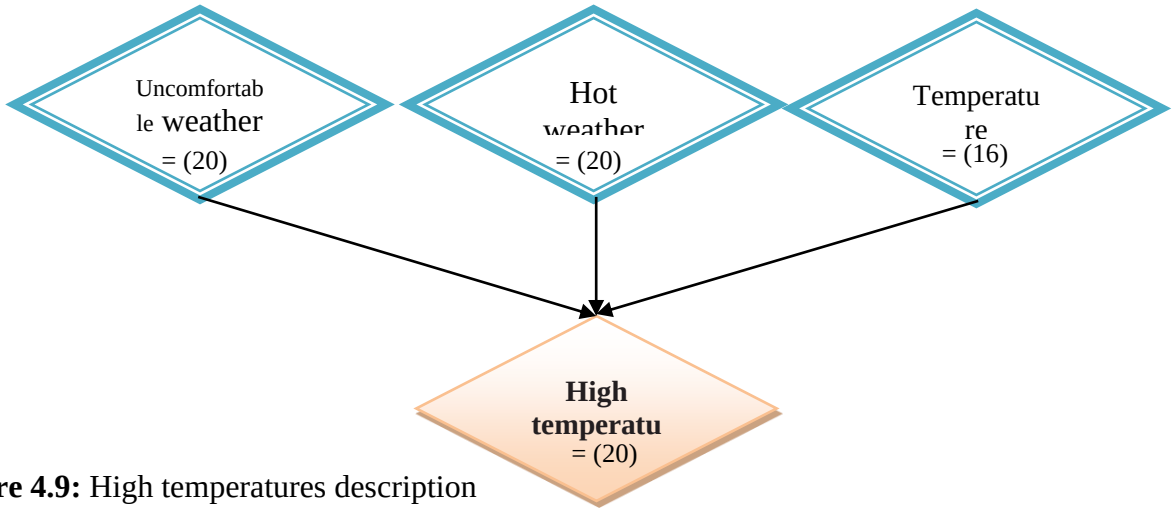

Figure 4.9: High temperatures description

The African continent has been affected by increased aridity especially since the 1980s and by the 2080s Africa's arid and semi-arid terrain is projected to expand by 5–8% (LaFleur *et al.,* 2009; Hope, 2009). For Africa, in terms of future trends, for the period 2080–2099 annual mean surface air temperature is expected to increase by an average of between 3°C and 4°C compared to the 1980–1999 period (Boko *et al.,* 2007). Rainfall is also expected to increase in tropical and Eastern Africa by more than 7% (Christensen *et al.,* 2007; Hope, 2009). These changes will have profound impact on tourism.

4.2.1.3.5: General indicators of climate change in Kenya

To further express the opinions of the 20 interviewees some of the most outstanding descriptions of general climate change indicators relevant to tourism are presented in Box 4.2.

The interviewees confirmed that the general indicators of climate are already a reality in Kenya and that the tourism sector is already being affected. The expert view of general climate change indicators strongly confirms the results from tourist and hotel managers. Although results from tourists could not significantly ascertain evidence of these indicators in Kenya, hotel managers and experts strongly confirmed that these indicators were already occurring in the country.

Box 4.1: General indicators of climate change in Kenya

General climate change indicators

Climate change poses great danger to people and resources (Government 1)

99 per cent of conflicts in the entire planet result from competition for natural resources…. managing such challenges is figuring out mitigation and adaptation measures in combating climate change (Government 5).

Climate change is a reality in Kenya. Kenya is susceptible to climate change effects. It is evident in the current variation in weather patterns, frequent and prolonged occurrence of droughts and floods, hot weather conditions, unpredictable rainfall occurrences, flash flood frequency and strengths is increasing and other environmental disasters are now a reality. Kenya has experienced both prolonged droughts and intense flooding every year since 2000 (Government 5).

Climate change in the country will worsen over the coming decades, even if stringent measures are adopted and implemented today towards reducing greenhouse gas emissions (Government 4).

The vulnerability of the forest to fires will increase; there will be a reduction of economic profitability in tourism and related sectors and river flows will reduce (Government 7).

The cooler regions have been affected by frost and hail that has affected vegetation and discouraged tourism in these regions, such as Central Kenya (Government 4).

It is likely that a changing climate will exacerbate the current rate of habitat loss in Kenya (Government 4).

The tourism industry, which supports a large proportion of the livelihoods and the Gross Domestic Product (GDP), is particularly vulnerable to the impacts of climate change (UN 1).

As climate change intensifies tourism demand patterns will inevitably alter. Perceived ethical considerations may induce tourists to switch from travelling overseas to holidaying closer to home (NGO 2).

Extreme events such as flash floods have at times rendered some tourist destinations inaccessible. For example the Masaai Mara National reserve was rendered inaccessible in 2011 due to the destruction of the road infrastructure (Government 4).

The results are also in line with the IPCC forth Assessment Report, which says that Africa is one of the regions most vulnerable to the adverse impacts of climate change. The report further points out that the continent is already under pressure from climate stresses and is highly vulnerable to the impacts of climate change. Many areas in Africa are recognized as having climates that are among the most variable in the world on seasonal and decadal time scales (Boko *et al.*, 2007).

A report by the Government of Kenya on climate change adaptation strategy confirmed that more frequent and severe floods and droughts, rising temperatures (15% rise between 1960 and 2003), declines in annual rainfall, rising sea levels, and reduced water availability are already a reality in the country (GoK, 2007). In addition, floods in many African countries such as South Africa, Kenya and Tanzania have destroyed property and infrastructure and displaced people (Kumssa and Jones, 2010). This has

both direct and indirect impact on tourism. The findings also agree with Kenya's recent reports on climate change; National Climate Change Response Strategy (NCCRS) and National Climate Change Action Plan (NCCAP) 2013 – 2017, which confirm the evidence of the climate system changing significantly (GoK, 2010; GoK, 2013).

Experts confirmed that the sea water has reached levels that it had never reached before. This is in line with other scientific research whereby the recent rise in sea level has been attributed to human-induced climate change (IPCC 2007a). A rise in sea level is predicted to threaten tourist destination cities like Mombasa (Kenya) due to damage caused to the tourism infrastructure such as airports, hotels, roads, communication and electrical networks, water works and health facilities. Sea level rise will also lead to coastland flooding, and a loss of habitat for birds, fish and other wildlife and plants (Kumssa and Jones, 2010).

4.2.2: Sub-theme 2: Indirect indicators of climate change on tourism

This sub-theme is divided into three parts: indirect indicators of climate change according to tourists, hotel managers and experts.

4.2.2.1: Part 1: Indirect indicators of climate change on tourism (Tourists views)

The majority of the tourist respondents either agreed or strongly agreed that there was presence of *weather disaster preparedness* (61%, mean 3.6). However, the majority of them were moderate on witnessing any *forest fires* (63%, mean 2.7) and *water restrictions* (70%, mean 2.8). Therefore, according to the tourists, there was evidence of

weather disaster preparedness but no evidence *of forest fires* and *water restrictions*. This is summarized in Table 4.11

Studies have shown that marked declines in precipitation levels have had a severe impact on water reserves, giving rise to conflicts among different economic activities (Martin, 2005) and reduced water available for use. Increases in temperature and drops in precipitation have left forests more vulnerable to fire, with a considerable rise in the number of forest fires over the last few years.

Table 4.0.11: Indirect indicators of climate change on tourism (tourists views)

Indirect indicators (N= 352)	**Sub-Levels**	**Freq.**	**Percent**	**Mean Score**	**Std**
Weather Disaster preparedness	Strongly disagree	18	5.1	3.62	1.163
	Disagree	52	14.8		
	Moderate	65	18.5		
	Agree	127	36.1		
	Strongly Agree	90	25.6		
Forest fires	Strongly disagree	43	12.2	2.66	.836
	Disagree	64	18.2		
	Moderate	225	63.9		
	Agree	10	2.8		
	Strongly Agree	10	2.8		
Water restrictions	Strongly disagree	30	8.5		
	Disagree	53	15.1		

	Moderate	248	70.5	2.76	.758
	Agree	12	3.4		
	Strongly Agree	9	2.6		

4.2.2.1.1: Indirect indicators according to the source market

According to Goosling *et al.,* 2012, perceptions of climate and climate change indicators differ among tourists from different cultural and climate contexts. To test if this is true in Kenya, an analysis of the indirect indicators according to the source market of the tourists respondents was performed in order to determine if there is a difference in the views of tourists on various indirect indicators. Although most of the respondents agreed or strongly agreed that climate change has caused *weather disaster preparedness*, most tourists who agreed were from Kenya (72%), North America (71%) and Asia (68%). The least number of respondents agreeing were from Africa (28%), as shown in Table 4.12.

Table 4.12: Residence and indirect indicators

	Country of Residence							
	Europe Percent	**Africa Percent**	**Kenya Percent**	**Asia Percent**	**North America Percent**	**South America Percent**	**Australia Percent**	**p value**
Weather Disaster preparedness								
Strongly disagree	.0	8.3	2.7	6.5	4.3	.0	30.8	
Disagree	14.0	27.8	7.3	10.9	19.1	14.3	7.7	
Moderate	17.5	34.7	17.3	13.0	4.3	28.6	7.7	0.000
Agree	47.4	9.7	50.9	34.8	29.8	42.9	30.8	
Strongly Agree	21.1	19.4	21.8	34.8	42.6	14.3	23.1	
Forest fires								

	Country of Residence							
	Europe	**Africa**	**Kenya**	**Asia**	**North America**	**South America**	**Australia**	**p value**
	Percent	**Percent**	**Percent**	**Percent**	**Percent**	**Percent**	**Percent**	
Strongly disagree	14.0	13.9	11.8	13.0	6.4	.0	23.1	
Disagree	17.5	29.2	8.2	23.9	23.4	14.3	7.7	
Moderate	61.4	50.0	76.4	58.7	63.8	71.4	61.5	0.322
Agree	3.5	4.2	1.8	4.3	.0	.0	7.7	
Strongly Agree	3.5	2.8	1.8	.0	6.4	14.3	.0	
Water restrictions								
Strongly disagree	.0	8.3	9.1	15.2	4.3	14.3	30.8	
Disagree	22.8	25.0	7.3	6.5	19.1	14.3	7.7	
Moderate	71.9	56.9	77.3	76.1	70.2	71.4	61.5	0.218
Agree	1.8	6.9	3.6	.0	4.3	.0	.0	
Strongly Agree	3.5	2.8	2.7	2.2	2.1	.0	.0	

There was a significant difference in these views, with Chi-square p-value of less than 0.001. Views on climate change causing *forest fires* and *water restrictions* did not vary with tourists source market since Chi-square produced a p-value of 0.322 and 0.218 respectively. Tourists could have experienced the increasing presence of *weather disaster preparedness* from floods, and storms. However, they may not have noticed any *forest fires* or *water restriction* if these did not occur during their stay in Kenya. In addition, tourists get preferential treatment in sharing of scarce resources such as water.

The competitive position of some popular holiday areas such as the Mediterranean and Africa are anticipated to decline, while others such as Canada are expected to improve. However, uncertainties related to tourist climate preference and destination loyalty will also greatly influence geographic and seasonal redistribution of visitor flows (Scott *et al.*, 2012).

4.2.2.1.2: Indirect indicators by purpose of visit

Tourists perceptions of most indirect indicators also varied by the purpose of visit (p-value < 0.05). Only *water restrictions* was not significant (p-value of 0.149). Leisure tourists were the most sensitive to the indicators followed by business tourists and then tourists visiting friends and relatives, as shown in Table 4.14.

Table 4.13: Indirect indicators by purpose of visit

Indirect indicators	**Business**	**Leisure**	**VFR**	**Total**	**p-value**
	Mean	Mean	Mean	Mean	
Weather disaster preparedness	3.6 (1.3)	3.7 (0.8)	3.3 (1.2)	3.6 (1.2)	0.078
Forest fires	2.6 (0.9)	2.8 (0.5)	2.4 (1.0)	2.7 (0.8)	0.009
Water restrictions	2.7 (0.9)	2.9 (0.5)	2.7 (0.8)	2.8 (0.8)	0.149
Total	**3.0 (1.0)**	**3.2 (0.6)**	**2.8 (1.0)**	**3.0 (0.9)**	

4.2.2.1.3: Indirect indicators of climate change on tourism by age

Tourists perceptions of indirect indicators also significantly varied by age with ANOVA value of 0.024. Older tourists are sensitive to indirect climate change indicators than younger tourists. Similar findings were obtained by Goosling *et al.*, (2012), whereby older people (+60 years) were more heat sensitive than younger people (18-24 years). This is summarized in Figure 4.10.

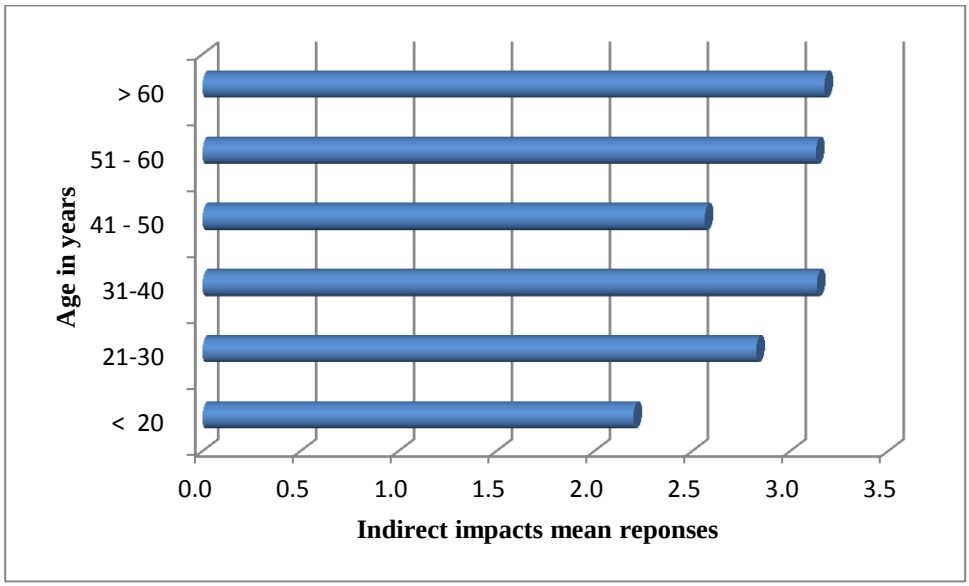

Figure 4.10: Indirect indicators of climate change on tourism by age (tourists views)

4.2.2.1.4: Indirect indicators by marital status

Weather disaster preparedness varied significantly according to marital status, as shown in Table 4.14. Married tourists were the most sensitive to this indirect indicator followed by single tourists and then the divorced. This finding was expected since married tourists, especially those travelling with children have been found to be more sensitive to risks than tourists travelling alone (Goosling *et al.*, 2012).

Table 4.0.14: Indirect indicators by marital status (tourists view)

Indirect indicators	**Married**	**Single**	**Divorced**	**Total**	**p-value**
	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	
Weather disaster preparedness	3.7 (1.1)	3.6 (1.2)	3.1 (1.3)	3.6 (1.2)	0.025
Forest fires	2.7 (0.8)	2.6 (0.9)	2.5 (0.9)	2.7 (0.8)	0.465
Water restrictions	2.8 (0.7)	2.8 (0.8)	2.6 (0.9)	2.8 (0.8)	0.220
Total	**3.1 (0.9)**	**3.0 (1.0)**	**2.7 (1.0)**	**3.0 (0.9)**	

4.2.2.1.5: Indirect indicators by hotel rating

Two indirect indicators of climate change on tourism varies significantly according to hotel rating which are *weather disaster preparedness* and *water restrictions*. In both cases, tourists staying in three star hotels were the most sensitive followed by four star and then five star hotels, as shown Table 4.15. According to Gossling *et al.,* (2012), tourism operators in certain market segments are profoundly affected by interannual climate variability and extremes.

Table 4.0.15: Indirect indicators by hotel rating

Indirect indicators	**Five**	**Four**	**Three**	**Total**	**p-value**
	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	
Weather disaster preparedness	3.1 (1.1)	3.6 (0.9)	3.9 (1.2)	3.6 (1.2)	0.000
Forest fires	2.6 (1.0)	2.8 (0.9)	2.6 (0.7)	2.7 (0.8)	0.285
Water restrictions	2.6 (0.8)	2.7 (0.7)	2.9 (0.7)	2.8 (0.8)	0.009
Total	**2.8 (1.0)**	**3.0 (0.8)**	**3.1 (0.9)**	**3.0 (0.9)**	

4.2.2.2: Part 2: Indirect indicators of climate change on tourism (hotel managers views)

Hotel managers were asked how they would rate a number of indirect climate change indicators on tourism. Most indirect indicators (8 out of 10) were strongly considered by the hotel managers as high and very high (mean above 4). *Loss of species habitats, increased water stress, damage of attractions, reduced agricultural production, loss of livelihoods, loss of biodiversity, increase in diseases* and *reduced landscape beauty* recorded a percentage of over 70% under high and very high. Although l*oss of culture*

and *species reduction* averaged below 4, the mean was closer to high than moderate. This shows that the indirect indicators of climate change on tourism are highly experienced by hotel managers in Kenya, as shown in Table 4.16.

The increases in air and sea temperatures favor the proliferation of certain organisms (such as mosquitoes and algae) that pose a health threat and, consequently, affect the normal provision of tourism activities (Martin, 2005). On the other hand, frequent droughts and floods will increase waterborne diseases such as cholera and diarrhoea, while at the same time spreading diseases such as malaria to the highlands of Africa such as in Kenya, Rwanda and Tanzania (Kumssa and Jones, 2010).

Table 4.16: Indirect indicators on tourism

Indicators	Rating	Freq.	Percent	Mean	Std Dev.
Loss of cultural heritage	Very Low	3	8		
	Low	4	11		
	Moderate	4	11	3.9	1.4
	High	7	19		
	Very High	18	50		
Loss of biodiversity	Very Low	2	6		
	Low	2	6		
	Moderate	5	14	4.3	1.2
	High	3	8		
	Very High	24	67		
Loss of species habitats	Very Low	0			

	Low	4	11		
	Moderate	2	6	4.4	1.0
	High	6	17		
	Very High	24	67		
Species reduction	Very Low	2	6		
	Low	3	8		
	Moderate	3	8	3.6	.9
	High	28	78		
	Very High	0			
Loss of livelihoods	Very Low	1	3		
	Low	5	14		
	Moderate	2	6	4.3	1.2
	High	4	11		
	Very High	24	67		
Reduced landscape beauty	Very Low	2	6		
	Low	2	6		
	Moderate	5	14	4.2	1.2
	High	4	11		
	Very High	23	64		
Damage of attractions	Very Low	2	6		
	Low	1	3		
	Moderate	3	8	4.4	1.1
	High	6	17		
	Very High	24	67		

Table 4.16: Indirect indicators on tourism contd…

Increase in diseases	Very Low	2	6		
	Low	2	6		
	Moderate	6	17	4.2	1.2
	High	2	6		
	Very High	24	67		
Reduced agricultural production	Very Low	1	3		
	Low	3	8		
	Moderate	2	6	4.3	1.1
	High	7	19		
	Very High	23	64		
Increased water stress	Very Low	1	3		

	Low	3	8		
	Moderate	1	3	4.4	1.1
	High	8	22		
	Very High	23	64		

In addition, damage of attractions has been reported whereby glaciers and the ice caps on mountains are melting, affecting water catchments downstream and the environment in general. This will also reduce the touristic value of these mountains. One of the most dramatic glacial retreats has been documented on Mount Kilimanjaro where scientists have observed in the past century an 80% decrease in the volume of glacial ice caps on the mountain. Scientists warn that if Mount Kilimanjaro continues to lose its glaciers at the current rate, they may disappear within the next decade (Kumssa and Jones, 2010).

4.2.2.2.1: Indirect indicators by star rating (hotel managers views)

Analysis between the indirect indicators of climate change and the star rating showed that the mean was the highest in four star hotels, followed closely by three star hotels and then five star hotels. However, this was found not to be significant with ANOVA p-value of 0.475 ($p > 0.05$), as shown in Figure 4.11. This is in line with Kundzewicz *et al.*, (2007) who found that environmental change due to climate change, extreme events and pressure on resources is posing challenges for tourist destinations.

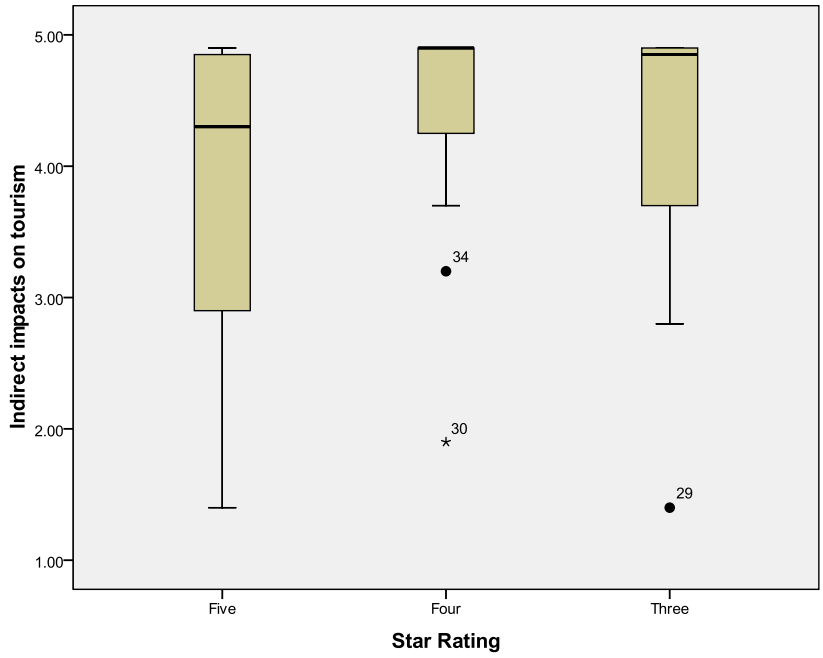

Figure 4.11: Indirect indicators by star rating (hotel managers views)

4.2.2.2.2: Indirect indicators of climate change by region (hotel managers views)

An analysis of hotel managers' view on the indirect indicators showed that these views varied significantly with the region of operation. Coast recorded the highest mean, followed by Nairobi and then Central. ANOVA test was significant with a p-value of less than 0.001. This means that hotter regions were experiencing more indirect indicators than colder regions, as shown in 4.12.

Climate changes will affect the tourism industry through additional emergency preparedness requirements, higher operating expenses (e.g., insurance, backup water and power systems, and evacuations), and business interruptions, depending on locations of such businesses (Martin, 2005).

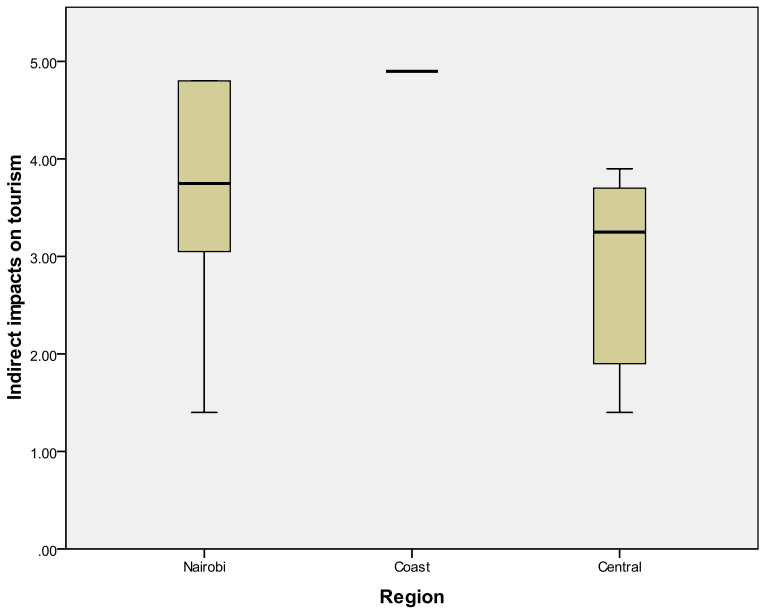

Figure 4.12: Indirect indicators of climate change by region

4.2.2.3: Part 3: Indirect indicators of climate on tourism (experts views)

The 20 interviewees reported that climate change indicators have impacted heavily on other systems related to tourism such as ecosystems and agriculture. In addition, there are a number of factors that are exacerbating climate change on tourism such as land use practices.

4.2.2.3.1: Systems affected related to tourism

All the interviewees said that there were other sectors related to tourism that were affected by climate change. 7 mentioned health, 19 agriculture and all of them biodiversity. All these were areas of convergence, as shown in Figure 4.13.

This is in line with Hope, (2009) who points out that many African countries are situated where extremes of climate variation such as drought and unpredictable rainfall patterns, coupled with famine and related humanitarian disasters, are already being experienced.

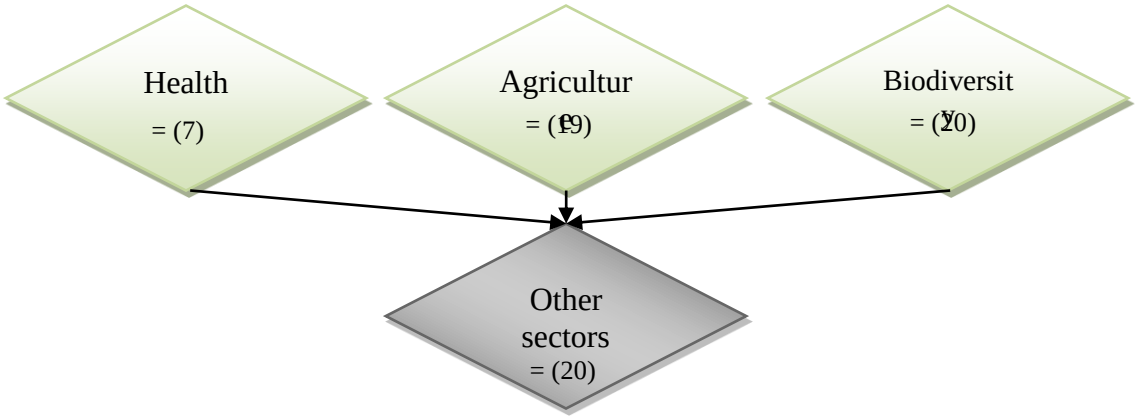

Figure 4.13: Systems affected related to tourism

4.2.2.3.2: Indicators of climate change on ecosystems

All the respondents said that climate change had impacted on the ecosystems. 18 said that there was habitat loss, 17 said that there were reduced water levels and 9 said that there was reduction of wildlife. These were all areas of convergence. However, 12 reported that there was invasion of species and 16 of them said that there was evidence of coral bleaching, which were areas of non-convergence, as shown in Figure 4.14.

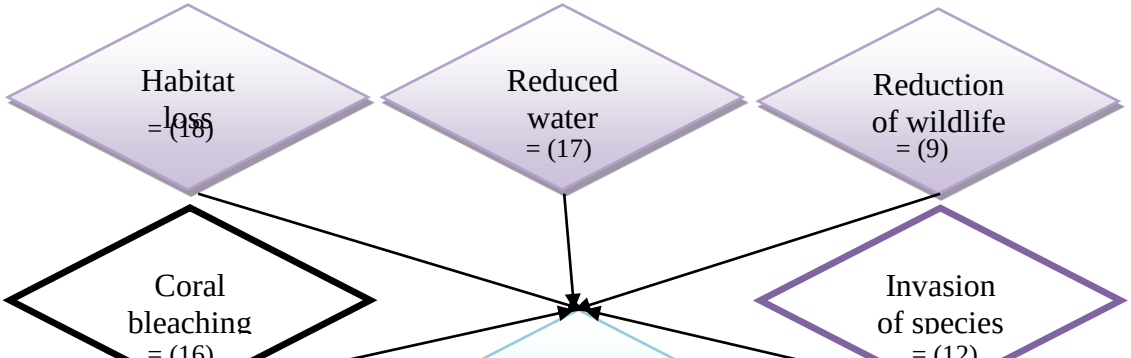

Figure 4.14: Indicators on ecosystems

Other similar findings relates to Biggs *et al.,* (2008) in their study of biodiversity loss in South Africa scenarios to explore future land use and climate change in southern Africa, whereby they project absolute declines in the average population sizes that are two to three times greater than the reductions that have occurred since 1700s. Although most of this decline is associated with land use practices, climate change is also expected to substantially contribute to species decline. Additionally, mammals are expected to be most impacted by the projected changes (Biggs *et al.,* 2008). These impacts will result in other effects which will indirectly impact on tourism.

4.2.2.3.3: Factors exacerbating climate change

All the interviewees said that there were various factors that were exacerbating climate change. 16 mentioned settlement, 15 illegal logging, 18 charcoal burning, 16 cultivation and 18 encroachment on habitat. This was further information sought on the factors that are exacerbating climate change and therefore represented areas of non-convergence, as shown in Figure 4.15.

Droughts will increase the prevalence of fire and predispose large areas of forest to pests and pathogens. Subtropical forests contain many biodiversity hotspots that are at particular risk from climate change, even under stable scenarios (Seppala, 2009).

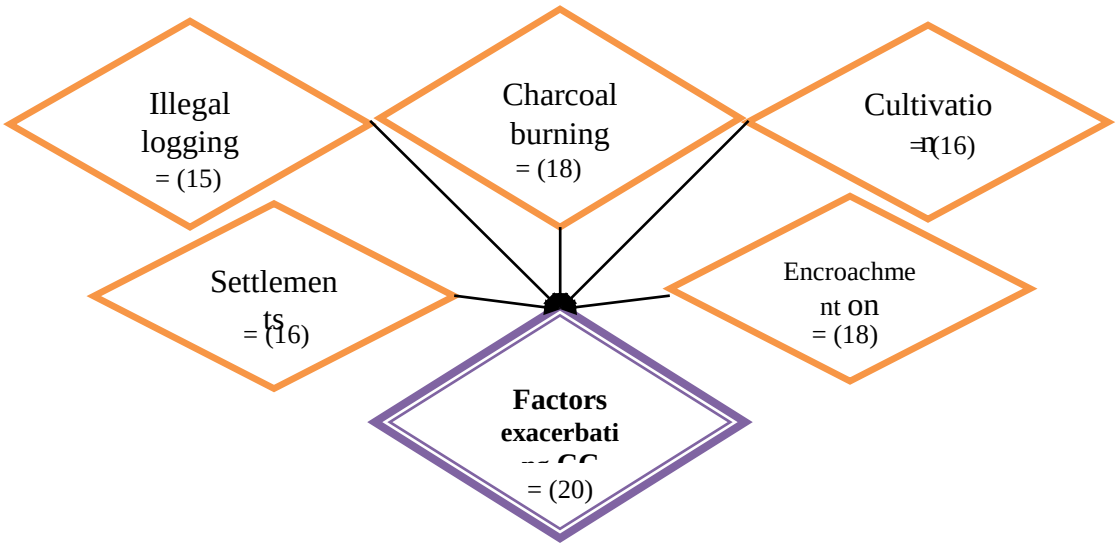

Figure 4.15: Factors exacerbating climate change

The experts emphasized that climate change has caused habitat loss, reduced water levels, increase in diseases and human – wildlife conflicts. The most important responses from the experts on indirect indicators of climate change affecting tourism in Kenya are presented in Boxes 4.3.

Box 4.2: Indicators of climate change on biodiversity

There may be major changes in biodiversity caused by climate change (Government 7). Loss of water resources and ecosystem resources especially wildlife is affected by climate change. The only lake in the central region Lake Olobolasat is almost drying up due to climate change and unsustainable land use practices. In addition, there has been a notable reduction of volume of water in the Mara river due to climatic change and the

destruction of the Mau catchment. This is affecting the ecosystem balance such as wildebeests migration between the Serengeti National Park in Tanzania and the Maasai Mara Reserve in Kenya (Government 4)

Climatic conditions have resulted to species reduction, isolation of wildlife, decreased forest cover. One in 10 species in Kenya could face extinction by the year 2100 if current climate change impacts continue (Government 4).

The 2009 prolonged drought was the worst that had ever been felt in the Amboseli ecosystem. The drought took a heavy toll on wildlife, livestock and habitats. Herbivores reduced from as many as 7000 to just 300. The communities also lost over 80 per cent of their livestock. Lions and hyenas turned to the remaining livestock. The communities attacked them in return (Government 4).

There was a decline in growth rate of elephant numbers that can partly be attributed to the severe drought Kenya suffered in 2009, which claimed hundreds of young and aged elephants…though poaching has greatly affected the growth. Drought has caused over 20 elephants death per year from 2007 to 2009 (Government 4).

In 2007, drought-induced anthrax in Northern Kenya plains infested Grevy's zebras living in and near Samburu National Reserve, and almost wiped them out. Other diseases such as *trypanosomiasis* will increase with climate change (Government 4).

Recent years have witnessed repeated crop failures and death of animals including wildlife in parts of the country due to prolonged droughts, including in areas that were traditionally considered 'safe' from extreme climate and weather events like droughts and floods. There has been increasing human encroachment into wildlife habitats. Wildlife straying into human settlements in pursuit of water and food is in the rise (NGO 1).

Generally, almost the entire African continent has been affected by increased aridity especially since the 1980s and by the 2080s Africa's arid and semi-arid terrain is projected to expand by 5–8% (LaFleur *et al.*, 2009; Hope, 2009).

4.2.2.3.4: Climate change impact on tourism in the coastal resources

Specifically, climate change has impacted on the coastal tourism resources such as beaches, mangroves, coastal rain forests, coral reefs, plants and other marine life as described in Box 4.4.

Box 4.3: Climate change impact on tourism in the coastal resources

Climate change impact on tourism in the coastal resources

Climate change is happening and will worsen over the coming decades, even if stringent measures are adopted and implemented today towards reducing greenhouse gas emissions. Beaches, mangroves, coastal rain forests, coral reefs, plants and other marine life which are the basis for the growing tourism sector in the coastal region have been affected by climate change at varying degrees. Coral bleaching has been identified as a cause of reef deaths in the Indian Ocean. In 1998, upto 50% of coral reefs died during the El Niño (Government 4).

Climate change has affected mangroves and caused displacement of coastal wetland, erosion of shorelines, increased salinity, and intrusion of saline into coastal aquifers (Government 4).

Mangrove dieback has caused massive sedimentation in many areas along the Kenyan coast due to erosion caused by extremely heavy rainfall (Government 4).

Although there is inadequate data on the impacts of climate change on biodiversity, climate change has caused more conducive conditions for the establishment and spread of invasive species also changed the suitability of microclimates for native species (Government 4).

Coral bleaching due to warming water temperatures is already affecting coral reefs, making connectivity important for recolonization ad recovery (Lovejoy and Hannah, 2005). For example climate change impacts on the Great Barrier Reef (GBR) include severe coral bleaching episodes in 1998 and 2002 due to higher summer sea temperatures and increased ocean acidity affecting calcium density in corals (Zeppel, 2011).

A wide-range of indirect climate change impacts are having and will have profound and varying effects on tourism at the destination and regional level such as: changes in biodiversity loss; water availability (Martin, 2005; Kundzewicz *et al.,* 2007); increased natural hazards; reduced landscape aesthetic; altered agricultural production (Easterling *et al.*, 2007); coastal erosion and inundation; coral bleaching (Goosling *et al.,* 2012); damage to infrastructure and attractions; increase in operating costs (Scott and Lemieux, 2011) and the increasing incidence of vector-borne diseases (UNWTO, 2007a).

4.2.3: Sub - theme 3: Direct indicators of climate change on tourism

4.2.3.1: Part 1: Direct indicators of climate change on tourism (tourists views)

A substantial number of tourists either strongly disagreed or disagreed that climate change had *reduced beach use* (49%, mean 2.4) and that it has *reduced their overall satisfaction* (38%, mean 2.7). The majority neither agreed nor disagree that it has *reduced overall satisfaction* though a mean score of 2.7 leans towards disagreeing. This shows that according to the tourists, the climate change indicators discussed earlier have not resulted into *reduced beach use* and *reduction in overall satisfaction* yet, as shown in Table 4.17.

Table 4.17: Direct indicators of climate change on tourism (tourists views)

Direct indicators (n= 352)	Sub-Levels	Freq.	Percent	Mean Score	Std
Reduced beach use	Strongly disagree	136	38.6		
	Disagree	39	11.1		

	Moderate	74	21.0	2.43	1.308
	Agree	94	26.7		
	Strongly Agree	9	2.6		
Reduced overall satisfaction	Strongly disagree	40	11.4	2.67	.772
	Disagree	57	16.2		
	Moderate	237	67.3		
	Agree	14	4.0		
	Strongly Agree	4	1.1		

4.2.3.1.1: Direct indicators of climate change according to source markets (tourists view)

Culture plays an extremely important role in travel behaviour and what may be perceived as unattractive in one culture may be attractive in another (Goosling *et al.*, 2012). In order to find out if tourists from different parts of the world have differing views on direct indicators of climate change, these views were distributed according to the source markets, as shown in Table 4.18.

Table 4.18: Direct indicators by place of residence (N= 352)

	Country of Residence							
	Europe	**Africa**	**Kenya**	**Asia**	**North America**	**South America**	**Australia**	**p value**
	Percent	**Percent**	**Percent**	**Percent**	**Percent**	**Percent**	**Percent**	

	Country of Residence							
	Europe	**Africa**	**Kenya**	**Asia**	**North America**	**South America**	**Australia**	**p value**
	Percent	**Percent**	**Percent**	**Percent**	**Percent**	**Percent**	**Percent**	
Reduced beach use								
Strongly disagree	38.6	15.3	53.6	41.3	29.8	42.9	61.5	<0.001
Disagree	12.3	22.2	6.4	8.7	6.4	14.3	7.7	
Moderate	22.8	31.9	18.2	10.9	21.3	28.6	7.7	
Agree	21.1	25.0	20.9	39.1	42.6	.0	23.1	
Strongly Agree	5.3	5.6	.9	.0	.0	14.3	.0	
Reduced overall satisfaction								
Strongly disagree	5.3	12.5	12.7	8.7	12.8	28.6	15.4	0.635
Disagree	10.5	19.4	13.6	21.7	17.0	.0	30.8	
Moderate	78.9	59.7	70.0	65.2	63.8	71.4	53.8	
Agree	1.8	6.9	3.6	4.3	4.3	.0	.0	
Strongly Agree	3.5	1.4	.0	.0	2.1	.0	.0	

Results showed that more than 50% of the tourists from Australia and Kenya strongly disagreed that climate change indicators have resulted to *reduced beach use*. This could be because these countries are already experiencing high temperatures and therefore high temperatures at the Kenya Coast could not be too high for them. ANOVA p-value of less than 0.001 shows that the tourist views on climate change *reducing beach use* differed according to the source markets. However, the view that climate change has *reduced overall satisfaction* did not differ according to the source market.

Declining rainfall and increasing temperatures will have serious consequences various sectors such as tourism in Africa (Hope, 2013) Climate change impacts on Africa's ecosystems will probably have a negative effect on tourism given that between 25% and

40% of mammal species in National Parks in Sub-Saharan Africa are likely to become endangered (Boko *et al.*, 2007). This will definitely have some effect on the satisfaction of tourists.

4.2.3.1.2: Direct indicators of climate change by purpose of travel

Perceptions on direct indicators of climate change varied by purpose of travel. Leisure tourists disagreed the most that climate change had caused *reduced beach use* (mean 1.5). Business and VFR tourists may not have used the beach and therefore were neutral (mean 2.9). However, a different trend was seen under *reduced overall satisfaction* effect whereby business and VFR tourists disagreed more (mean 2.6) than leisure tourists (mean 2.9) that climate change had caused *reduced overall satisfaction.* Overall, business travelers were the most sensitive to direct indicators followed by VFR tourists and then leisure tourists. These views were significant with ANOVA p-value of less than 0.05, as shown in Table 4.19.

Table 4.19: Direct indicators of climate change by purpose of travel

Direct indicators	**Business**	**Leisure**	**VFR**	**Total**	**p-value**
	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	
Reduced beach use	2.9 (1.2)	1.5 (1.0)	2.9 (1.1)	2.4 (1.3)	0.000
Reduced overall satisfaction	2.6 (0.9)	2.9 (0.5)	2.6 (0.9)	2.7 (0.8)	0.006
Total	**2.8 (1.0)**	**2.2 (0.7)**	**2.7 (1.0)**	**2.6 (1.0)**	

4.2.3.1.3: Direct indicators by age

Direct indicators varied with age, with older tourists being more sensitive to indicators than younger tourists, as shown Figure 4.16. . This could be associated with the fact that climate defines the length and quality of tourism seasons in different regions (Scott and Lemieux, 2011).

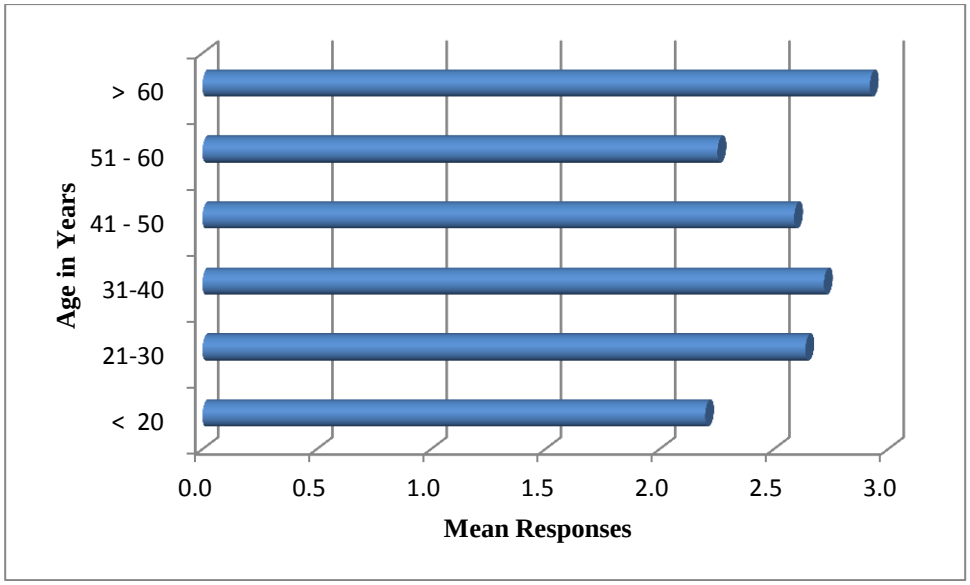

Figure 4.16: Direct indicators by age (tourists view)

4.2.3.1.4: Direct indicators by marital status

Married and divorced tourists disagreed the most that there is *reduced beach use* due to climate change indicators. However single tourists disagreed the most that climate change indicators had reduced overall satisfaction. This is summarized in Table 4.20.

Table 4.20: Direct indicators by marital status

Direct indicators	Married	Single	Divorced	Total	p-value
	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	
Reduced beach use	2.2 (1.4)	2.9 (1.1)	2.2 (1.2)	2.4 (1.3)	0.000
Reduced overall satisfaction	2.8 (0.7)	2.6 (0.8)	2.7 (0.9)	2.7 (0.8)	0.091
Total	**2.5 (1.0)**	**2.7 (1.0)**	**2.4 (1.1)**	**2.6 (1.0)**	

4.2.3.1.5: Direct indicators by hotel rating

Generally, five star hotels disagreed the most that climate change had caused *reduced beach use* and *reduced overall satisfaction* followed by four star and then three star, as shown in Table 4.21.

Destinations' competitive relationships and profitability will consequently be adversely affected by changes in the length and quality of climate-dependent tourism seasons such as sun-and-sea or winter sports holidays (Scott and Lemieux, 2011).

Table 4.21: Direct indicators by hotel rating

Direct indicators	Five	Four	Three	Total	p-value
	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	
Reduced beach use	1.8 (1.0)	1.9 (1.2)	3.0 (1.2)	2.4 (1.3)	0.000
Reduced overall satisfaction	2.6 (0.8)	2.8 (0.7)	2.6 (0.8)	2.7 (0.8)	0.116
Total	**2.2 (0.9)**	**2.3 (1.0)**	**2.8 (1.0)**	**2.6 (1.0)**	**0.000**

4.2.3.2: Part 2: Direct indicators of climate change (Hotel managers view)

Hotel managers were asked how they would rate a number of direct climate change indicators on tourism. The following question was posed:

Question: How would you rate the current climate change indicators affecting tourism in this area in terms of: (direct indicators)

More than 50% of the respondents rated 10 out of 12 indicators as high and very high. These indicators were *reduced competitiveness, damage to infrastructure, damage to company property, loss of revenue, additional emergency preparedness, higher operating expenses, business interruptions, reduced quality of tourism, affected destination image* and *increased cost of adaptation*. The mean ranged between 3.6 and 4.4. Only *reduction in tourist satisfaction* and *reduced length of tourism* were rated as moderate by 81% (mean of 3.1) and 78% (mean of 2.9) of the respondents respectively. The standard deviation in all the cases was very low, that is less than 1.0. This shows that tourism businesses are being affected both in operations and financially by the indicators of climate change. However, these indicators have not yet impacted on tourists directly since the length of tourism and tourists satisfaction has not been affected, as shown in Table 4.22.

Overall, there is evidence that the weather conditions experienced at the destination have important influence on travel and holiday satisfaction (Scott and Lemieux, 2011).

Table 4.22: Direct indicators on tourism

Direct indicators N= 36	Rating	Frequency	Percent	Mean	Std Dev.
Reduced competitiveness	Very Low	1	3		
	Low	1	3		
	Moderate	9	25	3.6	.7
	High	24	67		
	Very High	1	3		
Damage to infrastructure	Very Low	1	3		
	Low	1	3		
	Moderate	4	11	4.4	1.0
	High	6	17		
	Very High	24	67		
Damage to company property	Very Low	2	6		
	Low	10	28		
	Moderate	6	17	3.6	1.5
	High	0	0		
	Very High	18	50		
Loss of revenue	Very Low	2	6		
	Low	3	8		
	Moderate	5	14	4.0	1.2
	High	8	22		
	Very High	18	50		
Additional emergency preparedness	Very Low	1	3		
	Low	0	0		
	Moderate	6	17	4.3	1.0
	High	9	25		
	Very High	20	56		

Table 4.22: Direct indicators on tourism (continued)

Reduced length of tourism	Very Low	0			
	Low	2	6		
	Moderate	28	78		
	High	6	17	3.1	.5
	Very High	0	0		
Reduced quality of tourism	Very Low	1	3		
	Low	3	8		
	Moderate	9	25	3.6	.8
	High	21	58		
	Very High	2	6		
Affected destination image	Very Low	2	6		
	Low	2	6		
	Moderate	3	8	3.7	.9
	High	26	72		
	Very High	3	8		
Cost of adaptation	Very Low	0	0		
	Low	1	3		
	Moderate	7	19	4.4	.9
	High	3	8		
	Very High	25	69		
Reduction in tourist satisfaction	Very Low	3	8		
	Low	1	3		
	Moderate	29	81	2.9	.7
	High	2	6		
	Very High	1	3		

4.2.3.2.1: Direct indicators by hotel star rating

Box plot of the direct indicators and hotel star rating showed that the mean of five star hotels was slightly lower than the mean of four and three star hotels. However, ANOVA gave a p-value of 0.189, which was not significant, which means that all the hotels are experiencing the direct indicators of climate change relatively equally despite of their classification, as shown in Figure 4.17. Climate has been found to be a key factor considered by tourists, consciously or implicitly during travel planning, and represents both a push and pull factor for tourists (Jopp *et al.*, 2010).

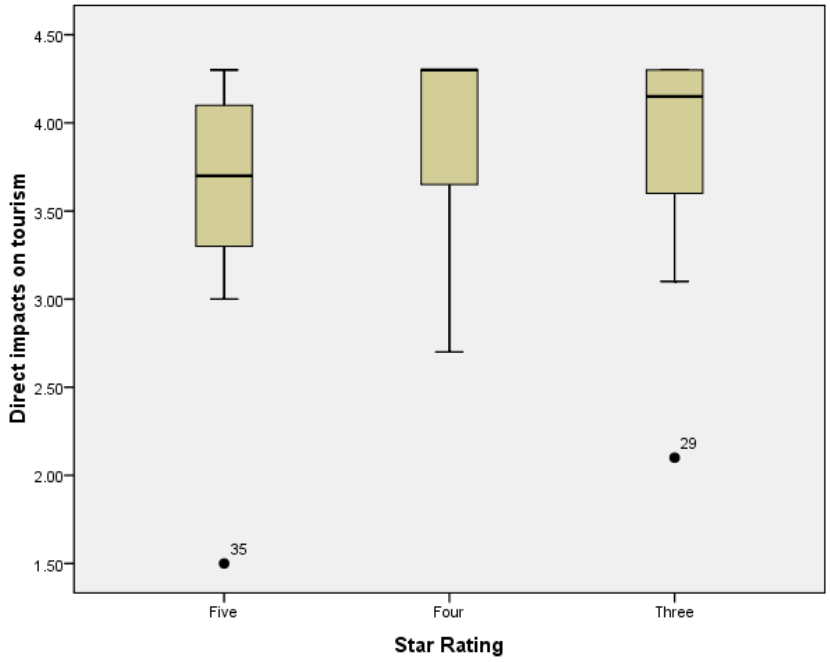

Figure 4.17: Direct Impact by hotel star rating (hotels)

4.2.3.2.2: Direct indicators of climate change by region

Box plots between the direct indicators of tourism and the region showed that Coast had the highest mean followed by Nairobi and then Central. ANOVA p-value of value <0.001 showed that this difference was significant. This means that hotels are experiencing indicators of climate change according to where they are situated. This is depicted in Figure 4.18. According to Scott and Lemieux, (2011), climate is a salient influence on tourist decision-making and the travel experience.

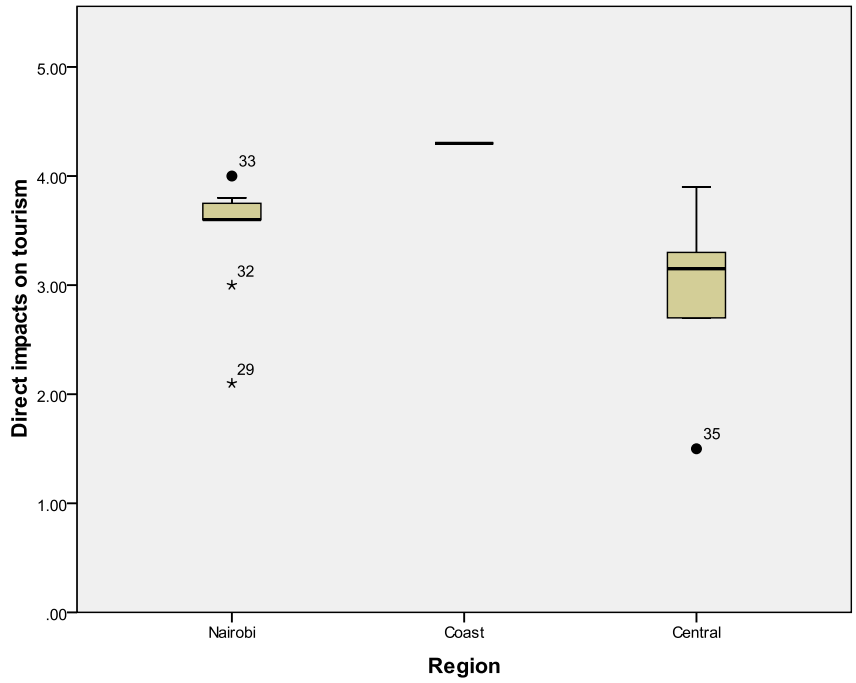

Figure 4.18: Direct indicators of climate change by region (hotels)

4.2.3.2.3: Indicators of climate change on tourism (hotel managers perspective)

Open-ended questions to the hotel managers generated the indicators of climate change on tourism presented in Box 4.5.

Box 4.4: Indicators on tourism resources

Indicator	Effects on resources
Heavy rain and floods	Flooding of roads, national parks and reserves, campgrounds and buildings; impassability of untarmacked roads, closure of recreation areas, damage to road infrastructure, road closures, road slips, bridges destruction, damage to walking tracks, overflow of rivers, lakes and coastlines, flash floods, rescue attempts difficult, cancellation of activities. Beach erosion.
Hot spells and drought	Fire risks, water shortages, low lake and river levels, reduced air quality from dust and increases in mosquitoes. Destruction of wildlife habitats; Less food and water for wildlife; Drought has also pushed lions closer to waterholes near human settlements. Human-wildlife conflicts. Effects on the coastal rainforests and fragile marine ecosystems. Wildlife diseases will increase with climate change eg *trypanosomiasis* and antrax.
High temperatures	Reduction of some species. Uncomfortable weather. High temperatures have reduced snow-caps of Mt. Kenya and Mt. Kilimanjaro.
Unseasonal weather	Difficult to plan outdoor recreation, disruption of activities, cancellation of activities, disruption to water- based activities and air transport (scheduled and scenic flights) and power outages.
Fog and mist	Transport disruptions and tourism activity cancellations.

Climate change is anticipated to have profound implications that could fundamentally transform aspects of the global tourism sector (UNWTO, 2007b).

4.2.3.3: Part 3: Direct indicators of climate change on tourism (experts views)

Experts reported that Kenya's weather and climate are a key attraction for tourism. Any changes in the climate system such as floods and high temperatures have impacted negatively on landscape, habitats, wildlife and tourists activities. However, the increased precipitation has caused more improvement to the industry than destruction. Also, according to the experts, tourists visiting Kenya may have slightly reduced due to the climate change mitigation policies being implemented in the European and other regions. Some of the most important views are presented in Box 4.6.

Box 4.5: Direct indicators of climate change on tourism (experts views)

Kenya's weather and climate attracts tourists from all over the world. The country's climate also plays an important role in region choice, timing of travel, and the overall satisfaction. In addition, the climate is conducive for the enjoyment of a wide variety of resources that are key tourist attractions in the country such as wildlife and beach (Academia, 2).

Abrupt weather changes are affecting the operations of tourism business as well as tourist satisfaction. Rains falling at the unexpected seasons is making planning difficult. Some tourists lodges that close during the rainy seasons are finding it difficult to determine when to close (Academia 3).

High temperatures have led to tourists involving in limited activities during the day. This has been observed in most parts of the country except the very cold areas, which are in most cases not attractive for tourism (Academia 4).

Droughts have not only reduced the richness of biodiversity, but also have made many parts of the country less attractive (Government 4).

Floods have resulted to closure of some tourism facilities in various regions in Kenya such as Samburu and Mombasa. Evacuations also have been expensive causing great loses to businesses and reduced tourist satisfaction (Government 2).

The high amounts of rainfall that has been experienced in the country from 2010 to 2013 has greatly improved the beauty of the country. Although a few cases of destruction of habitats and wildlife deaths have been reported, most the country has benefited heavily from the rains. Therefore this is an important positive impact of climate change (Government 3).

Although most of the current reduction of tourist numbers may be attributed to insecurity, there may be a small percentage that has been caused by mitigation policies such as carbon taxes (NGO 1).

African, like many developing countries is characterized with high levels of vulnerability and low adaptive capacity (Conway and Schipper, 2011; Kumssa and Jones, 2010).

4.2.3.3.1: Summary of general, indirect and direct indicators

4.2.3.3.1.1: Summary of indicators on the tourism sector - Hotel managers' perspective (N = 36)

On average, the hotel managers rated the indirect indicators and general indicators as between *high* and *very high* (4.19 and 4.02 respectively), and the direct impact as between *moderate* and *high* (3.81). Although ratings of the three types of indicators were close to high, the indirect indicators on tourism sector was the highest. This means that the direct indicators are not too heavy on the tourism sector yet, while the general and indirect indicators are already a reality in the country. Figure 4.19 shows a summary of climate change indicators affecting the tourism industry in Kenya according to the hotel managers.

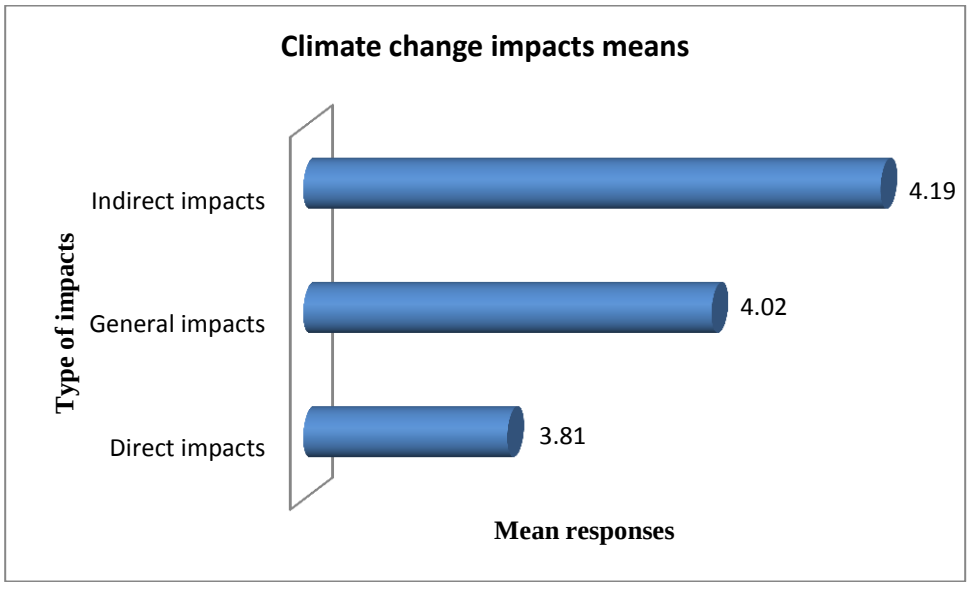

Figure 4.19: Summary of indicators on the tourism sector

4.2.3.3.2: Correlation among general, direct and indirect indicators (hotel managers views N=36)

Pearson correlation shows that there is direct positive correlation between the three indicators, as shown in Table 4.23.

Table 4.23: Correlation among general, direct and indirect indicators (hotel managers views)

Indicators		General Indicators	Direct Indicators	Indirect Indicators
General Indicators	Pearson Correlation	1	.798**	.965**
	Sig. (2-tailed)		.000	.000
	N	36	36	36
Direct Indicators	Pearson Correlation	.798**	1	.867**
	Sig. (2-tailed)	.000		.000
	N	36	36	36
Indirect Indicators	Pearson Correlation	.965**	.867**	1
	Sig. (2-tailed)	.000	.000	
	N	36	36	36

The correlation between general, direct and indirect indicators produced $p<0.01$ and r^2 between 0.798 and 0.965, This shows that tourists who perceived that Kenya is experiencing general indicators perceived also that the country is experiencing direct and indirect indicators.

Climate change impacts are exacerbated by a number of factors such as high reliance on natural resources, high poverty levels, illiteracy and lack of skills, weak institutions,

limited infrastructure, lack of technology and information, poor access to resources, lack of safety nets and armed conflicts (Christensen *et al.*, 2007).

4.2.3.3.2: Summary of indicators on the tourism sector - tourists perspective (n = 352)

4.2.3.3.2.1: Tourists views of all indicators

Tourists views, on the other hand, showed that the average of *general indicators, direct indicators* and *indirect indicators* leaned towards an average of 3. Although the responses were close to moderate, *general indicators* and *indirect indicators* leaned towards agree, while direct indicators leaned towards disagree. Therefore, although tourists reported to have experienced the various general and indirect indicators of climate change, these had not strongly directly impacted on them. Tourists views on climate change indicators evident in Kenya can be depicted in Figure 4.20.

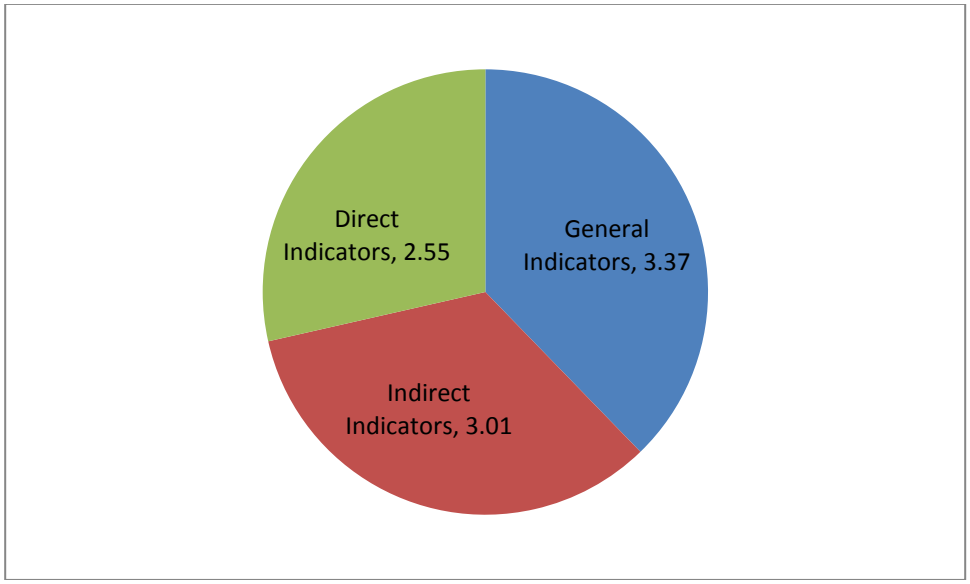

Figure 4.20: Tourists views of all indicators

In addition, the destination chosen for a given tourism experience has to meet motivational demands and provide satisfactory experiences in order to be successful (Goosling *et al.,* 2012). The respective combination of destination attributes and travel motives results in a destination's specific attractiveness and climate change can affect this attractiveness (Goosling *et al.,* 2012).

4.2.3.3.3: Relationship between tourists perceptions of general, direct and indirect indicators

Pearson correlation shows that there is direct positive correlation between the three indicators: general, direct and indirect indicators with $p<0.001$ and r^2 between 0.428 and 0.695, as shown in Table 4.24. This shows that tourists who perceived that Kenya is experiencing general indicators perceived also that the country is experiencing direct and indirect indicators.

Table 4.24: Correlations among indicators

Indicators		General Indicators	Direct Indicators	Indirect Indicators
General Indicators	Pearson Correlation	1	.428**	.695**
	Sig. (2-tailed)		.000	.000
	N	352	352	352
Direct Indicators	Pearson Correlation	.428**	1	.350**
	Sig. (2-tailed)	.000		.000
	N	352	352	352
Indirect Indicators	Pearson Correlation	.695**	.350**	1
	Sig. (2-tailed)	.000	.000	
	N	352	352	352

According to Scott and Lemieux (2010), all tourism destinations are climate-sensitive. Destinations are affected positively or negatively by interannual climate variability that brings floods, drought and storms which can affect not only tourist comfort and safety (and thereby satisfaction), but also the products that attract tourists (wildlife and coral reefs). This is because motives for travel are interlinked with perception of destination attributes such as climate.

4.2.3.3.4: Relationship between average indicators and weather parameters

There was a positive correlation between average perceptions of indicators and perceptions on weather parameters with $p<0.05$ and $r^2 = 0.105$. This implies that tourists who perceived that there is presence of general, direct and indirect impacts also perceived that weather parameters were important in choosing a destination, as shown in Figure 4.25.

Table 4.25: Correlations between average indicators and weather parameters

Indicators		Average Indicators	Weather parameters
Average Indicators	Pearson Correlation	1	.105*
	Sig. (2-tailed)		.049
	N	352	352
Weather parameters	Pearson Correlation	.105*	1
	Sig. (2-tailed)	.049	
	N	352	352

Up to 50 per cent of Africa's total biodiversity is at risk due to reduced habitat and other human-induced pressures due to agricultural expansion and subsequent destruction of

habitat; pollution; poaching; civil war; high rates of land use change; population growth and the introduction of exotic species. (Boko *et al*., 2007, UNFCCC, 2007).

4.2.4: Sub-theme 4: Magnitude of indicators of climate change on the main components of tourism

In order to find out the magnitude of climate change indicators on the main components of tourism, hotel managers were asked to rate the level of indicators on resources, activities, infrastructure and services. A five Likert scale was used with 1 being very low and 5 very high. The following question was posed:

Question: What is the magnitude of indicators of climate change on the following aspects of tourism?

4.2.4.1: Indicators on resources

Hotel managers were asked to rate the indicators of climate change on the three most important tourism resources in Kenya which are *wildlife, beach* and *sceneries*. Most hotel managers rated the magnitude of indicators on tourism resources highly. Those who said that climate change has impacted highly and very highly on *wildlife* were 85% (mean 4.7), *beach* 65% (mean 4.2) and *sceneries* 88% (mean 4.4). The magnitude of indicators of climate change on the three main tourism resources in Kenya (*wildlife, beach* and *sceneries)* was rated very highly by hotel managers, as shown in Table 4.26.

Table 4.26: Indicators on resources

Resources	Rating	Frequency	Percent	Mean	Std Dev .
Wildlife	Very Low	0	0		
	Low	0	.0		
	Moderate	5	14	4.7	.7
	High	2	6		
	Very High	29	81		
Beach	Very Low	0			
	Low	1	3		
	Moderate	11	31	4.2	1.0
	High	5	14		
	Very High	19	53		
Sceneries	Very Low	0			
	Low	2	6		
	Moderate	2	6	4.4	.8
	High	12	33		
	Very High	20	56		

In Kenya, forest area has reduced from 6.52% in 1990 to 6.09% in 2010. This has further changed wildlife habitat and biodiversity balance (World Bank, 2013). However, the terrestrial protected areas and marine protected areas have substantially increased from 11.6 and 5.2 in 1990 to 11.8 and 10.5 in 2010 respectively (World Bank, 2013). If this trend increases, wildlife will be more resilient to impacts of climate change due to increased habitat (Mutimba *et al.*, 2010).

4.2.4.1.1: Magnitude of indicators on resources by star rating

The magnitude of indicators on resources was seen to vary according to the star rating according to the box plot. However, ANOVA analysis showed that the variance was not significant with p-value of 0.768, as shown in Figure 4.21.

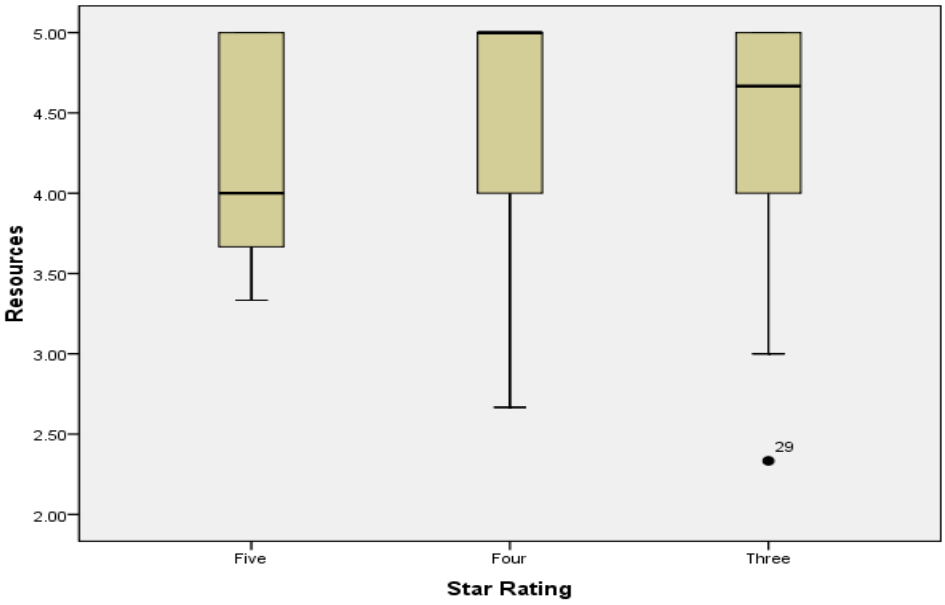

Figure 4.21: Magnitude of indicators on resources by star rating

Much of Kenya's remarkable biodiversity is protected by an extensive system of national parks, game reserves and forest reserves. Conservationists worry that the efficiency of the existing static protected areas for conserving wild species will increasingly be reduced as plants and animals respond to changes in climate with projected changes in the climate system (Lovett *et al.*, 2005).

4.2.4.1.2: Magnitude of indicators on resources by region

Box plot on the indirect indicators according to the region showed that views varied according to the region with Coast recording higher mean than Nairobi and Central. ANOVA produced a p-value of less than 0.001, which shows that the variance is significant. Magnitude of climate change indicators was significantly higher in hotter regions than in colder ones, as shown in Figure 4.22.

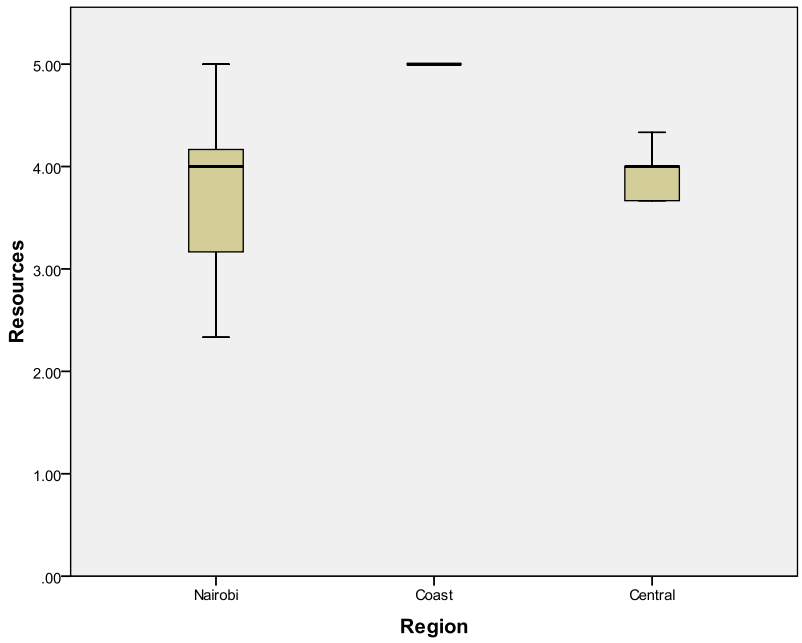

Figure 4.22: Magnitude of indicators on resources by region

A study by Cinner *et al.* (2012) found that coastal societies were highly vulnerable to a range of climate-related indicators in five countries in East Africa. They also found out that 7 of the 10 most vulnerable sites were from Kenya. In addition, coral reefs are highly vulnerable to climate change induced stresses that have led to substantial coral mortality over large spatial scales (Boko *et al.*, 2007).

Forests are a major tourist resource in Kenya. Forests are important attractions, sites for activities and wildlife habitats as well as water catchment areas, all crucial for tourism. Scientific information confirms that climate change is already affecting forest ecosystems such as tree growth and dieback, insect outbreaks, species distributions, species types and the seasonality of ecosystem processes (Seppala, 2009). This will

have profound indicators on tourism especially since in drier tropical areas, forests are projected to decline hence putting this biodiversity at considerable risk (Seppala, 2009). In addition, changes in vegetation in response to natural rainfall fluctuations are increasing desertification in many parts of the world (Lovett *et al.,* 2005) including Kenya. However, researchers do not know much about the response of the African flora and fauna to projected future climate changes, though preliminary models indicate substantial range shifts by both plants and animals (Lovett *et al.,* 2005).

With climate change protected areas cannot aspire to conserve biological diversity if it consists mostly of isolated units. Restoration of connections in landscapes between protected areas, always important for various migratory species is central to conservation under climate change. Habitat loss and alien invasive species are likely to interact in negative ways with climate change. Since these are considered the two main threats to biodiversity, conservation responses will be challenged by these interactions.

In addition, incentives should be provided to land owners in order to establish wildlife corridors through private or community land. Available funding mechanisms could include Carbon Finance, industry contribution and Pro-Poor Rewards for Environmental Services. However, the latter would need to be anchored in the Environmental Policy. Conservationists are now looking to the development experience for useful lessons in how to bring local people into the conservation process in Africa.

4.2.4.2: Magnitude of indicators of climate change on activities

Indicators on all the activities were rated by the hotel managers as high and very high by most of the respondent (over 60%, mean between 3.6 and 4.4), except *business / conferencing* whose respondent concentrated on moderate (80%, mean 2.9). Therefore the tourist activities that have been highly impacted were *beach activities*, *game drives*, *sightseeing*, *adventure*, *trekking / walking*, *animal riding* and *camping*. *Business* and *conferencing* has not been highly affected probably since it takes place indoors, as shown in Figure 4.27.

Climate change is the next great set of human changes that may alter biodiversity important for tourism and its conservation. It is apparent that the current protected area system in Kenya is insufficient in the changing climate environment. Therefore there is need for reassess and redesign to create a system resilient to climate change.

Table 4.27: Indicators on activities

Indicators	Rating	Frequency	Percent	Mean	Std Dev.
Beach activities	Very Low	0	0		
	Low	1	3		
	Moderate	12	33	4.1	1.0
	High	5	14		
	Very High	18	50		
Game drives	Very Low	1	3		
	Low	2	6		
	Moderate	3	8	4.4	1.0
	High	6	17		
	Very High	24	67		
Sightseeing	Very Low	1	3		
	Low	2	6		
	Moderate	4	11	3.7	.7
	High	28	78		
	Very High	1	3		
Business / conferencing	Very Low	1	3		
	Low	4	11		
	Moderate	29	81	2.9	.6
	High	1	3		
	Very High	1	3		
Adventure	Very Low	1	3		
	Low	4	11		
	Moderate	4	11	3.6	.8
	High	26	72		
	Very High	1	3		
Trekking / walking	Very Low	2	6		
	Low	3	8		
	Moderate	5	14	4.2	1.3
	High	2	6		
	Very High	24	67		
Animal riding	Very Low	2	6		
	Low	4	11		
	Moderate	5	14	4.1	1.3
	High	1	3		
	Very High	24	67		
Camping	Very Low	1	3		
	Low	2	6		
	Moderate	5	14	4.2	1.1
	High	9	25		
	Very High	19	53		

4.2.4.2.1: Magnitude of indicators on activities by star rating

Although Box plots showed that four star hotels' activities were affected most by climate change indicators, the difference was not significant with ANOVA p-value of 0.799. Therefore, tourist activities were affected relatively equally despite of the rating of hotels, as shown in Figure 4.23.

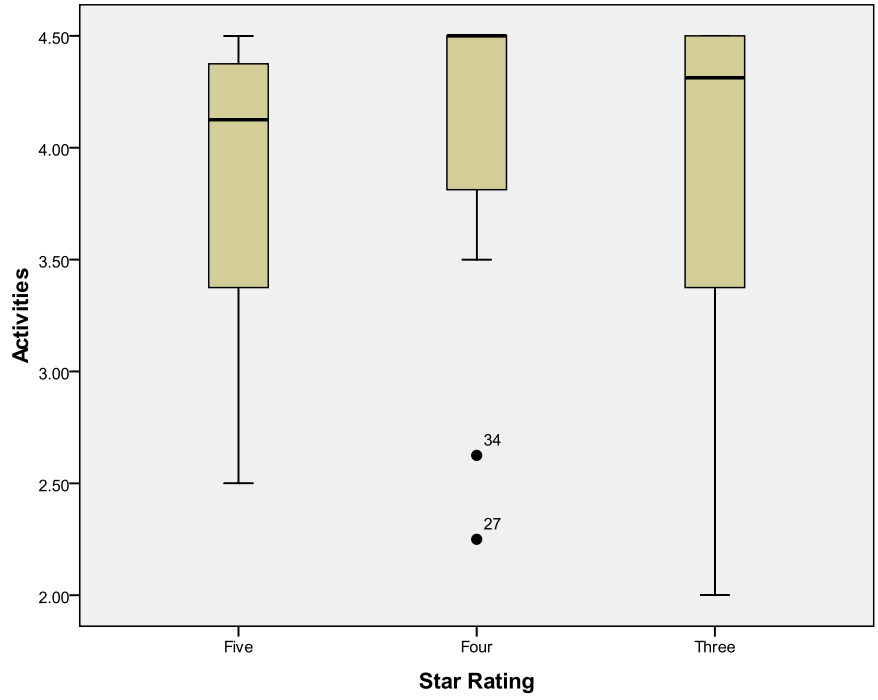

Figure 4.23: Magnitude of indicators on activities by star rating

Tourism continues to depend on a few natural areas (wildlife, the beach and scenic features) that are getting depleted by other activities and by tourism itself (Mutimba *et al.*, 2010).

4.2.4.2.2: Magnitude of indicators on activities by region

A box plot analysis of the indicators of climate change on the activities showed that hotel managers' views on these indicators varied according to the regions with the

lowest mean in Coast followed by Nairobi and then Central. ANOVA analysis showed that this variance is significant with p-value less than 0.001. Activities have not been highly impacted in colder regions as much as in the hotter regions, as shown in Figure 4.24.

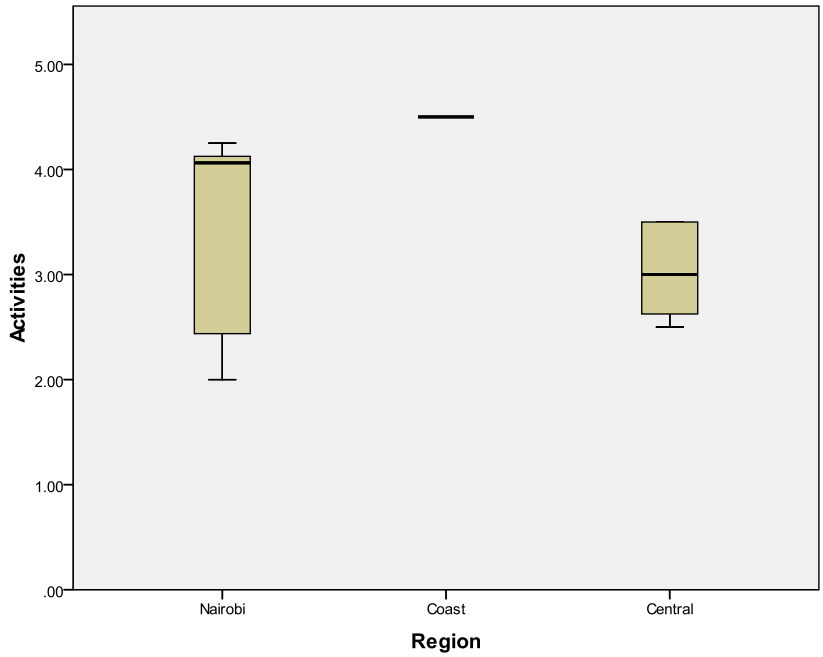

Figure 4.24: Magnitude of indicators on activities by region

Other studies have shown that climate change and weather can adversely affect tourist activities (Mutimba *et al.,* 2010). Consequently, the wrong combination of climatic conditions may more than suffice to cancel a scheduled programme (Martin, 2005).

4.2.4.3: Magnitude of indicators of climate change on the infrastructure

The majority of the hotel managers reported that indicators of climate change on various infrastructure was either high or very high (over 70%). The mean score was at least 4.3 which means that the mean was between high and very high. These

infrastructure were *roads, telecommunication, sewer system* and *airports/ airstrips.* Therefore, tourism infrastructure has been highly affected by climate change indicators, as summarized in Table 4.28.

Table 4.28: Magnitude of indicators on infrastructure

Impact	Rating	Frequency	Percent	Mean	Std Dev.
Roads	Very Low	0	0		
	Low	2	6		
	Moderate	4	11	4.4	.9
	High	9	25		
	Very High	21	58		
Telecommunication	Very Low	1	3		
	Low	3	8		
	Moderate	5	14	4.3	1.2
	High	3	8		
	Very High	24	67		
Sewer System	Very Low	2	6		
	Low	2	6		
	Moderate	4	11	4.3	1.2
	High	2	6		
	Very High	26	72		
Airports/airstrips	Very Low	1	3		
	Low	2	6		
	Moderate	6	17	4.28	1.111
	High	4	11		
	Very High	23	64		

A similar studies shows that a wet ground following heavy rain can cause accidents among those on a cycling holiday, make a windy day of swimming in the sea difficult and generally put a stop to almost all outdoor activities (Martin, 2005). In addition, climatic elements such as temperature, humidity, rainfall, fog, and winds should be

considered when planning different overland routes, airports, coastal infrastructure, and river navigation projects (Scott and Lemieux, 2010).

4.2.4.3.1: Magnitude of indicators on infrastructure by star rating

Box plot analysis showed that indicators on infrastructure did not significantly vary according to the star rating (ANOVA p - value = 0.558), as shown in Figure 4.25. This a reason to worry since according to Martin, (2005), when faced by adverse weather conditions, tourists have to rethink their activities, abandoning outdoor in favor of indoor ones.

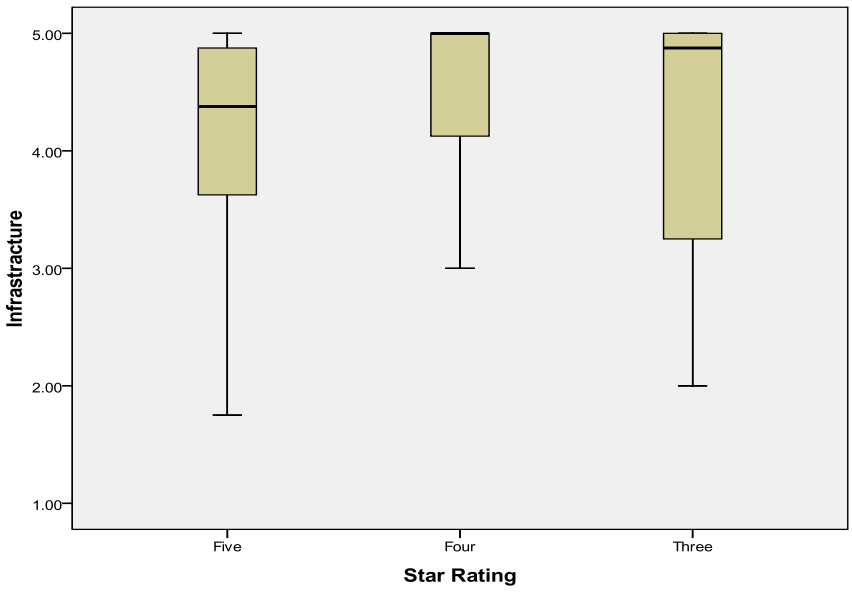

Figure 4.25: Magnitude of indicators on infrastructure by star rating

4.2.4.3.2: Magnitude of indicators of climate change on the infrastructure by region

There was a significant difference of views on indicators on infrastructure according to regions. Coast produced the highest mean followed by Nairobi and then Central

(ANOVA p-value < 0.001). Therefore hotel managers from the hotter regions perceived indicators on infrastructure as higher than those from colder regions, as shown in Figure 4.26.

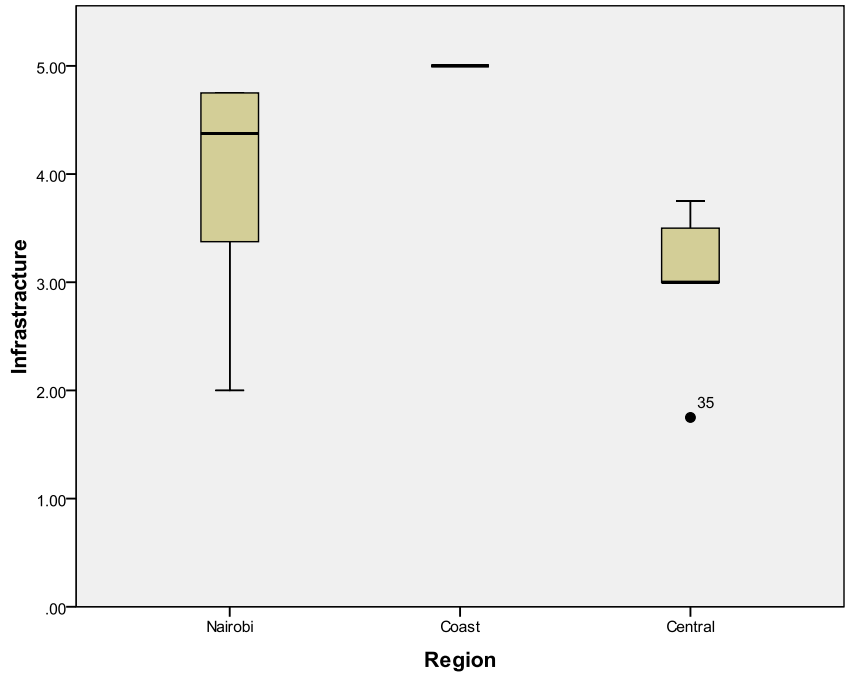

Figure 4.26: Magnitude of indicators on the infrastructure by region

Similar studies show that climate variability influences various facets of tourism operations (water supply and quality, heating–cooling costs, irrigation needs, pest management, and evacuations and temporary closures, for example) (Martin, 2005; Scott and Lemieux, 2010). This is important in order to determine the possible weaknesses or diseconomies caused by road surface erosion and road closures (due, for example, to frequent floods) and to be able to take the most appropriate measures to rectify the problems (Martin, 2005).

4.2.4.4: Magnitude of indicators of climate change on services

Majority hotel managers (over 70%) rated climate change indicators on services as at least high. These services were *road transport, air transport* and *hospitality services*. This resulted to a mean of at least 3.7, as shown in Table 4.29.

Table 4.29: Indicators on services

Impact	Rating	Frequency	Percent	Mean	Std Dev.
Road transport	Very Low	1	3		
	Low	1	3		
	Moderate	4	11	4.5	1.0
	High	2	6		
	Very High	28	78		
Air transport	Very Low	2	6		
	Low	2	6		
	Moderate	6	17	3.7	1.0
	High	21	58		
	Very High	5	14		
Hospitality services	Very Low	1	3		
	Low	3	8		
	Moderate	5	14	3.8	.9
	High	22	61		
	Very High	5	14		

The private sector faces many challenges that are hindering effective engagement in climate change adaptation. These include; low understanding of climate change adaptation risks and its opportunities, increasing climate variability that brings about operational constraints, the high costs inherent to the infrastructure sector, financial risks due to insufficient cost recovery, unreliable weather information, high cost of capital and weak linkages (Lovett *et al.,* 2005).

4.2.4.4.1: Magnitude of indicators of climate change on the services by hotel rating

Although Box plots showed that the hotel managers from three star hotels reported a higher rating of the magnitude of indicators on services, ANOVA p-value of 0.550 shows that there was no significant difference of views according to the hotel rating. This can be summarized in Figure 4.27

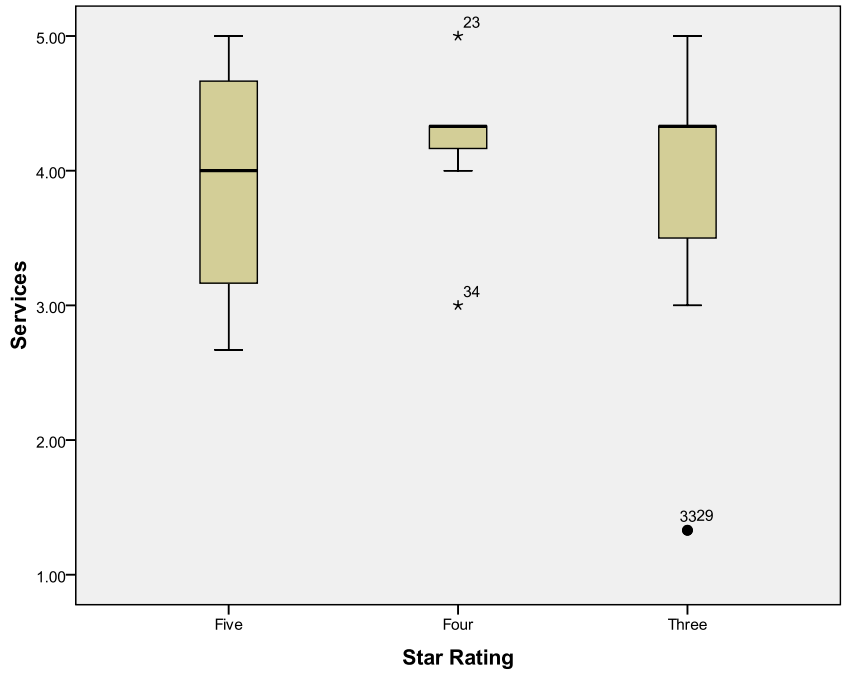

Figure 4.27: Magnitude of indicators of climate change on the services by hotel rating

These results are in line with Martin (2005) who found out that climate and weather have a major influence on whether transport and communication systems work smoothly and facilitate or confine tourists' mobility. This factor is undeniably important given that the definition of tourism requires movement in space.

4.2.4.4.2: Magnitude of indicators of climate change on the services by region

Box plot showed that the hotel managers responses on climate change indicators on services differed by region. Coast and Nairobi recorded a much higher mean than Central. An ANOVA p-value of 0.014 showed that this difference was significant. This means that hotter regions were experiencing higher magnitude of climate change indicators on services than colder regions, as shown in Figure 4.28.

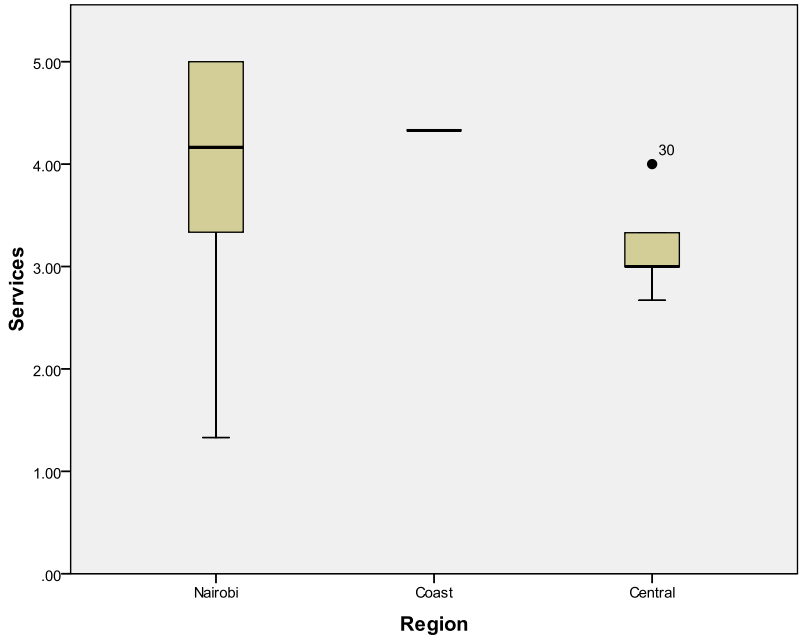

Figure 4.28: Magnitude of indicators on the services by region

Tourists have become increasingly more dynamic and, as a result, demand efficient systems of transport and communication that allow them to fulfill their objectives. In addition, climate has a strong influence on the seasonality of tourism activities (Scott and Lemieux, 2010). Long seasons mean the infrastructure and services are more extensively exploited and, consequently, allowing a higher return on the capital invested (Martin, 2005).

4.2.4.5: Magnitude of indicators of climate change on the facilities

The hotel managers' views on climate change indicators on facilities were varied. Only 57% of the respondents said that climate change had highly impacted on *buildings*, 77% said that it had highly impacted on *sites* and 68% said that it had highly impacted on *equipment*. Therefore magnitude of indicators on facilities was high, as shown in Table 4.30.

Table 4.30: Magnitude of indicators on the facilities

Impact	Rating	Frequency	Percent	Mean	Std Dev.
Buildings	Very Low	1	3		
	Low	2	6		
	Moderate	12	33	3.5	.8
	High	20	56		
	Very High	1	3		
Sites	Very Low	0			
	Low	4	11		
	Moderate	4	11	4.2	1.0
	High	9	25		
	Very High	19	53		
Equipment	Very Low	1	3		
	Low	3	8		
	Moderate	7	19	4.1	1.2
	High	6	17		
	Very High	19	53		

Some possible initiatives to overcome these difficulties include; stimulating the market for adaptation by scaling up financial and risk reduction incentives, building private sector capacity to engage, policy and regulatory mechanisms, generating case studies to show the viability of adaptation, improving weather data availability and providing

decision-relevant information, improving infrastructure, and expanding project bonds (Lovett *et al.*, 2005).

4.2.4.5.1: Magnitude of indicators of climate change on the facilities by hotel rating

Box plot showed that the climate change indicators on facilities varied by star rating but this was found to be not significantly with ANOVA p-value of 0.117. Therefore the magnitude of indicators on facilities is relatively the same in all hotels regardless of their rating, as shown in Figure 4.29.

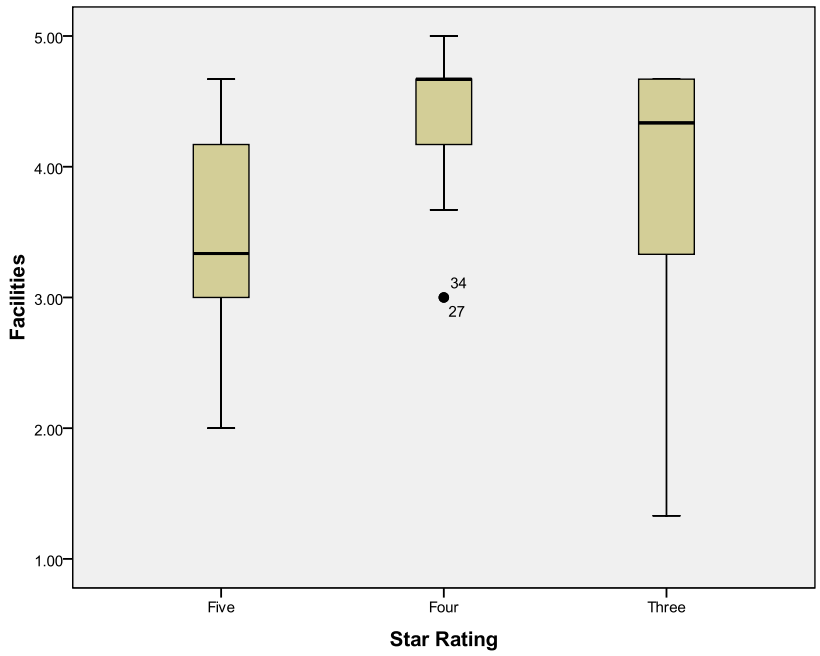

Figure 4.29: Magnitude of indicators on the facilities

4.2.4.5.2: Magnitude of indicators of climate change on the facilities by region

Box plot showed that the climate change indicators on facilities varied according to regions. Coast recorded the highest mean followed by Nairobi, which was followed closely by Central. ANOVA resulted into a p-value of less than 0.001, which was significant. Therefore, as it is the case of the other components of tourism discussed earlier, perceptions on indicators of climate change on facilities varied by region with hotter regions experiencing higher magnitude. This can be depicted in Figure 4.30.

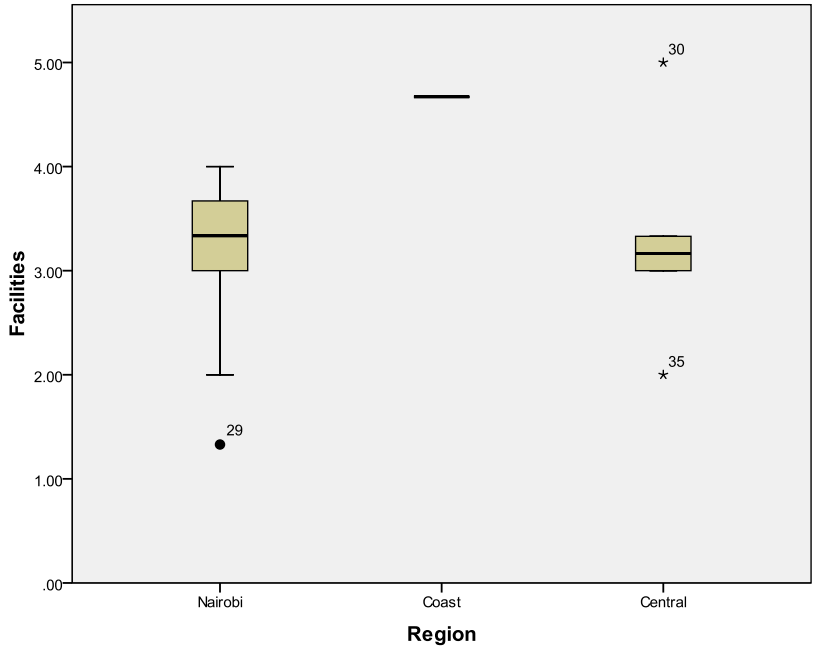

Figure 4.30: Magnitude of indicators on the facilities by region

A similar study can be found in Martin (2005) who found out that climate both determines the ideal type of accommodation and has an influence on the architecture of the tourism complex. For example, cool and wet climate is not very appropriate for camping. On the other hand, the type of construction should ensure occupants will enjoy comfortable and safe indoor environments. This calls for carefully considering the

weather of a place when designing the buildings and, when necessary, by installing artificial devices such as air conditioning.

4.2.4.5.3: Summary of magnitude of indicators on components of tourism – (hotel managers perspective)

Hotel managers rated indicators of climate change as highest on *infrastructure (4.31)* and substantially lower in *services (3.99), facilities (3.93) and activities (3.91).* These responses were all very close to high. This means that these indicators have been felt the heaviest on *infrastructure* but also considerably high on *services*, *facilities* and *activities*, as shown in Figure 4.31.

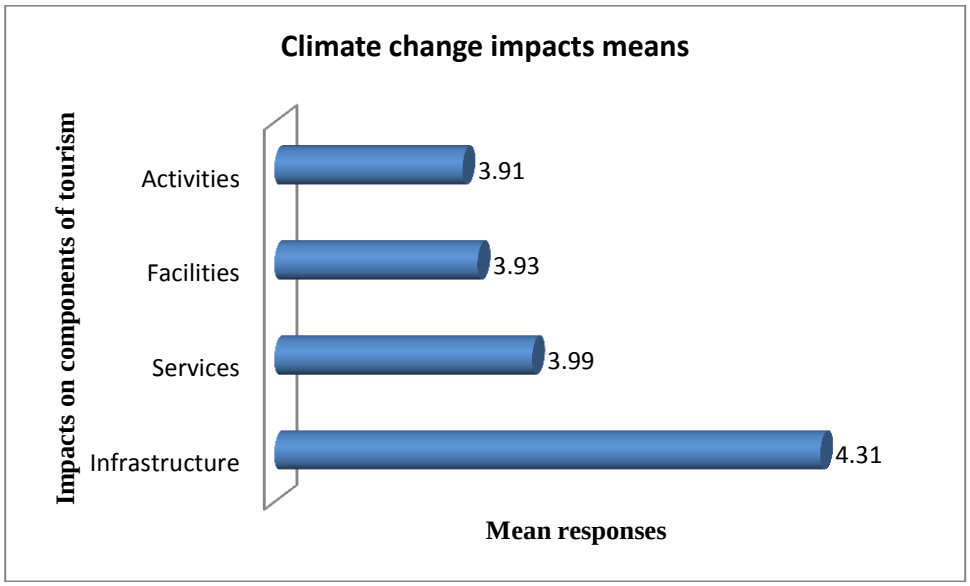

Figure 4.31: Magnitude of indicators on components of tourism

Overall, there is evidence that the weather conditions experienced at the destination have important influence on travel and holiday success and satisfaction (Martin, 2005).

Climate plays an important role in the planning, financial success and quality of visitor experience (Scott and Lemieux, 2011).

4.2.4.5.4: Correlations between average indicators and average magnitude

Pearson correlation shows that there is direct positive correlation between average indicators with $p<0.01$ and $r^2 = 0.865$, as shown in Table 4.31. This shows that hotel managers who perceived that Kenya is experiencing general, direct and indirect indicators also perceived that the country is experiencing high magnitude of impacts.

Table 4.31: Correlations between average indicators and average magnitude

Indicators		**Average Indicators**	**Average Magnitude**
Average Indicators	Pearson Correlation	1	.865**
	Sig. (2-tailed)		.000
	N	36	36
Average Magnitude	Pearson Correlation	.865**	1
	Sig. (2-tailed)	.000	
	N	36	36

Destinations' competitive relationships and profitability will consequently be adversely affected by changes in the length and quality of climate-dependent tourism seasons since climate defines the length and quality of tourism seasons in different regions (Scott and Lemieux, 2011).

4.2.4.5.4: Indicators of climate change on tourist experience (hotel managers perspective)

Open questions to the hotel managers generated varying results on the magnitude of climate change indicators on major components of tourism, as show in Box 4.7. Generally hotel managers reported that climate change had adversely impacted on tourism resources, activities, infrastructure, services and facilities.

Box 4.6: Indicators of climate change on tourist experience (hotel managers perspective)

Resources	Wildlife, beach, sceneries have been affected at varying degrees by flooding, high temperatures and droughts. Food costs have risen. Hospitality services have been affected by heavy rains and flooding. Coral reefs have bleached.
Activities	Beach activities, game drives, sightseeing, adventure, trekking, walking, animal riding, camping and other tourism activities are affected at varying degrees. Cancellation of scenic flights, boat cruises, jet boat, rafting and other water based operations. Impacts on enjoyment of experiences and on tourist safety for various activities. Cancellation of activities has disrupted tourist flows. Cancellation of sporting events, concerts and outdoor shows and festivals as a result of extreme weather.
Infrastructure	Climate change has affected roads, telecommunication, sewer, system, airports, and airstrips due to flooding and unpredictable rains. Government and other stakeholders have incurred a lot of loses in infrastructure repairs and rescue services. Insurance costs have risen. Costs to the taxpayer for infrastructure repairs and rescues. Tourist providers have to provide more provisions for tourist safety and enjoyment
Services	Mainly road transport and air transport have been affected. All types of transport and associated infrastructure have been affected by weather events – airports closed and flights delayed, ferry crossings cancelled or delayed, roads closed, bridges washed away and closed; Evacuations and rescue services; More equipment for safety; High operating expenses.
Facilities	Buildings, sites, equipment have been affected. Flooding can cause evacuations, popularity of some types of accommodation linked to type of weather eg camping have been threatened by flooding. Accommodation prices may rise because of increased operating costs.

Kenya's tourism largely depends on natural resources such as wildlife and the coastline. The country also relies on longhaul travel and seeks to become a top 10 longhaul destinations by 2030 (GoK, 2007). Therefore if these resources are adversely impacted upon by climate change, there is course for concern.

4.2.5: Sub-theme 5: Nature of the indicators of climate change affecting Tourism

The study also sought to find out in what manner the climate change indicators affecting tourism in Kenya were occurring. To achieve this, hotel managers were asked to describe the indicators of climate change on tourism by checking *yes* or *no* to a number of factors, in response to the following question:

Question: How do indicators of climate change affecting tourism occur in this area?

Results showed that 83% of the respondents said that the indicators of climate change are occurring currently. Only 2% said that they had occurred 20 years ago. 77% said that the indicators are sudden and surprising, while only 13% said that they are gradual. Only 5% said that the indicators were occurring in a linear manner while 77% said that they were occurring in a non-linear manner. 77% of the respondents said that the indicators were persistent while only 11% said that they were non-persistent. None said that the impacts were reversible, while 75% said that they were irreversible. Only 5% said that the indicators were predictable, while 94% said that they were unpredictable. 69% said that there was high potential for adaptation, only 13% said that the potential was low, as shown in Table 4.32.

Table 4.32: Indicators of change affecting Tourism

Indicators of Climate Changes	Freq.	Percent
Occurring currently	30	83.3
Occurred 20 years ago	1	2.8
Sudden & surprising	28	77.8
Gradual	5	13.9
In a linear manner	2	5.6
Non linear manner	28	77.8
Persistent	28	77.8
Not persistent	4	11.1
Reversible	0	.0
Irreversible	27	75.0
Predicable	2	5.6
Unpredictable	34	94.4
High potential for adaptation	25	69.4
Low potential for adaptation	5	13.9

The respondents confirmed that the indicators of climate change occurring in Kenya are happening currently, in a sudden and surprising manner, in a nonlinear manner, are persistent, irreversible, unpredictable but have high potential for adaptation.

This is in line with other studies such as the IPCC forth assessment report that has identified seven criteria from the literature that may be used to identify *key vulnerabilities* that merit particular attention by policy-makers due to their unique characteristics that might make them '*key*' (Schneider *et al.*, 2007).

4.2.5.1: Climate change indicators on tourism by region

Hotel managers views of climate change indicators on tourism varied according to regions. Respondents from Central had more varied views followed by Nairobi and then Central, as shown in Table 4.33.

Table 4.33: Climate change indicators on tourism by region

	Region						p value
	Nairobi		Coast		Central		
	Freq.	Percent	Freq.	Percent	Freq.	Percent	
Occurring currently	8	66.7	18	100.0	4	66.7	0.027
Occurred 20 years ago	0	.0	0	.0	1	16.7	0.076
Sudden & surprising	7	58.3	18	100.0	3	50.0	0.005
Gradual	2	16.7	0	.0	3	50.0	0.009
In a linear manner	1	8.3	0	.0	1	16.7	0.266
Non linear manner	6	50.0	18	100.0	4	66.7	0.004
Persistent	7	58.3	18	100.0	3	50.0	0.005
Not persistent	1	8.3	0	.0	3	50.0	0.003
Reversible	0	.0	0	.0	0	.0	-
Irreversible	7	58.3	18	100.0	2	33.3	0.001
Predicable	1	8.3	0	.0	1	16.7	0.266
Unpredictable	11	91.7	18	100.0	5	83.3	0.266
High potential for adaptation	6	50.0	18	100.0	1	16.7	<0.001
Low potential for adaptation	3	25.0	0	.0	2	33.3	0.049

Three out of thirteen variables were significantly different according to regions with a Chi-square p-value of less than 0.05. Only about 50% of the respondents from Nairobi confirmed that climate change indicators were *sudden and surprising*, *non-linear*, *persistent*, *irreversible* and *had a high potential for adaptation*. More respondents from the region said that the indicators were *occurring currently* (66%) and were *unpredictable* (91%). An overwhelming 100% respondents from Coast confirmed that

the indicators were *occurring currently, were sudden and surprising, non-linear, persistent, irreversible, unpredictable* and *had a high potential for adaptation*. 50% of the respondents from Central said that the indicators were sudden and surprising, gradual and persistent. 50% also said that the indicators were *non persistent*. The manner of occurrence of these climate change indicators were more consistent and highly rated in Coast than the other two regions. This clearly shows that hotter regions experience greater magnitude of indicators than colder ones.

These seven criteria are: magnitude of indicators; timing of indicators; persistence and reversibility of indicators; likelihood (estimates of uncertainty) of indicators and vulnerabilities and confidence in those estimates; potential for adaptation; distributional aspects of indicators and vulnerabilities; and importance of the system(s) at risk (Schneider *et al.*, 2007). Results from this study shows that tourism in Kenya is a key vulnerability sector.

4.2.6: Sub-theme 6: Importance of weather parameters for tourism

4.2.6.1: Factors defining weather

In order to find out what conditions tourists consider to as unfavourable, the following question was posed:

Question: What are the conditions that characterize a day of 'unfavourable weather' for tourism? (tourists views).

Tourists were asked what conditions characterized a day of unfavourable weather. The most highly rated variables were *presence of rain (86%), presence of strong wind*

(80%), high temperatures (67%) and *high humidity (66%).* However, *low temperatures, low humidity* and *cloudy sky* were rated below 50%. Therefore, *presence of rain, presence of strong wind, high temperatures,* and *high humidity* are considered as unfavourable factors by tourists while travelling. Increase in frequency, intensity and unpredictability of these factors, as projected under changing climate, may lead to discomfort and eventual dissatisfaction, as shown in Figure 4.32.

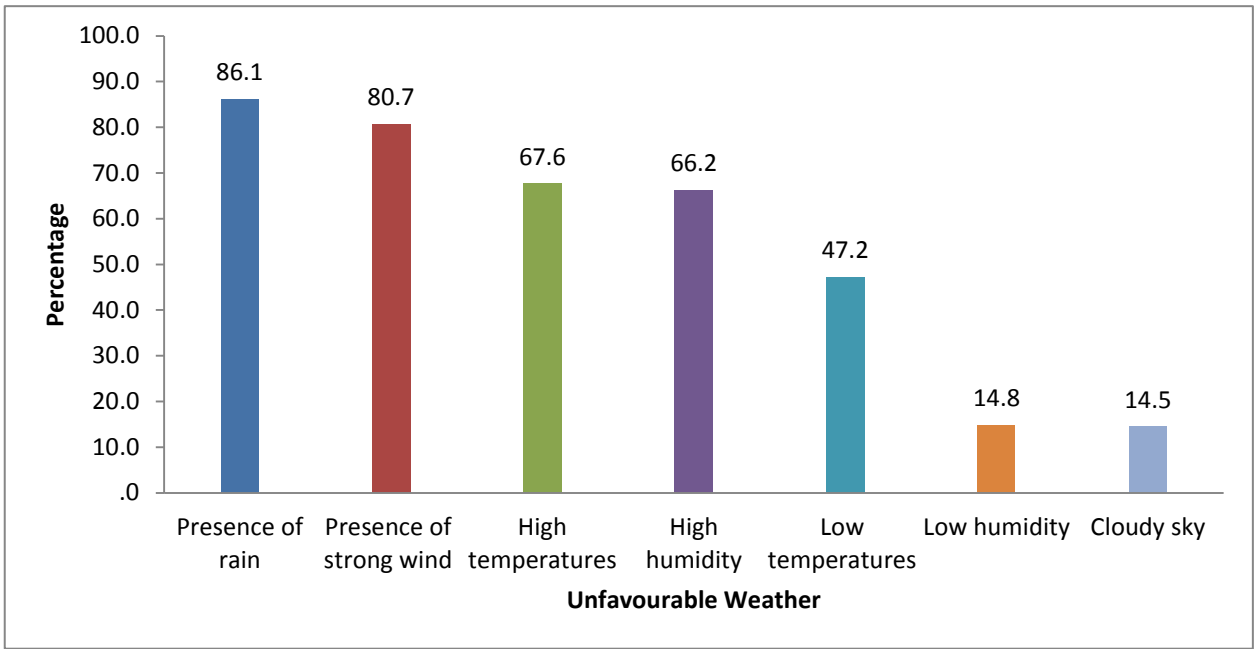

Figure 4.32: Unfavorable Weather for tourism

Considerable evidence demonstrates the intrinsic importance of weather and climate for tourist decision-making, including motivations, destination choice and timing of travel, as well as experience (Martin, 2005; Scott & Lemieux, 2010; Goosling *et al.*, 2012). The climate of a destination can be a main appeal as is in the case of many sun, sea and sand destinations such as Mombasa, Mediterranean and Caribbean (Martin, 2005). While each activity requires its own particular climate and weather, there appears to be

a particular predilection among tourists for plenty of sun and gentle temperatures, the two conditions that are termed as environmental comfort. For example tourists visit Spain mainly for climate (sun and pleasant temperatures) (Martin, 2005).

4.2.6.2: Factors defining weather according to source market

The factors that were considered to characterize a day of unfavourable weather were analyzed according to the source markets of the tourists. There was a significant difference in the responses between the source markets, with Chi-square p-value of less than 0.05 except the case of *presence of strong wind* and *cloudy sky*. Presence of rain was considered as one of the factors that characterized unfavourable weather conditions by 100% of tourists from South America, 95% of those from Asia and 92% of those from Europe. 80% of tourists from Asia, 76% from Europe and 71% from Kenya considered high temperatures as an unfavourable factor. Generally, all the parameters were rated highest by tourists from Asia (85%) followed closely by those from Europe (82%). For those from the other countries except the *rest of Africa*, between 75-77% considered these parameters as indicative of unfavourable weather, as shown in Table 4.34.

This means that all major source markets consider weather parameters, which are significantly changing as important. Culture plays an extremely important role in travel behaviour (Goosling *et al.*, 2012).

Table 4.34: Factors defining weather according to source market

Weather parameters	Country of Residence				p value
	Kenya	Africa	Europe	South America	
Presence of rain	87.7	70.8	92.7	100.0	<0.001
Presence of strong wind	80.7	66.7	83.6	85.7	0.054
High temperatures	71.9	41.7	76.4	57.1	<0.001
High humidity	68.4	41.7	75.5	57.1	<0.001
Low temperatures	29.8	61.1	38.2	42.9	0.002
Low humidity	14.0	27.8	9.1	.0	0.019
Cloudy sky	14.0	25.0	8.2	.0	0.061

Tourists base their decisions on perceived and experienced climatic conditions (Halmilton *et al.,* 2010). In addition, specific weather conditions affect whether tourists can participate in certain activities, their level of satisfaction and even their safety (Martin, 2005). Consequently, climate change will have important consequences for tourism demand at various scales. Therefore, climate change is anticipated to have profound implications that could fundamentally transform aspects of the global tourism sector (UNWTO, 2007a). Generally, climate change has the potential to exacerbate adverse conditions but also may generate more favourable climates in some places.

These findings are in line with other studies. Some researchers argue that climate is among the most dominant factors affecting global tourist flows (Scott and Lemieux, 2010; Hamilton *et al.,* 2005b). An international survey of 66 national tourism and

meteorological organizations found that a large majority (81 per cent) felt weather and climate were major determinants of tourism in their nation (Scott and Lemieux, 2010).

4.2.6.3: Rating of weather parameters for tourism

In order to assess the importance of weather parameters for tourism, tourists were asked to rate five climate variables by their importance. They were asked the following question:

Question: How important do you rate the following weather parameters for tourism in Kenya. The results are summarized in Figure 4.35.

Results showed that four variables, *comfortable temperatures, water temperature absence of rain, hours of sunshine* and *absence of strong wind* were rated as at least important by more than 70% of the respondents (mean above 4). Only absence of *cloud cover* was rated below important, but above moderate (mean of 3.6). Generally all the major climate change factors, some of which have changed in Kenya, were rated as important and very important.

Table 4.35: Rating of Weather Parameters

Rating of weather Parameters	Level	Freq	Percent	Mean[a] Score	std
Absence of rain	Unimportant	25	7.1		
	Less important	20	5.7		
	Moderate	42	11.9	4.2	1.3
	Important	49	13.9		
	Very important	216	61.4		
Comfortable temperature	Unimportant	1	.3		
	Less important	4	1.1		
	Moderate	22	6.3	4.6	0.7
	Important	78	22.2		
	Very important	247	70.2		
Hours of sunlight	Unimportant	5	1.4		
	Less important	15	4.3		
	Moderate	49	13.9	4.2	0.9
	Important	137	38.9		
	Very important	146	41.5		
Water temperature	Unimportant	5	1.4		
	Less important	16	4.5		
	Moderate	62	17.6	4.3	0.9
	Important	69	19.6		
	Very important	200	56.8		
Absence of strong wind	Unimportant	8	2.3		
	Less important	23	6.5		
	Moderate	44	12.5	4.1	1.2
	Important	131	37.2		
	Very important	123	41.5		

a – 1 = Unimportant, 5 =Very important.

In summary weather parameters for tourism in Kenya were rated in order of importance as follows: *comfortable temperature, water temperature, absence of rain, hours of sunlight, absence of strong wind* and *absence of cloud cover*, as shown in Figure 4.36.

Table 4.36: Means Rating of weather parameters

Weather parameters	Mean	Std. Deviation
Comfortable temperature	4.61	.683
Water temperature	4.26	.995
Absence of rain	4.17	1.255
Hours of sunlight	4.15	.913
Absence of strong wind	4.09	1.000
Absence of cloud cover	3.58	1.215

a – 1 = Unimportant, 5 =Very important.

The interface between climate and tourism is multifaceted and complex. All tourism destinations and operators are climate-sensitive to a degree and climate is a key influence on travel planning and the travel experience (Scott and Lemieux, 2010).

4.2.6.4: Rating of weather parameters according to source markets

Tourists who considered absence of rain as a very important consideration in a holiday were from Kenya (71.8%), South America (71.4%) and Asia (69.6%). This is summarized in Table 4.37.

Table 4.37: Rating of Weather Parameters according to source markets

	Country of Residence					P value
	Europe	Africa	Kenya	Asia	South America	
	%	%	%	%	%	
Absence of rain						
Unimportant	1.8	19.4	4.5	6.5	.0	
Less important	5.3	8.3	5.5	2.2	14.3	***0.007***
Moderate	17.5	15.3	8.2	8.7	.0	
Important	12.3	20.8	10.0	13.0	14.3	
Very important	63.2	36.1	71.8	69.6	71.4	
Comfortable temperature						
Unimportant	.0	.0	.0	.0	.0	
Less important	1.8	1.4	.0	2.2	.0	
Moderate	1.8	15.3	2.7	2.2	14.3	***0.013***
Important	15.8	36.1	18.2	17.4	28.6	
Very important	80.7	47.2	79.1	78.3	57.1	
Hours of sunlight						
Unimportant	3.5	.0	.9	2.2	.0	
Less important	1.8	11.1	4.5	.0	.0	
Moderate	10.5	27.8	6.4	13.0	14.3	***<0.001***
Important	38.6	38.9	29.1	47.8	28.6	
Very important	45.6	22.2	59.1	37.0	57.1	
Water temperature						
Unimportant	1.8	2.8	.9	.0	.0	
Less important	3.5	9.7	1.8	4.3	14.3	
Moderate	12.3	25.0	19.1	15.2	14.3	***0.004***
Important	17.5	33.3	10.0	15.2	28.6	
Very important	64.9	29.2	68.2	65.2	42.9	
Absense of cloud cover						
Unimportant	3.5	12.5	3.6	2.2	.0	
Less important	14.0	25.0	6.4	6.5	28.6	
Moderate	31.6	37.5	31.8	47.8	28.6	***<0.001***
Important	8.8	13.9	6.4	6.5	.0	
Very important	42.1	11.1	51.8	37.0	42.9	

Comfortable temperature was rated highest in Europe (80%), Kenya (79%) and Asia (78%). Tourists from Kenya had the most number of respondents rating water temperature as very important (68%) followed by those from Asia (65%) then those

from Europe (64%). Absence of cloud cover was rated as very important by the least number of respondents with the highest being from Kenya (51%), followed by South America (42.9%) and then Europe (42.1%). Further, there was a significant difference among the variable ratings by respondents from different regions with Chi-square p-value of less than 0.05.

Table 4.38 shows the rating of weather variables by tourists source markets.

Table 4.38: Summary of rating of weather parameters according to source markets (tourists view)

Indicators **N= 352**	**Country of Residence**						
	Europe	**Africa**	**Kenya**	**Asia**	**North America**	**South America**	**Australia**
	%	%	%	%	%	%	%
Absence of rain							
Important and very important	75.5	56.9	81.8	82.6	78.8	85.7	76.9
Comfortable temperature							
Important and very important	96.5	83.3	97.3	95.7	87.3	85.7	92.3
Hours of sunlight							
Important and very important	84.2	61.1	88.2	84.8	80.9	85.7	84.6
Water temperature							
Important and very important	82.4	62.5	78.2	80.4	80.8	71.5	84.6
Absence of cloud cover							
Important and very important	50.9	25	58.2	43.5	34.1	42.9	53.9
Average	**77.9**	**57.76**	**80.74**	**77.4**	**72.38**	**74.3**	**78.46**

On average, Kenya had the highest number of respondents rating all the variables as important or very important with an average of 80%, followed by Australia (78%) and then Europe (77%). Most (over 70%) of the source markets rated the variables as

important and very important except those from Africa who were only 57%. This means that tourists from all source markets except the rest of Africa are very sensitive to climate change impacts.

Other studies have also found that perceptions of climate differ among tourists from different cultural and climate contexts (Goosling *et al.,* 2012). Culture plays an extremely important role in travel behaviour and what may be perceived as unattractive in one culture may be attractive in another. For example, although many international travellers avoid the torrential downpours of the monsoon season, in the Indian context it is a time of refreshment and renewal. Monsoon tourism is promoted to domestic tourists as well as to the Middle East market for whom the cultural value of heavy rain is different (Goosling *et al.,* 2012).

4.2.6.5: Factors defining weather according to the reason for travel

Absence of rain, comfortable temperatures, hours of sunshine, water temperature, absence of cloud and *absence of strong wind* were all rated as more important by leisure tourists followed by business tourists and them tourists VFR, as shown in Table 4.39.

Table 4.39: Factors defining weather according to the reason for travel

Weather parameters	Business		Leisure		VFR		Total		
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	P-value
Absence of rain	3.9	1.3	4.8	.6	3.4	1.5	4.2	1.3	.000
Comfortable temperature	4.5	.7	4.9	.4	4.3	.9	4.6	.7	.000
Hours of sunlight	3.9	.8	4.8	.5	3.4	1.1	4.1	.9	.000
Water temperature	4.1	1.0	4.9	.4	3.3	1.2	4.3	1.0	.000
Absence of cloud cover	3.1	.9	4.7	.8	2.6	1.2	3.6	1.2	.000
Absence of strong wind	3.9	.9	4.8	.5	3.1	1.3	4.1	1.0	.000
Total	**3.9**	**.9**	**4.8**	**.5**	**3.3**	**1.2**	**4.1**	**1.0**	

In general, leisure travelers considered all the weather variables as very important followed by business travelers and then tourists visiting friends and relatives, as shown in Figure 4.33.

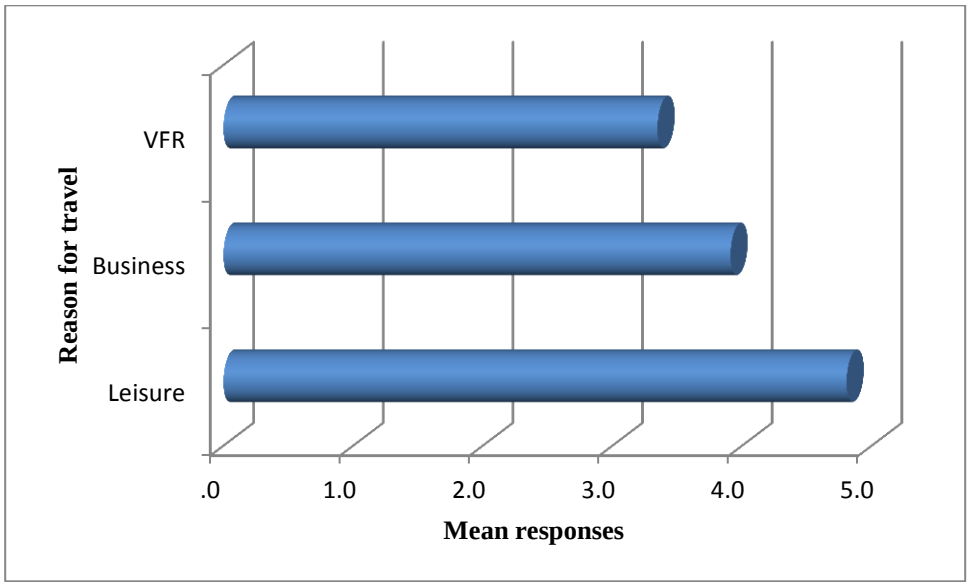

Figure 4.33: Factors defining weather according to the reason for travel

Similar results have been presented by Goosling *et al.*, 2012, whereby VFR tourism was found to be influenced by a strong social commitment that may mean that the tourist will travel to a destination for family or relationship reasons, despite the effects of climate.

4.2.6.6: Rating of Weather Parameters according to age (tourists views)

Ratings of various weather parameters also varied by age. Ages below 20 to 50 years rated the parameters between moderate and important while those above 50 years old rated them as between important and very important. The difference was significant with a p-value of less than 0.001. Generally the older tourists were more sensitive to weather parameters than younger ones, as shown in Figure 4.34.

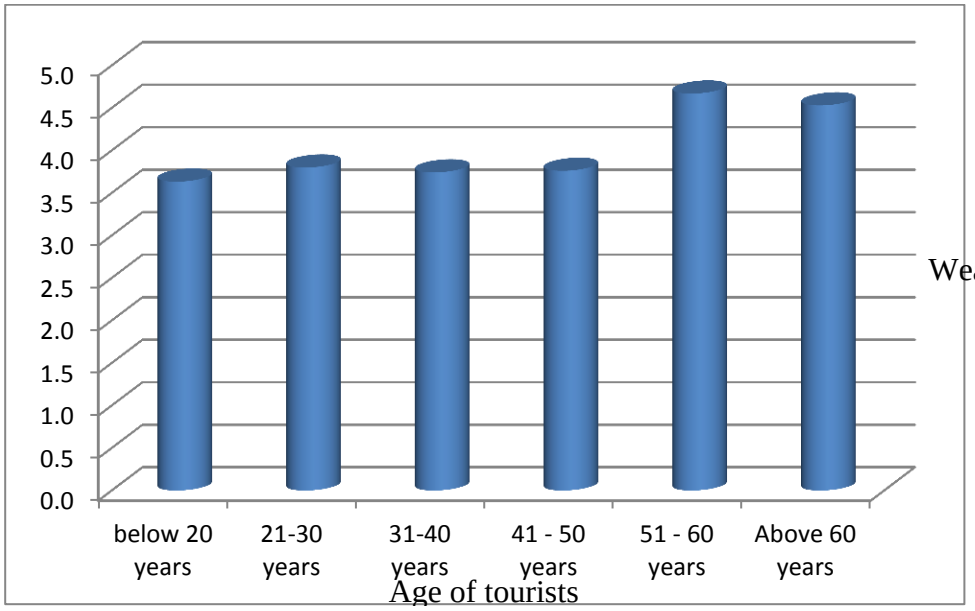

Figure 4.34: Rating of Weather Parameters according to age (tourists views)

A study by Goosling *et al.,* (2012) shows that personal differences exist in climate preferences for holidays and interpretations of climate-induced environmental change by age.

4.2.6.7: Weather parameters by marital status

Table 4.40 shows rating of weather parameters by marital status.

Table 4.40: Weather parameters by marital status

Weather parameters (N= 352)	**Married**	**Single**	**Divorced**	**Total**	**p-value**
	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	
Absence of rain	4.3 (1.2)	4.0(1.3)	4.0 (1.2)	4.2 (1.3)	0.113
Comfortable temperature	4.7 (0.6)	4.5 (0.8)	4.6 (0.5)	4.6 (0.7)	0.027
Hours of sunlight	4.4 (0.9)	3.8 (0.8)	4.0 (1.1)	4.1 (0.9)	0.000
Water temperature	4.4 (0.9)	4.2 (1.0)	3.9 (1.3)	4.3 (1.0)	0.007
Absence of cloud cover	3.9 (1.2)	3.1 (1.0)	3.5 (1.2)	3.6 (1.2)	0.000
Absence of strong wind	4.3 (1.0)	3.8 (0.9)	4.1 (1.0)	4.1 (1.0)	0.000
Total	**4.3 (1.0)**	**3.9 (1.0)**	**4.0 (1.1)**	**4.1 (1.0)**	

Married tourists considered the weather parameters as most important (mean 4.3) followed by divorced tourists (mean 4.1) and then single tourists (mean 3.9).

Although most research on tourist climate preferences has come from Europe, North America, and Australia (Goosling *et al.,* 2012), key knowledge gaps still exist on the different values attached to aspects of weather by people from different cultures.

4.2.6.8: Weather parameters by hotel rating

Generally four star hotels considered the weather parameters more important than three star and five star hotels, as shown in Table 3.41.

Table 4.41: Weather parameters by hotel rating

Weather parameters	**Five**	**Four**	**Three**	**Total**	**p-value**
	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	Mean (Std. Dev)	
Absence of rain	4.0 (1.3)	4.4 (1.1)	4.1 (1.3)	4.2 (1.3)	0.062
Comfortable temperature	4.5 (0.8)	4.7 (0.6)	4.6 (0.7)	4.6 (0.7)	0.147
Hours of sunlight	4.1 (1.0)	4.4 (0.9)	4.0 (0.8)	4.1 (0.9)	0.001
Water temperature	4.1 (1.1)	4.2 (1.1)	4.4 (0.9)	4.3 (1.0)	0.034
Absence of cloud cover	3.8 (1.2)	4.0 (1.3)	3.3 (1.0)	3.6 (1.2)	0.000
Absence of strong wind	4.2 (0.9)	4.3 (1.0)	3.9 (1.0)	4.1 (1.0)	0.004
Total	**4.1 (1.0)**	**4.3 (1.0)**	**4.1 (1.0)**	**4.1 (1.0)**	

Martin (2005) exerts that building structures and installation of ventilation highly determines tourists' comfort or discomfort caused by weather conditions.

4.2.7: Sub- theme 7: Seasonality of tourism in Kenya

Figure 4.35 shows the number of international tourists visiting Kenya over the years from 1970 to 2010, during different quarters of the year, starting from January. The second quarter has been having substantially fewer international tourist arrivals than the other quarters since 1970. On the other hand, the main rainy season usually starts in March and decreases in May to June while the second wet season starts around September or October and shows decreasing trends in December (World Bank, 2013). Although there is no significant reduction in international tourists visiting Kenya during the second rainy season (3^{rd} quarter), the reduction in numbers during the second quarter could be attributed to the heavy rains. During this time accessibility and visibility are low and the general comfort is greatly reduced. In addition, some tourist

facilities are closed. With the changing climate, seasonality of tourism caused by weather factors may adversely affect tourism in the country.

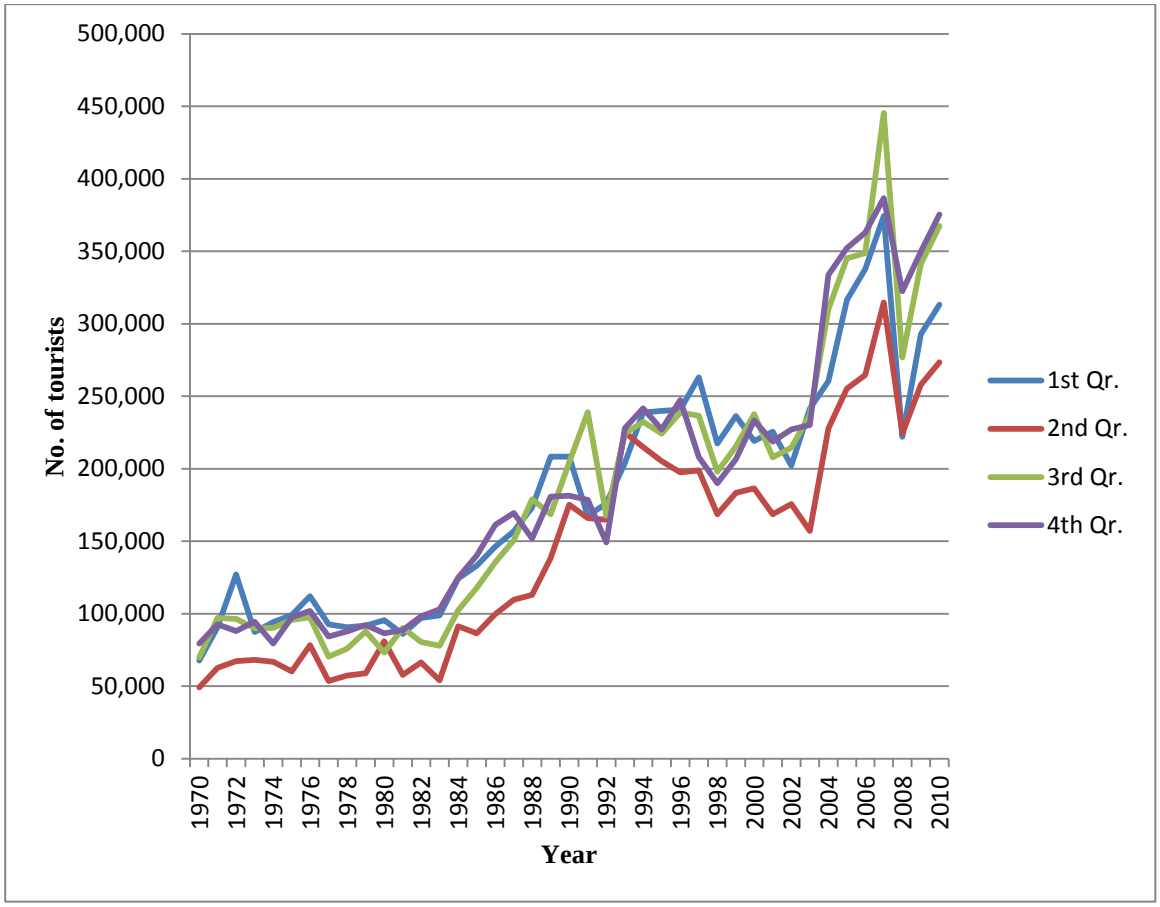

Figure 4.35: Seasonality of tourism in Kenya

Favorable climatic conditions for a particular tourist activity usually occur in certain periods of the year (Martin, 2005; Scott and Lemieux, 2010). This results to seasonality. Destinations such as Kenya that promote climate as the main attraction, since it acts as a basic input into the creation of the product, are highly affected by seasonality. If the activities are poorly adapted to climate or poorly diversified to suit the conditions recorded during the year, seasonality problem can be worse. Seasonality is more

significant when destinations are dependent on one activity and climate is promoted as one of the resources rather than being merely sensitive to it (Martin, 2005). On the other hand, seasonality is not only linked to the supply side temporal concentration of the offering; it also depends, albeit to a lesser degree, on the time-concentration of the demand. This is because climate largely determines when people work and when they go on holiday. With the changing climate therefore there is urgent need to establish an optimum adaptation of activities is achieved in order to ensure that seasonality (one of the problems causing most concern to the industry) is minimized (Martin, 2005).

4.2.8: Hypothesis testing

4.2.8.1: Hypothesis 1

H_o: Perceptions of climate change impacts by tourists do not vary by:

(i) region of residence,

(ii) purpose of visit,

(iii) age,

(iv) marital status or

(v) accommodation type.

From the above results, the null hypothesis is rejected and the alternative hypothesis accepted that perceptions of climate change impacts by tourists vary by region of residence purpose of visit, age, accommodation type and marital status.

4.2.8.2: Hypothesis 2

$H_{o:}$ Perceptions of climate change impacts by hotel managers do not vary by

(i) hotel rating and

(ii) location.

The null hypothesis is accepted and the alternative hypothesis rejected that perceptions of climate change impacts by hotel managers vary by hotel rating.

However, the null hypothesis is rejected and the alternative hypothesis accepted that perceptions of climate change impacts by hotel managers vary by location.

Kenya's ability to cope with the impacts of climate change is compounded by many factors including poverty, weak institutions, poor infrastructure, lack of information, poor access to financial resources, low management capabilities, armed conflicts due to a scramble for diminishing environmental resources and high interest rates (GoK, 2010).

4.3: Theme 3: Adaptation of the tourism sector to the indicators of Climate Change

4.3.1: Part 1: Adaptation of the tourism sector to the indicators of climate change (tourists views)

Tourists are considered to have the greatest capacity to adapt to the risks and opportunities posed by climate change (Scott *et al.,* 2008). In order to find out the views of tourists on adaptation, tourists were asked what their response to '*unfavourable weather'* experienced in Kenya would be. The following question was raised:

Question: What would be your response to 'unfavourable weather' during your next visit? I will choose:

The majority (54%) said that they will make no change; 34% said they will choose the same destination but different dates, while only 12% said that they would change the destination. This means that the appeal of Kenya as a tourism destination is still very high despite the climate change indicators affecting the destination. However, 12% who plan to change the destination due to climate change indicators may be a reason to increase the rate of climate change adaptation, as shown in Figure 4.36.

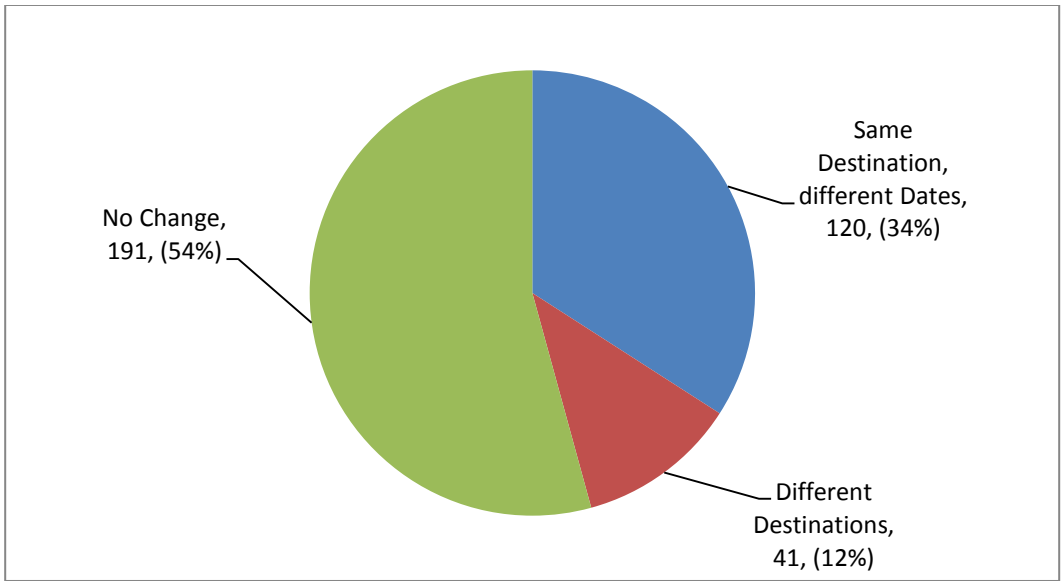

Figure 4.36: Response to unfavourable weather

Of the respondents who said that they will choose the same destination but different dates, 47% were visiting Coast at the time of the survey, while 32% and 21% were in Nairobi and Central respectively. For those who said they will visit a different destination, 68% were in Nairobi, 17% in Coast and 15% in Central. 59% who said that they will not change the designation were in Coast, 27% were in Nairobi and 14% in Central. Therefore, although most climate change indicators were experienced in Coast,

most respondents who are planning to choose a different destination were in Nairobi. This could be attributed to the fact that most tourists visiting Nairobi are either on transit or on business, and therefore are likely to visit other destinations in future probably to explore other climatic conditions while pursuing other motives. These results are shown in Table 4.42.

Table 4.42: Unfavourable weather by region tabulation

Response			Region			Total
			Nairobi	Coast	Central	
unfavourable weather'	Same Destination, different Dates	Count	38	56	26	120
		%	32%	47%	22%	100%
	Different Destinations	Count	28	7	6	41
		%	68%	17%	15%	100%
	No Change	Count	52	112	27	191
		%	27%	59%	14%	100%
	Total	Count	118	175	59	352
		%	34%	50%	17%	100%

A Chi-square test was run to determine if there was a significant association between the tourists responses to unfavourable weather and the regions visited, which produced a p-value less than 0.005. This means that region visited can predict tourists response to climate change indicators.

Responses by tourists from different source markets did not show any significance association with Chi-square p-value of 0.171. This is summarized in Table 4.43.

Tourists have the largest adaptive capacity of elements within the tourism system because of their flexibility to substitute the place, timing and type of holiday, even at very short notice (Scott *et al.*, 2008; Goosling *et al.*, 2012). Consequently, understanding tourist perceptions and reactions to the impacts of climate change is essential to anticipating the potential geographic and seasonal shifts in tourism demand, as well as the decline or increase of specific tourism markets (Goosling *et al.*, 2012).

Table 4.43: Unfavourable weather by country of residence tabulation

	Country of Residence							
Unfavourable weather'	**Kenya**	**Africa**	**Europe**	**Asia**	**North America**	**South America**	**Austra lia**	**Total**
Same Destination, different Dates	22	23	40	14	18	1	2	120
	18%	19%	33%	12%	15%	1%	2%	100 %
Different Destinations	6	14	15	2	2	0	2	41
	15%	34%	37%	5%	5%	%	5%	100 %
No Change	29	35	55	30	27	6	9	191
	15%	18%	29%	16%	14%	3%	5%	100 %
Total	57	72	110	46	47	7	13	352
	16%	20%	31%	13%	13%	2%	4%	100 %

Similar results to this study were obtained from a survey of 339 visitors to the Great Barrier Reef carried out at the Cairns airport that found impacts of future coral bleaching on reef visitation ranged from not sure (40.8%), would revisit (40.7%, half repeat visitors), and would not revisit (12.5%, mainly first-time visitors), with a low level of climate change concern (Zeppel, 2011).

Correlations between average indicators and unfavourable weather

Spearman's Rho correlation shows that there is direct positive correlation between average perceptions on indicators and response to unfavourable weather with $p<0.01$ and $r^2 = 0.142$, as shown in Table 4.44 This shows that tourists who perceived that Kenya is experiencing general, direct and indirect indicators also plan to visit other destinations due to weather related experiences in Kenya.

Table 4.44: Correlation between average indicators and unfavourable weather

Indicators			**Average Indicators**	**unfavourable weather**
Spearman's rho	Average Indicators	Correlation Coefficient	1.000	.142**
		Sig. (2-tailed)	.	.008
		N	352	352
	unfavourable weather'	Correlation Coefficient	.142**	1.000
		Sig. (2-tailed)	.008	.
		N	352	352

Generally, research has shown that climate change would lead to a gradual shift of tourist destinations towards higher latitudes and altitudes. Tourists from temperate nations that currently dominate international travel were projected to spend more holidays in their home country or nearby regions. Therefore, relative demand for international travel to sub-tropical and tropical nations was projected to decline (Hamilton *et al.,* 2005a; Goosling *et al.,* 2012).

4.3.2: Part 2: Adaptation of the Tourism sector to the indicators of climate change (hotel managers perspective)

In order to assess the adaptation practices in the supply side of the tourism sector, hotel managers were asked which adaptation practices they are currently practicing. The following question was posed:

Question: My institution has implemented the following adaptation practices to curb climate change.

The most popular adaptation practices adopted by hotel managers in Kenya were *promotion of conservation*, that was practiced by 91% of the respondents followed by education *campaigns* (88%) and then *enhancement of disaster preparedness* (72%). Other important practices such as *use of new technologies, product diversification, insurance, fund research on climate change, market diversification, change of building design or material, taken advantage of opportunities* were practiced by less than 40% of the hotels, as shown in Table 4.45.

Table 4.45: Adaptation practiced by hotels

Adaptation Practice	Frequency	Percent
Promote conservation	33	91.7
Education campaigns	32	88.9
Enhance disaster preparedness	26	72.2
Use of new technologies	13	36.1
Product diversification	7	19.4
Insurance	6	16.7
Fund research on climate change	4	11.1
Market diversification	3	8.3
Change of building design or material	2	5.6
Taken advantage of opportunities	2	5.6

An analysis of adaptation practices by region revealed diverse view. All the three most popular practices were practiced in the Coast region by all the hotels. Coast hotels did not practice any other adaptation practices. Hotels in Nairobi and Central on the other hand practiced most of the adaptation practices at varying degrees. In addition to the three most popular adaptation practices, over 50% of the respondents from hotels in Nairobi are practicing *use of new technologies* and *product diversification*. On the other hand, none of the respondents from Central were practicing *enhanced disaster preparedness* despite the fact that this was one of the most popular adaptation practices overall. However use of new technologies and insurance rated highly in the region (over 50%). Therefore areas that are highly impacted by climate change such as the Coast have adopted a limited number of adaptation practices. This difference is significant in six out of ten adaptation options with a Chi-square value of less than 0.005. Although the few methods chosen are practiced by all the hotels, the regions need to diversify in order to successfully deal with climate change, as shown in Table 4.46.

In a similar study different resilience to climate change-induced environmental changes was found among market segments visiting national parks in Canada's Rocky Mountains, where long-haul tourists that travelled specifically to see certain attractions were much less willing to visit these parks if these attractions were impacted by climate change than tourists from the region (defined as six hour travel time) (Goosling *et al.*, 2012).

Table 4.46: Adaptation practices by region

Adaptation	Region						p-value
	Nairobi		Coast		Central		
	Freq.	%	Freq.	%	Freq.	%	
Promote conservation	10	83.3	18	100.0	5	83.3	0.195
Change of building design or material	1	8.3	0	.0	1	16.7	0.266
Insurance	3	25.0	0	.0	3	50.0	0.011
Product diversification	6	50.0	0	.0	1	16.7	0.003
Market diversification	3	25.0	0	.0	0	.0	0.038
Education campaigns	10	83.3	18	100.0	4	66.7	0.06
Use of new technologies	9	75.0	0	.0	4	66.7	<0.001
Enhance disaster preparedness	8	66.7	18	100.0	0	.0	<0.001
Fund research on climate change	3	25.0	0	.0	1	16.7	0.092
Taken advantage of opportunities	1	8.3	0	.0	1	16.7	

4.3.3: Part 3: Climate change adaptation in Kenya (experts views)

In order to triangulate the tourists and hotel managers views on climate change adaptation practices in Kenya, the twenty experts were consulted. The main adaptation efforts that are currently being practiced in the tourism industry as reported by the experts were *government efforts*, mentioned by 20 respondents, *business adaption (20), technological adaptation (20), behavioural adaptation (15)* and *training adaptation (16). Only* Government efforts were not among the adaptation strategies mentioned by hotel managers, as shown in Figure 4.37. This factor was further elaborated as can be seen in the subsequent sections.

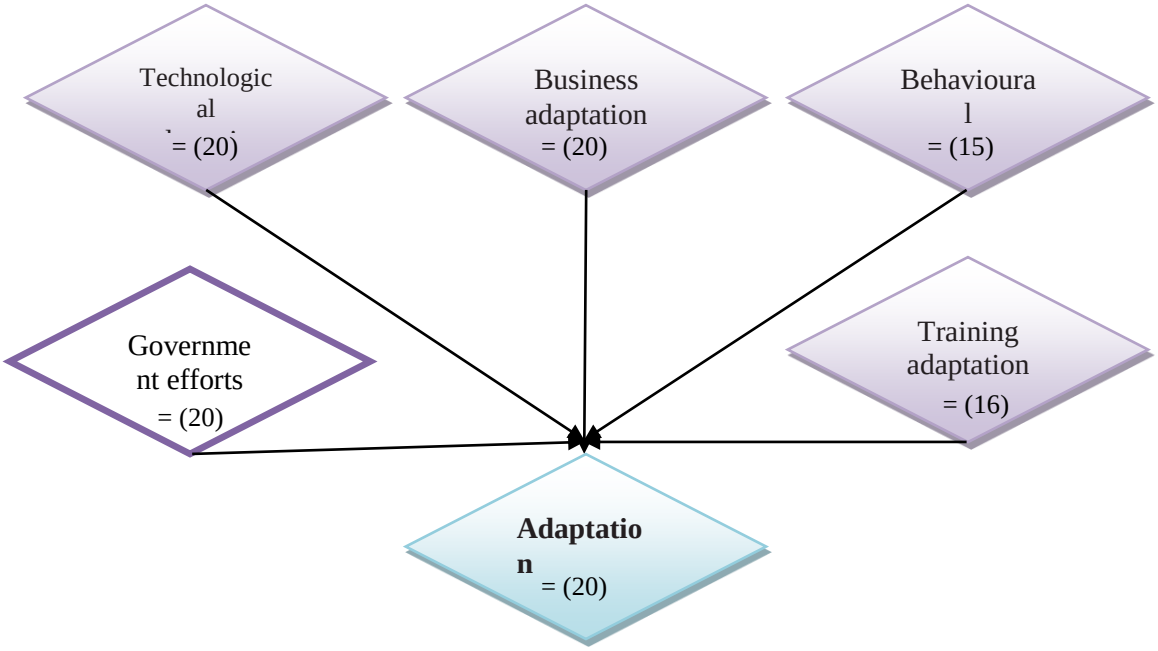

Figure 4.37: Adaptation options adopted

In a similar study, 72% of respondents from Belgium and the Netherlands said that they would still travel to the Mediterranean for holidays even if their self-defined preferred climatic conditions were available in Northern Europe. (Goosling *et al.*, 2012).

4.3.3.1: Government efforts

Since *government efforts* were one of the most popular methods mentioned by the expert respondents, they were asked to give more details on what it entailed. They gave examples of *disaster preparedness, national law and policy, data provision, economic adaptation, social adaptation, collaboration and fund research.* This is summarized in Figure 4.38, which all represent areas on non-convergence since this was additional information not included in the questionnaires.

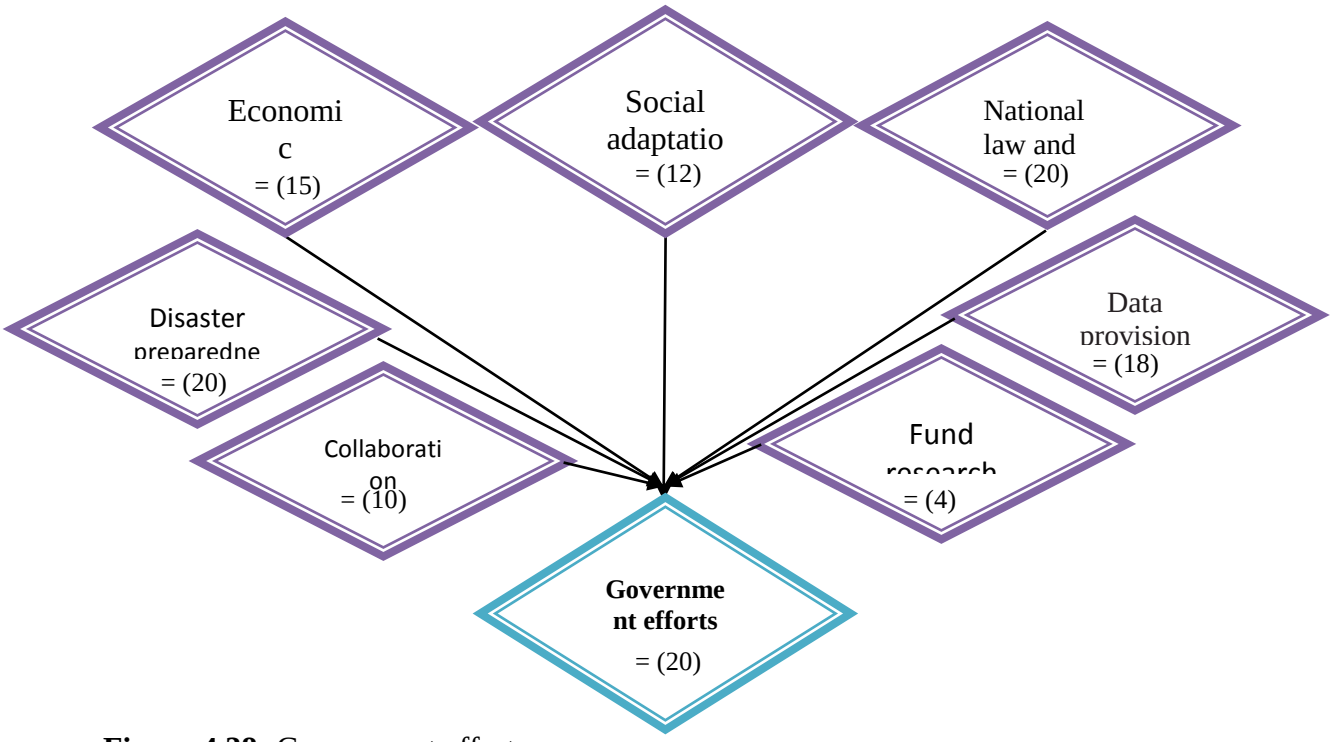

Figure 4.38: Government efforts

Scholars are only now beginning to develop the capability to deliver relevant scientific knowledge that can be used by the tourism decision-makers in both the public and private sectors in Kenya as is the case in most parts of the world (Scott and Becken, 2010).

4.3.3.2: Business Adaptation

The experts said that the tourism sector was practicing various business adaptation such as *use of product diversification, market diversification, promotion of conservation, insurance, new technologies* and *disaster preparedness.* Only low carbon development and access to finance were areas of non-convergence. This means that most hotel managers have not yet taken advantage of the funds associated with climate change such as carbon trading and also have not adopted a low carbon development path. However, since these factors were mentioned by more than 10 experts, this could mean

that other tourism stakeholders are practicing these adaptation strategies, as shown in Figure 4.39.

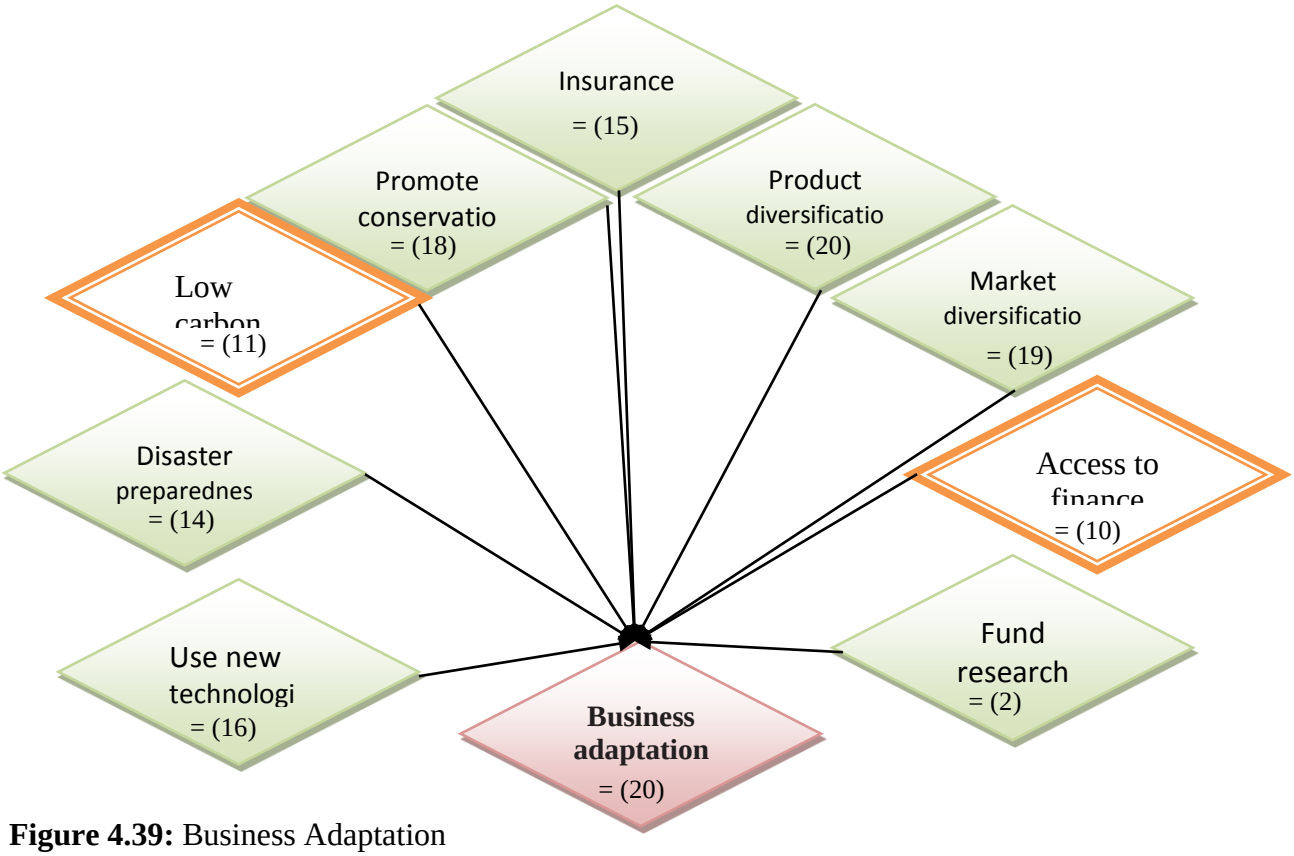

Figure 4.39: Business Adaptation

Destinations may be able to respond to long-term changes through both anticipatory and reactive adaptation. For instance, changed business and destination price structures may offset increasing transport costs, while product and marketing innovations may also be used to attract new customer groups (Goosling *et al.*, 2012)

4.3.3.3: Technological adaptation

Technology adaption was further explored whereby 19 respondents mentioned *cooling systems, 18 innovation, 16 scaling up of green investments, 15 renewable energy* and

only 8 change of building designs. These are areas of no-convergence since this is additional information. This is summarized in Figure 4.40.

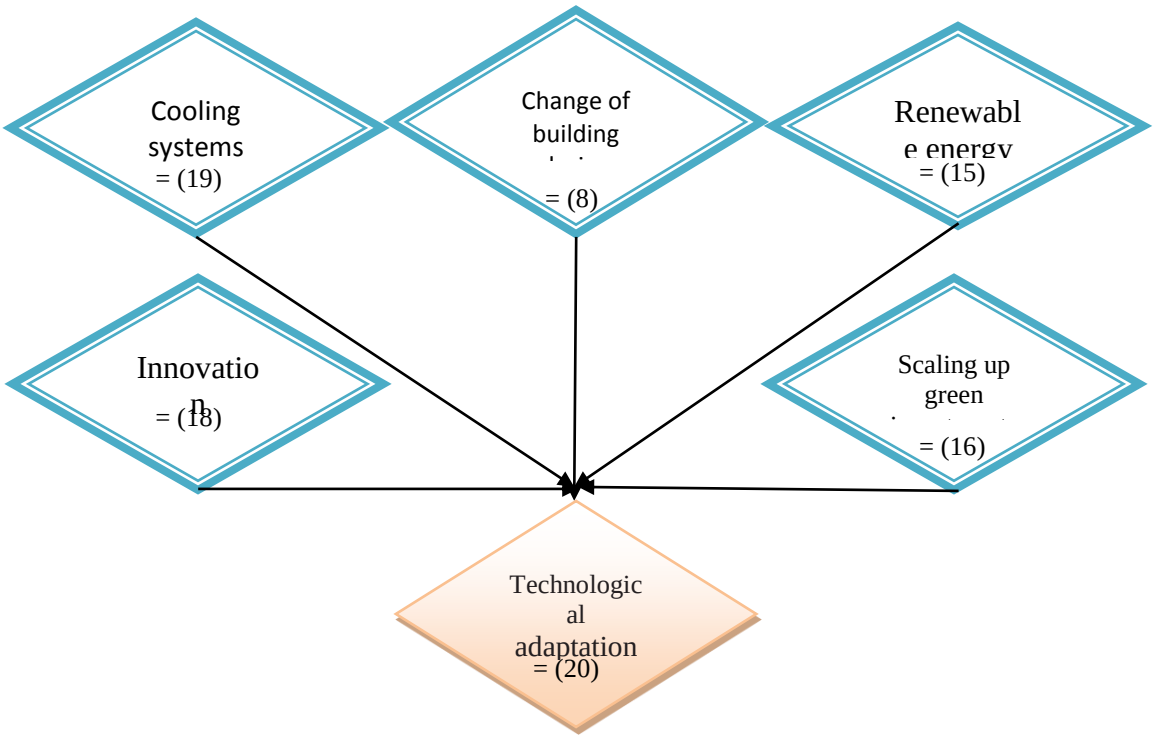

Figure 4.40: Technological adaptation

Climate change adaptation at the local level is necessary because the impacts of climate change register their effects in particular regions and places and on particular communities and ecosystems (Kennedy *et al.,* 2010).

4.3.4: Part 4: Future climate change adaptation

Hotel managers reported that some of their future adaptation plans are: *enhancement of disaster preparedness, use of new technologies to conserve energy and reduce emissions, use of cooling systems, diversification of the product and market* and *community education programmes on climate change.* On the other hand, all the

interviewees mentioned that there is need to adapt to indicators of climate change on tourism through: *improving land management systems*; *enhancing disaster preparedness*; *wildlife adaptation*; *provision of data*; using *new technologies* and starting *education campaigns* on adaptation. 19 of them said that *product diversification* and *market diversification* was important while 17 said that there is need for *funding research* on climate change, 10 *take advantage of opportunities* brought about by climate change while only 5 said that there is need to *change the building design and material* and *provide insurance* against climate change risks. The areas of convergence are shaded in Table 4.47. These adaptation possibilities were further explored with the experts as discussed in the subsequent sections.

Table 4.47: Future adaptation options (in order of popularity)

No.	**Adaptation Practice**	**No. of interviewees quoting**
1	Land management systems	20
2	Enhance disaster preparedness	20
3	Wildlife adaptation	20
4	Provision of data	20
5	Use of new technologies	20
6	Education campaigns	20
7	Product diversification	19
8	Market diversification	19
9	Fund research on climate change	17
10	Take advantage of opportunities	10
11	Change of building design or material	5
12	Provide insurance	5

Adaptation should be planned, and based upon an assessment of the vulnerability to climate change impacts, and evaluation of the future costs and benefits of action, versus

inaction. This is because a delayed response to climate change issues may lead to higher costs in the future, or even irreversible damage. (Jopp *et al.*, 2010).

4.3.4.1: Wildlife adaptation

Another adaptation measure that featured prominently in the interviews was the necessity for wildlife adaptation. 15 interviewees said that there was necessity for *wildlife adaptation*. 11 strongly suggested the idea of *wildlife translocation* during harsh climatic conditions, 10 suggested *watering the wildlife* and 8 *feeding the wildlife*. On the other hand, 5 interviewees insisted that wildlife should never be interfered with and even in cases of droughts and flood, nature should take its course, as shown in Figure 4.41.

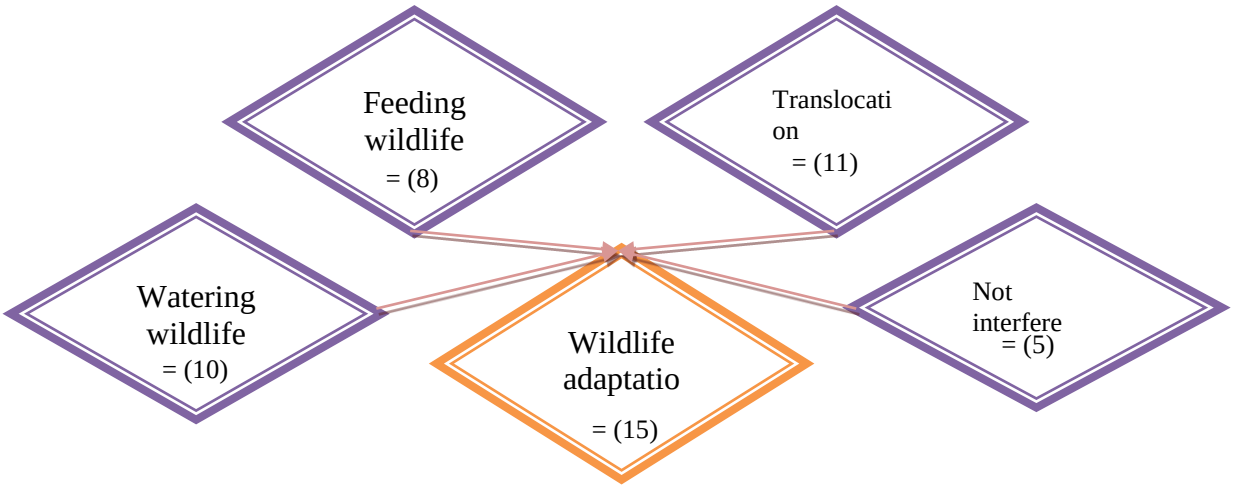

Figure 4.41: Wildlife adaptation

In a study by Hagerman (2010) interviewees supported the concept of increased interventions, as being a necessary component of conservation strategies adapted to the impacts of climate change, where the focus centered on advocating for additional strategically located protected areas. Many of the respondents also supported assisted

migration which entails the deliberate translocation of an imperiled species from one location to another.

4.3.4.2: Tourism resources adaptation

Experts reported that some of the adaptation efforts on tourism resources are *wildlife translocation, forests rehabilitation, conservation of coastal resources, establishment of wildlife corridors* and *collaboration with local communities.* This is elaborated in Box 4.8

Box 4.7: Tourism resources adaptation

There is an ongoing translocation of thousands of zebras and wildebeests at a cost of Sh103 million to restore the Amboseli ecosystem by the Kenya Wildlife Service (Government 4).

Rehabilitating forests has also the potential to help address climate change, through mitigation and adaptation (Government 7).

Regionally the marine and coastal environment in the Kenyan coast is of high ecological and economic value. Beaches, mangroves, coral reefs, plants and other marine life are an important resource for tourism in Kenya. Coral reefs and sea grass beds and other coastal ecosystems are facing challenges related to climate change such as coral bleaching. Coral bleaching has been identified as a cause of reef deaths in the Indian Ocean. To ensure that these resources are conserved, a first ever national strategy for conservation of coral reefs and sea grass beds in Kenya is being formulated by a National task force mandated by the Kenyan Government and chaired by Kenya Wildlife Service (Government 4).

Establish wildlife corridors to allow movement of animals from one park to the other (Academia 8).

Since the success of Kenya's conservation efforts largely depended on the goodwill of communities living adjacent to national parks and reserves, KWS strongly discourages communities from killing carnivores such as lions and hyenas and strives to protect them and their livestock. Also communities are building lion-proof bomas (Government 4).

Due to this heterogeneity of tourism resources, there are widespread differences in the nature of climate sensitivities and abilities of tourism operators worldwide to incorporate climate services into decision-making (Scott and Lemieux, 2011).

4.3.4.3: Financial adaptation

Interviews also resulted into various adaptation options presented in Boxes 4.15 to Box 4.18. Interviewees reported that adaptation is extremely necessary. The government of Kenya and other institutions are investing a lot of money into adaptation. Opportunities are also emerging in REDD+ and carbon trading. However there is need to diversity the product and market, as detailed in Box 4.9.

Box 4.8: **Financial adaptation**

Adaptation to climate change is a necessity (Academia 5).

KWS with partnership with development partners such as the Canadian Government is investing over Ksh.300 million in climate change adaptation Kenya's premium National Parks in order to increase the resilience of wildlife and wildlife habitats to climate change and reduce human-wildlife conflicts among local communities living around the protected areas. One of the ways that they do this is by scooping artificial watering pans within conservation areas in the dry parts of the country (Government 4).

The government is creating enormous opportunities for environmental protection and conservation through facilitation of carbon trading and REDD+ through NEMA (Government 5).

There is need for realistic and implementable actions that will enable Kenya to integrate climate change into national, social, economic and governance systems (Government 1).

There is need to reposition Kenya as a premium destination for ecotourism, high-spending tourists and as an ideal destination for wildlife, conference and business tourism (Government 2).

Introduce fiscal incentives or financial assistance for upgrading tourism infrastructure such as roads and accommodation facilities to cope with consequences of climate change (Academia 10)

The capacity to adapt depends largely on access to assets (including natural resources; and human, technological, social, physical and financial capital) and how well these are used. On the other hand, the degree of adaptation is determined by the presence of adaptation measures, which can prevent damage or make use of favourable opportunities (IPCC, 2007b).

4.3.4.4: Education and research

Experts reported that some institutions such as KWS, institutions of higher learning and others are putting a lot of effort in providing education on climate change adaptation related to tourism. However, it was clear that many climate change-related decisions were still made without proper vulnerability and adaptation research. There is need to link research with policy and strategy in climate change adaptation. This is elaborated in Box 4.10.

Climate-change adaptation is knowledge-intensive, and access to climate services will be an important prerequisite for successful adaptation in the tourism sector. Historical climate information and climate-change projections are used for strategic planning of future tourism developments such as adaptation to risks and opportunities at the business, destination, and national level (Scott *et al.,* 2011).

Box 4.9: Education and research

Public education is important in addressing climate change. Public and private institutions like Universities and Colleges have adopted climate change in their curricula (Academia 8).

We have taken proactive action and mechanisms to manage climate risks which involves creating spaces to learn, communicate and share knowledge. More than 100 of our employees and wildlife management staff have been trained on climate change knowledge. The workshops target wildlife managers, scientists and stakeholders to empower and enlighten them on the issues related to climate change (Government 4).

We initiated the process of combating climate change on wildlife management across the country on August 11, 2011. Also we are putting a lot of effort in habitat rehabilitation and dealing with invasive species in protected areas. We have started an initiative called "the protected areas invasive species strategy'' to try and cope with the situation (Government 4).

We have put climate change in consideration in our efforts in park ecosystem planning and management; monitoring and assessment of ecosystem condition; policy development and implementation; and governance and accountability structures (Government 4).

The media has been in the forefront in creating awareness about Climate Change (Academia 9).

The decline of coral reefs globally underscores the need for co-ordinated assessment of their exposure to multiple environmental impacts, resilience assessments, climate vulnerability, assessment of coastal livelihoods, vulnerability to local threats and climate change to estimate vulnerability and evaluate potential counter-measures. There is also need to map coral reefs and associated habitats (Academia 10).

Most development programmes are not based on scientific climate related information. In addition, there is inadequate use of vulnerability assessments by planners in developing programmes in tourism (NGO 1).

Internalization of climate change impacts by planners has not yet gained momentum (Government 1).

There is need to provide direct training to the tourism sector in dealing with the consequences of climate change (Academia 1).

Introduce early warning systems and prepare hazard maps of vulnerable areas due to climate change (Government 3).

There is need to manage climate risks which involves creating spaces to learn, communicate and share knowledge (Academia 8).

There is need for the sharing of experiences of impacts of climate change and response strategies by different regions in the country to make climate change easier to cope with (Academia 7).

The government should review existing umbrella and sectoral policies, legislation and strategies in Kenya, closely linking research and management (Academia 6).

Though some adaptation is occurring now, more extensive adaptation is required to reduce vulnerability and make use of climate information (Government 3).

There is need to come up with action research that can deepen understanding of vulnerable ecosystems that includes animals, people and institutions (Academia 8).

4.3.4.5: Availability of climate change data and information

Climate change data is highly dispersed, insufficient, difficult to access and not often packaged for the consumption of the tourism industry. Consequently, the experts recommended that there is need for collaboration amongst all stakeholders to solve these drawbacks, as shown in Box 4.11.

Box 4.10: **Climate change - related data**

Tourism is a major part of the economy. The country could benefit significantly from weather projections. However, the country lacks sufficient weather stations, which do not sufficiently cover the whole country. Climate data, if adequate could help in planning and greatly reduce climate related risks (Academia 10).

Climate information available in many parts of Kenya is highly dispersed and therefore its applicability to decision-making in the tourism sector has not been common. This is because tourism activities are highly localized, and the information often communicated may substantially differ from the site conditions (Academia 8).

Historical climate information available in Kenya contains numerous missing entries which makes analysis difficult and often inaccurate (Academia 6).

Regional forecasts and weather data presented on television, newspapers and other media do not provide enough tourist specific information such as floods, tide times, water temperatures, and so on (Academia 3).

Although the Kenya Meteorological Department has in the recent past availed near-term climate data on the website, seasonal and long-term climate data in the country is still difficult to access and often very expensive (Academia 9).

There is urgent need to create collaborations between climate information providers, institutions of higher learning, tourism marketing and management institutions and others to provide timely and user-friendly climate information for use in the tourism industry (Academia 7).

As discussed above, all the experts reported that there was a serious dearth of data and climate related information for use in the tourism industry. All emphasized that data provision is important for the future. To expound on the point, 18 said that data should be *affordable*, 17 that there should be *up to date data*, 14 *reliable data* and 12 *correct scientific data*. This is summarized in Figure 4.42.

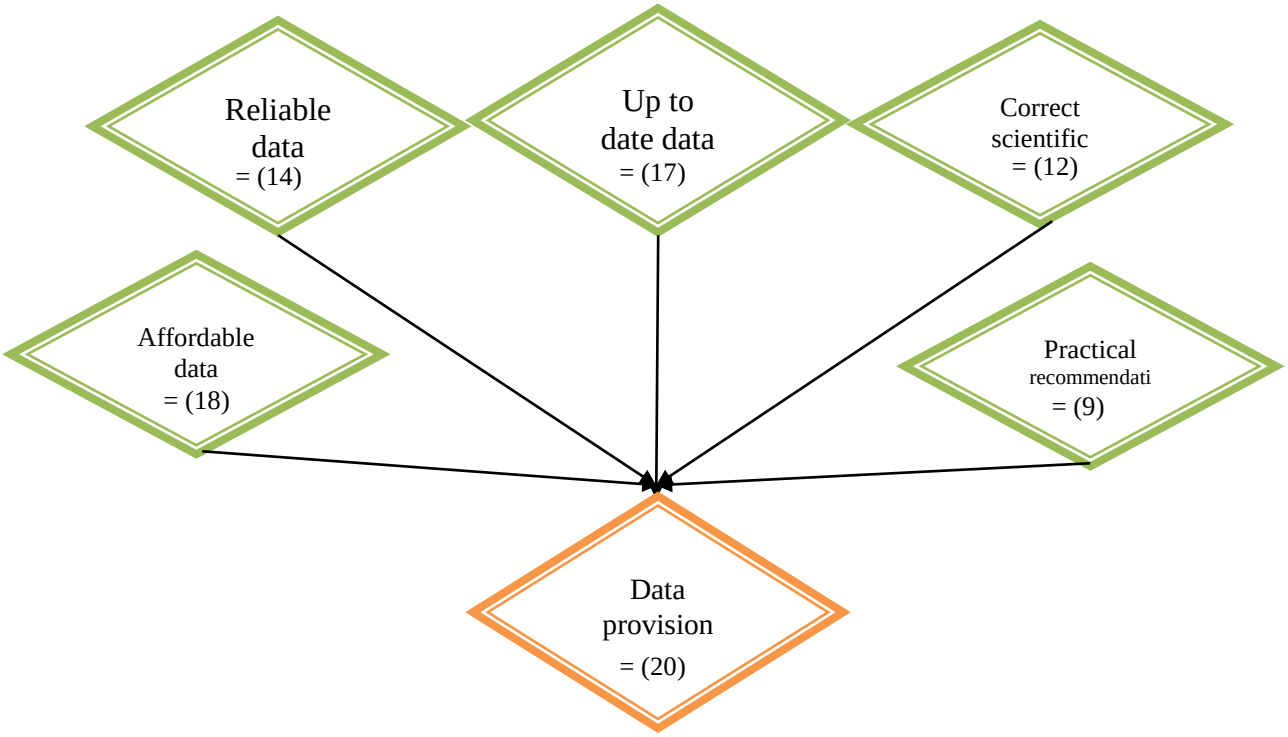

Figure 4.42: Availability of climate change information

Tourism industry utilize historical climate information for two purposes: (1) marketing the destination and (2) assisting travelers to prepare for a safe and comfortable travel experience (Scott *et al.*, 2011). Effective decision-making requires the right quality and applicability of climate information. Effective use of climate information has the potential for avoiding injury and death, averting property and environmental damage and a wide range of other societal benefits (Scott and Lemieux, 2010). However many tourism locations, particularly in developing countries, lack sufficient weather stations and historical climate information which could reduce weather-risks. Climate information in regions with spatially coarse meteorological networks have reduced

applicability to decision-making in the tourism sector, because activity patterns and tourism operations are highly localized, often in microclimate conditions (Scott *et al.*, 2011). Information must be delivered to end-users in a form that is relevant to them and that they have the capability to interpret.

4.3.4.6: Limitations of adaptation

The interviewees reported that climate change adaptation efforts in Kenya were being frustrated by limited finances, technologies, information and other factors. There also have been conflicts of interest, overdependence on tourism other economic sectors, changing social values and uncertainties on projections. Collaboration amongst various stakeholders was emphasized, as elaborated in Box 4.12.

Growing recognition of unavoidable changes in climate change, including increased occurrence of extreme climatic events, is shifting the parameters of the debate towards policies and practices of adaptation (Kennedy *et al.*, 2010). However several challenges have emerged.

Box 4.11: Limitations of adaptation

There is limited stakeholder capacity such as financial, technological and training (Government 1).

Limited information - capacity to successfully adapt to climate change for most stakeholders is information. This is in most cases too scientific or unavailable. Measurement of losses caused by climate change is often inaccurate and completely unavailable (Academia 4).

Conflicts between the climate change strategies favoured by the different groups for example most of the issues arise between the conservation managers and the tourism industry (Government 6).

Local community dependence on different industries such as tourism, agriculture, and forestry make climate change mitigation and adaptation very difficult (Government 6).

Adaptations will only work for the short term or for limited changes in climate (Government 6).

Different and/or changing social values (NGO 2).

There is need for more certainty in climate change predictions for the region, particularly in relation to spatial scale and variability (Government 3).

4.3.4.7: Opportunities of climate change

Climate change will definitely cause a lot of harm, but will also result into a number of opportunities. Some of those reported by the experts were increased rainfall, carbon trading and REDD+, as elaborated in Box 4.13.

Box 4.12: Opportunities brought about by climate change

There is need to elaborate enabling policies and legal frameworks to address challenges imposed by climate change and enable communities to take advantage of opportunities that may arise. There are opportunities for adaptation and mitigation in the REDD+ and carbon trading coordinated by NEMA (Government 5).

The predicted rainfall increases in East Africa will be good for agriculture, wildlife, tourism and other sectors (Government 3).

It is projected that rainfall will increase in the East African region, which will benefit the tourism industry in Kenya (Academia 7).

Most adaptation models focus on the risks of climate change, missing the potential opportunities that may emerge due to climate change (Jopp *et al.*, 2010). It is therefore important to assess and develop potential strategies to counter any potential threats to the industry (Moore, 2010), but also take advantage of opportunities.

4.4: Theme 4: Review of Climate Change Policy

4.4.1: Sub-theme 1: Policy issues and climate change

International climate change policy

The interviewees reported that Africa is highly vulnerable but remains least responsible for the GHG emissions which are causing the changes in the climate system. This is elaborated in Box 4.14.

Box 4.13: International climate change policy

Though Africa as a continent remains highly vulnerable to climate change impacts, because of its unique location and its low adaptive capacity due to its development challenges, some of the policies being considered, and indeed implemented and advocated by developed countries on limiting GHG emissions from aviation could potentially have major impacts on markets reliant on long haul air transport. Carbon taxes, aviation taxes and other emission penalties might be impacting negatively on long haul destination. If the trend continues then the economies of many such destinations will be adversely affected (Government 6).

Africa remains least responsible for the global effects of climate change, as the continents contributions remains very low and the continent therefore was justified to demand for justice and climate action from the global community (Government 2).

There is need to stress every country's sovereign right to national development. There are unfair efforts by rich countries to require developing countries such as Kenya to carry the burden of reducing GHG emissions. There is need to stress equal per capita access to the atmosphere … institutionalize it domestically (Government 6).

There has been a general feeling among the developing countries of a lack of access to meaningful participation in international decision-making and concerns that industrialized countries are using climate change negotiations to protect their own economic interests against the rapid rise of emerging economies (Government 2).

Having experienced only a minor share of the industrialization that has contributed to the current levels of GHGs in the planet's atmosphere, there is genuine belief among the developing countries that responsibility for the problem should be fairly reflected in the onus for action to address the problem (NGO 2).

There is urgent need for developed nations to fully commit themselves in provision of enhanced financial commitments, technology support and training to adequately assist developing nations in responding to climate change (Academia 8).

Therefore, the experts' view is that developed nations should equitably carry the burden of mitigation and adaptation. However, Africa and other developing nations should increase their efforts in constructive projects such as reforestation that will be beneficial to the environment.

4.4.1.1: Climate change policy by the tourism industry in Kenya

There was a general consensus among the experts that Kenya needs to be proactive in carrying out research and drafting policy on how to deal with climate change. According to the experts, though major policy documents in the country such as the vision 2030 and the constitution of Kenya have barely addressed climate change, the country's efforts to develop policy through the National Climate Change Response Strategy and the National Climate Change Action Plan may go a long way in dealing with climate change, as shown in Box 4.15.

While most countries have not adopted strict emission reduction goals, these do exist in the European Union and a few other countries (Goosling *et al.,* 2012). Inclusion of aviation in greenhouse gas mitigation policy for international bunker fuels and more recently adaptation policy proposals are causing concern among long haul and nations with tourism dependant economies due to perceived increased cost of travelling by air (Pentelow and Scott, 2010). Mitigation policies, especially tax and market-based instruments, may lead to an increase in the costs of travel as well as increase awareness of climate change and travel emissions (Goosling *et al.*, 2012).

Box 4.14: Climate change policy by the tourism industry in Kenya

There is need for climate change to be addressed from National law and policy in consultation with stakeholders (Academia 8).

It is better that Kenya submits a model for climate change response before one is thrust to them by developed countries (Academia 9).

Kenya urgently needs a comprehensive inventory of species to map, plan and conserve its biodiversity and at the same time, come up with a national plan that takes into account likely changes in land use and climate. There is need to come up with action plans in safeguarding the ecosystems and infrastructure important for tourism. The national plan should take into account likely changes in land use and climate (Academia 6).

Kenya's efforts in dealing with climate change are commendable. There is political goodwill from the government. All that is needed is the correct scientific data and practical recommendation to appropriately adapt. However there is a general lack of engagement by key stakeholders which extends to the parliamentary arena, in which few voices raise climate issues at the national level (NGO 2).

The Government has developed the National Climate Change Response Strategy (NCCRS) which requires over Ksh.235 billion shillings to implement. The NCCRS showed that climate change affects a wide range of the environmental resources that are critical attractions for tourism (Government 1).

The Kenya government has completed developing a comprehensive action plan to implement the national climate change response strategy. Implementation of this climate change action plan will lead to reduced climate vulnerability. In addition, climate change has been captured in the country's medium term plan (MTP) of 2013-2017. However, climate change has not been addressed in the country's national development blue print, *the Vision 2030* (Government 1).

The Kenyan Constitution takes into account environmental policies that advocates for a minimum National forest cover of 10 per cent and the Bill of Rights which every Kenyan has the right to a clean environment (Government 7).

Increased incidences and frequency of floods and drought require urgent mitigation and adaptation. While encroachment by humans on elephant habitat necessitate a sustainable land-use policy (Government 4).

There is need to include tourism as a specific sector in national climate vulnerability assessments to enable the coordination of adaptation measures to protect vital assets such as beaches, wildlife and areas of natural beauty (Academia 2).

Unless addressed, climate change will impede achievement of the MDGs and other development objectives as outlined in vision 2030 (Government 5).

4.4.2: Sub-theme 2: Content analysis of the climate change and tourism policy in Kenya

This sub-section contains a detailed content analysis of the current climate change and / or tourism policies that are currently affecting the tourism industry. Kenya has made several significant strides in addressing climate change. There are numerous institutions in Kenya working on climate change issues. These include Government ministries, departments, institutions and parastatals; Non-Governmental Organisations (NGOs), United Nations (UN) and related bodies; Community Based Organisations (CBOs); the private sector; and research and academic institutions. However, according to Mutimba *et al.* (2010), efforts of these organizations towards addressing climate change are not coordinated, leading to duplication of efforts.

Although most environmental policies such as the National Environmental Policy, the energy policy, the forest policy and the Arid and Semi-Arid Land policy have not significantly addressed climate change issues, the country has established a Climate Change Secretariat at the Ministry of Environment and Mineral Resources to oversee and coordinate the country's climate change activities.

The main and probably the strongest provisions that the government of Kenya has made towards addressing climate change are the National Climate Change Response Strategy (NCCRS), which was published in 2010 and the National Climate Change Action Plan (NCCAP) 2013-2017, which was published in 2013. These documents have addressed

mitigation and adaptation by giving guidelines on integration and mainstreaming climate change issues in various sectors and institutions.

This section reviews some of the key government plans related to climate change and tourism. The plans reviewed are:

- East African Community Climate Change Master Plan (EACCCMP)
- The Kenya Vision 2030
- The tourism policy
- The National Climate Change Response Strategy (NCCRS)
- The National Climate Change Action Plan 2013 - 2017 (NCCAP)

The issues reviewed from the respective policy documents sought to respond to the following questions:

i. Have climate change issues in the tourism sector been identified in the document?
ii. If so what impacts have been identified?
iii. What are the response strategies suggested?
iv. Are these strategies based on research?

4.4.2.1: East African Community Climate Change Master Plan (EACCCMP)

The EACCCMP was published in September 2011 and is aimed to guide climate change plans from 2011 to 2031. The main purpose of the Master Plan is to strengthen regional cooperation to address climate change issues that concern regionally shared resources. Tourism is one of the regional issues that have been identified and prioritised

by the in the report as being vulnerable to climate change. A summary of the situational analysis of the climate, trends and projection of each of the five partner states (Kenya, Tanzania, Uganda, Burundi and Rwanda) is given as a basis for understanding the vulnerabilities and sensitivities to climate change**.**

The report identifies tourism as one of the nine main regional issues which are most vulnerable in the region and therefore need priority. A number of climate change impacts have been highlighted as well as response strategies in the tourism sector. Eight pillars for increasing climate change resilience have been identified among them adaptation, mitigation and technology transfer. In addition, a number of adaptation responses have been identified such as managerial, technical and technological. The document is in line with a number of relevant environmental and climate change documents such as the EAC Climate Change Policy (EACCCP), EAC Climate Change Strategy, the EAC Protocol on Environment and Natural Resources and the EAC Food Security Policy. The climate change situation analysis has been based on climate data from Meteolorogical departments in each country. However, most of the findings are not scientific peer reviewed research evidence.

4.4.2.2: The Kenya Vision 2030

The vision seeks - 'to transform Kenya into a newly industrialising, middle-income country providing a high quality life to all its citizens by the year 2030'. To achieve this, Kenya aims to maintain a sustained economic growth of 10% p.a. over the next 25 years under the economic pillar. One of the six key sectors identified to achieve this is

tourism. The country aims to be one of the top ten long-haul tourist destinations in the world, offering a high-end, diverse, and distinctive visitor experience. Plans have been stipulated in the vision to address constraints facing the sector and improve the quality and breadth of the country's tourism product.

One of the key challenges facing developments worldwide is climate change. However, climate change issues did not feature prominently in Vision 2030 as a challenge to the three major pillars. Specifically, the economic pillar where tourism is featured did not address climate change issues in its planning agenda. The same case applies to the political pillar. Only the social pillar (environment chapter) addresses climate change, where the seven mentions of climate change relate to a few general impacts, ASALs, and suggestions to mainstream climate change into policy and planning (GoK, 2007). It is clear that the Vision has limited use of climate data for sectoral planning and budgeting. This is evidenced by a report by NEMA that says that the Vision 2030 does not contain an in-depth discussion of the effects of climate change and variability on the numerous set of goals under the economic, social and political pillars (GoK, 2012).

4.4.2.3: The National Climate Change Response Strategy (NCCRS)

The report seeks to increase the understanding of climate change both locally and internationally by analyzing policy and recording impacts in various sectors of the economy (GoK, 2010). It seeks to strengthen nationwide focused actions towards adapting to, and mitigating against a changing climate by ensuring commitment and engagement of all stakeholders while taking into account the vulnerable nature of the

country's natural resources and society as a whole (Mutimba *et al.*, 2010). In this regard, a number of recommendations are given on vulnerability assessment, impact monitoring and capacity building framework needs such as technology transfers to address climate change. It has also recommended a number of adaptation and mitigation measures needed to minimize risks associated with climate change while maximizing opportunities.

The report identifies tourism as one of the country's six most important economic sectors. It acknowledges the fact that tourism is one of the most vulnerable sectors and gives a brief overview of the impacts of climate change on the tourism sector. However, there is no evidence that such findings are peer reviewed. The report acknowledges important gaps in climate change and research, for example where it states that…

> *…how vulnerability varies across the country is something that is yet to be determined… (GoK, 2010:72).*

The report suggests several adaptation and mitigation measures for the sector. However these measures are not based on vulnerability assessment, a fact that could explain the reason why the tourism sector is assigned only 0.04 billion Kenya shillings as compared to a sectors such as Forestry and Wildlife (32.26 billion), Region Development Authorities (24 billion) and Agriculture (10 billion).

4.4.2.4: The National Climate Change Action Plan 2013-2017

The National Climate Change Action Plan (NCCAP) 2013 - 2017 developed in 2013 was developed as the next step after the NCCRS to enable Kenya to reduce vulnerability to climate change and to improve the country's ability to take advantage of the opportunities that climate change offers (GoK, 2013). The Action plan is the result of a year-long, participatory process involving the public sector, the private sector, academia and civil society, under the leadership of the Ministry of Environment and Mineral Resources guided by a multi-stakeholder, multidisciplinary taskforce.

The Action Plan has eight subcomponents which are not only distinct but are also closely linked and interrelated. These are: i) Long-term National Low Carbon Development Pathway; ii) Enabling Policy and Regulatory Framework *(to which this report contributes)*; iii) National Adaptation Plan; iv) Nationally Appropriate Mitigations Actions (NAMAs); v) National Climate Change Technology Action Plan; vi) National Performance and Benefit Measurement; vii) Knowledge Management and Capacity Development; and viii) Finance.

The plan recognizes tourism as one of the most important economic sectors to achieve the country's vision to become a prosperous country. On the other hand, it appreciates the fact that climate change has an important influence on environmental conditions and incidents that can deter tourists, such as infectious disease, very high temperatures, wildfires, increased wildlife mortality, and insects and waterborne pests. The plan further recognizes that GHG emissions in the tourism sector are low relative to Kenya's

overall national emissions but suggests a low carbon climate resilient pathway in the tourism sector that can help to ensure long-term sustainable growth of the industry. The recommended actions include solar water heating, the use of energy efficient lighting and appliances, and more efficient passenger vehicles. Further, the plan suggests priority adaptation actions such as the completion of the National Wildlife Adaptation Strategy, and undertaking research to determine the vulnerabilities of wildlife populations and habitats. The plan also recommends that a concerted programme could help to create a niche market by branding Kenya as a low carbon footprint destination. This could include replication of sustainable tourism initiatives, and guidelines on resource efficiency and greening the sector. The plan further recommends the implementation of research, training and capacity building programmes to enhance the climate resilience of the tourism sector. It estimates that adaptation efforts will cost Ksh. 1.3 billion for five year period from 2013 – 2017.

4.4.2.5: Conclusion of the review

From the above review, it is apparent that there is limited research and knowledge to identify climate change impacts in key sectors in the country, including tourism. Without such research, climate change is not being built into policy and planning in the sector. This is also acting as a barrier to adaptation and mitigation efforts. It is therefore important to put in place policies and institutions that will address and prepare the country to handle the projected impacts of climate change on tourism. Consequently, more institutions such as Academia and NGOs also need to take up research on climate change to ensure that any response strategy is based on concrete findings.

4.5: Theme 5: Conceptual model for vulnerability assessment

This theme starts with a detailed assessment of vulnerability in relation to tourists and service providers. Then the status of climate change and tourism in Kenya is analyzed using the Vulnerability Scoping Diagramme (VSD) and then using the results derived from the VSD, suggests a conceptual model for climate change vulnerability assessment for tourism applicable for all destination, especially those most affected by climate change.

4.5.1: Regression model for vulnerability assessment (tourists perspective)

Multiple regression analysis was used to determine whether climate change indicators and weather (independent variables) can predict presence of vulnerability (dependent variables). Table 4.48: shows the model summary of the coefficients of determination.

Table 4.0.48: **Model summary of the coefficients of determination (tourists perspective)**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.889(a)	.791	.789	.26708	.791	328.360	4	347	.000

(a) Predictors: (Constant), indirect impact, weather parameters, direct impacts, general impacts

(b) Dependent Variable: Vulnerability rating

Table 4.49 shows the model summary of the coefficients of determination implying that the perception of the tourists concerning importance of weather and climate change

indicators is explained by 78.9% of the variance (R_{adj} = 0.789). The remaining portion of the perception is determined by other factors. This means that vulnerability of tourism to climate change is to a large extent affected by tourists' perceptions of weather and climate change indicators.

Table 4.49: Regression coefficients of tourists perceptions

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations		
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part
1 (Constant)	.432	.105		4.099	.000	.225	.639			
Weather parameters	.096	.022	.138	4.471	.000	.054	.139	.195	.233	.110
General Indicators	.302	.026	.450	11.782	.000	.251	.352	.807	.535	.289
Direct Indicators	.335	.026	.425	13.095	.000	.285	.386	.639	.575	.321
Indirect Indicators	.155	.028	.189	5.463	.000	.099	.211	.687	.281	.134

At a confidence level of 0.05, the constant value in the regression model ranges from 0.225 to 0.639. While using the upper boundary, the perception model can be expressed as

$Y = 0.139W_1 + 0.352G_2 + 0.386D_3 + 0.211N_4$

Where:

Y = Vulnerability of tourism to climate change

W_1 = Weather factors

G_2 = General indicators

D_3 = Direct indicators

N_4 = Indirect indicators

The regression model shows the different levels at which each factor contributes to vulnerability of tourism to climate change. Perceptions on weather account for 13.9% (coefficient of 0.139), general indicators account for 35.2% (coefficient of 0.352), direct indicators account for 38.6% (coefficient of 0.38), while indirect indicators account for 21.1% (coefficient of 0.211) in determining the vulnerability of tourism to climate change.

4.5.2: Regression model for vulnerability assessment (hotel managers perspective)

Multiple regression analysis determined if climate change indicators and magnitude of impacts on resources (independent variables) can predict vulnerability (dependent variable), as shown in Table 4.50.

Table 4.50: Model summary of the coefficients of determination (hotel managers perspective)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.990	.979	.973	.16477	.979	160.323	8	27	.000

(a) Predictors: (Constant), General indicators on tourism, Direct indicators on tourism, Indirect indicators on tourism, Resources, Activities, Infrastructure, Services and Facilities

(b) Dependent Variable: Vulnerability rating

Table 4.51 shows the regression coefficients of determination implying that the perception of the hotel managers concerning general, direct and indirect indicators on tourism and magnitude of impacts on resources, activities, infrastructure, services and facilities is explained by 97.9% of the variance ($R_{adj} = 0.979$). The remaining portion of the perception is determined by other factors. This means that vulnerability of tourism to climate change is to a large extent affected by hotel managers' perceptions of general indicators on tourism, direct indicators on tourism, indirect indicators on tourism; and magnitude of impacts on resources, activities, infrastructure, services and facilities.

At a confidence level of 0.05, the constant value in the regression model ranges from -1.904 to -0.771. While using the upper boundary, the perception model can be expressed as

$$Y = 0.108A_1 + 0.389B_2 + 0.072C_3 + 0.588E_4 + 0.33F_5 + 0.513H_6 + 0.091J_7 + 0.369K_8$$

Where:

Y = Vulnerability of tourism to climate change

A_1 = general indicators on tourism

B_2 = direct indicators on tourism

C_3 = indirect indicators on tourism

E_4 = Magnitude of impacts on resources

F_5 = Magnitude of impacts on activities

H_6 = Magnitude of impacts on infrastructure

J_7 = Magnitude of impacts on services

K_8 = Magnitude of impacts on facilities

Table 4.51: Regression coefficients of tourists perceptions

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations		
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	-1.338	.276		-4.841	.000	-1.904	-.771			
	General Impacts on tourism	.654	.172	.567	3.789	.001	.300	.108	.880	.589	.105
	Direct impacts on tourism	.114	.134	.076	.848	.404	-.162	.389	.868	.161	.023
	Indirect impacts on tourism	-.215	.140	-.229	-1.539	.135	-.503	.072	.897	-.284	-.043
	Resources	.394	.095	.292	4.169	.000	.200	.588	.860	.626	.115
	Activities	.091	.117	.073	.778	.443	-.149	.330	.892	.148	.021
	Infrastructure	.279	.114	.271	2.444	.021	.045	.513	.898	.426	.068
	Services	-.251	.078	-.221	-3.230	.003	-.410	-.091	.670	-.528	-.089
	Facilities	.254	.056	.239	4.521	.000	.139	.369	.868	.656	.125

The regression model shows the different levels at which each factor contributes to vulnerability of tourism to climate change according to hotel managers perspectives. Perceptions on general indicators on tourism accounts for 10.8% (coefficient of 0.108), direct indicators on tourism accounts for 38.9% (coefficient of 0.389), indirect indicators on tourism accounts for 7.2% (coefficient of 0.072), resources accounts for 58.8% (coefficient of 0.588), activities accounts for 33% (coefficient of 0.33), infrastructure accounts for 51.3% (coefficient of 0.513), services accounts for 9.1% (coefficient of 0.091) and facilities accounts for 36.9% (coefficient of 0.369).

From the regression analysis, it can be concluded that among the many factors that affect vulnerability of tourism to climate change, factors that were found to be most significant from tourists perspective (in order of priority) were perceptions of: direct indicators, general indicators, indirect indicators and weather factors. From the hotel managers' perspective, the factors that determine vulnerability (in order of priority) are: magnitude of impacts on resources; magnitude of impacts on infrastructure; direct indicators on tourism; magnitude of impacts on facilities; magnitude of impacts on activities; general indicators on tourism; magnitude of impacts on services and indirect indicators on tourism. Therefore the third null hypothesis was rejected and the alternative hypothesis accepted that vulnerability of tourism to climate change depends on tourists and service providers' experiences.

It is apparent that influence of climate change on tourism demand patterns will be shaped by the response of tourists to the complexity of mitigation policies and their impacts on transportation systems, the wide range of climate change impacts on destinations, as well as broader impacts on society and economic development (Gossling *et al.,* 2012).

4.5.3: Vulnerability Scoping Diagramme (VSD)

A Vulnerability Scoping Diagramme (VSD) for tourism was constructed in order to describe the current vulnerability of tourism to climate change impacts in Kenya. VSD

is an easy tool for identifying and visualizing vulnerability components and measuring indicators (Polsky *et al.*, 2007), as shown in Figure 4.43.

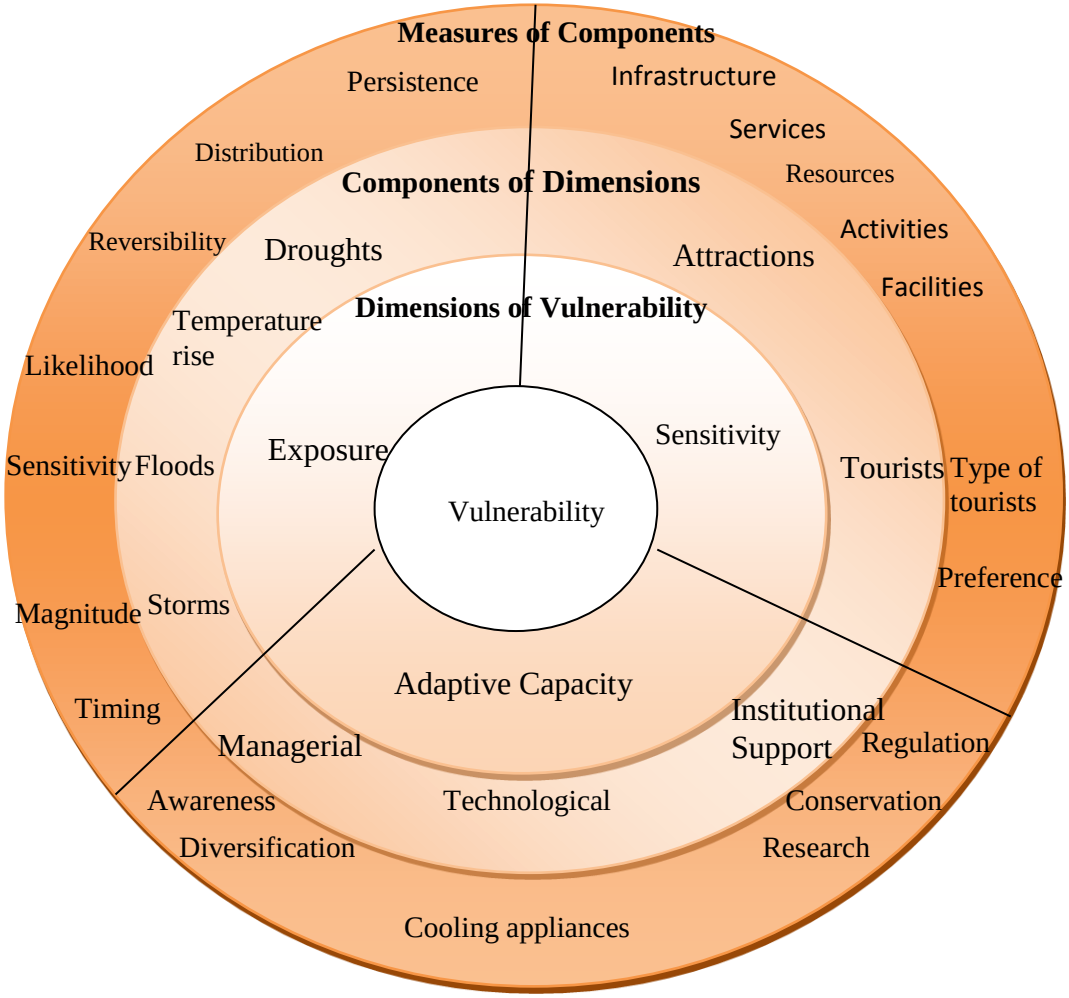

Figure 4.43: Vulnerability Scoping Diagramme for tourism
Source: adapted from Polsky et al., 2007

This VSD was based on archival analysis and the perceptions of stakeholders and tourism and / or climate change experts who provided the local context and knowledge necessary for embarking on the assessment. The overall vulnerability is measured in terms of the exposure, sensitivity and the adaptive capacity levels.

4.5.4: Vulnerability assessment rating of the tourism industry in Kenya to the impacts of climate change.

Validation of vulnerability components and indicators within exposure, sensitivity and adaptive capacity were developed in consultation with stakeholders. Semi-quantitative approaches were used where each indicator is divided into categories: Very low (1), low (2), moderate (3), high (4) and very high (5). In case of percentages, the ratings were 1 indicating 0-20%; 2 (21-40%); 3(41-60%); 4(61%-80%) and 5(81%-100%). However, for the most part, these results were discussed with two experts, one from tourism and the other from climate change in order to verify the various ratings.

4.5.4.1: Exposure of the tourism industry to climate change

In this study, the exposure of the tourism industry to climate change was measured in terms of two categories of variables:

(a) Rating of indicators of climate change on tourism according to the hotel managers (general, indirect and direct).

(b) Nature of occurrence of these indicators.

(a) Rating of indicators

A summary of the ratings show that the indicators had a mean of 4.0 which means that the hotel managers rated the indicators as *high*. This is summarized in Table 4.52

Table 4.52: **Indicators of climate change on tourism (Hotel managers perspective)**

Indicators n = 36	**Mean**	**Std. Deviation**
General indicators	4.0	1.0
Indirect indicators	4.2	1.1
Direct indicators	3.8	.9
Total	**4.0**	**1.0**

(b) Nature of indicators

The main criteria identified by IPCC forth assessment report that may be used to identify *key vulnerabilities* in various sectors (Schneider *et al.*, 2007) recorded very high percentage of confirmation of existence. More than 75% of the hotel managers said that the indicators are occurring currently in a sudden and surprising and non linear manner, are persistent, irreversible, unpredictable but have high potential for adaptation. Therefore, these results show that the tourism industry is *highly* exposed to the indicators of climate change with a rating of 4. This is summarized in Table 4.53.

Table 4.53: Nature of indicators

Nature of indicators n = 36	**Frequency**	**Percent**
Occurring currently	30	83
Sudden & surprising	28	78
Non linear manner	28	78
Persistent	28	78
Irreversible	27	75
Unpredictable	34	94
High potential for adaptation	25	69

4.5.4.2: Sensitivity of the tourism industry to climate change

This study measured sensitivity in terms of :

(a) Tourists perceptions

i. Tourists views of indicators of climate change

ii. Tourists rating of weather parameters

iii. Tourists perceptions of the factors defining weather

(b) Magnitude of indicators on components of tourism

(a) Tourists perceptions

Tourists rated the indicators of climate change on the tourism industry around moderate (rating of 3), as shown in Table 4.54.

Table 4.54: Tourists perceptions of indicators

Indicators **n = 352**	**Mean**	**Std. Deviation**
General indicators	3.4	.89
Indirect indicators	3.0	.70
Direct indicators	2.6	.74
Total	**3.0**	**.78**

4.5.4.3: Unfavourable weather for tourism

The weather indicators of the major climate change indicators that are currently affecting Kenya were described by at least 68% of the tourists as indicators of unfavourable weather (rating of 4), as shown in Figure 4.55.

Table 4.55: Unfavourable weather for tourism

Parameter	Percentage
Presence of rain	86
Presence of strong wind	81
High temperatures	68

4.5.4.4: Importance of weather parameters

Similarly main weather parameters were considered important in choosing a destination (rating of 4), as shown in Table 4.56.

Table 4.56: Importance of weather parameters

Weather parameters	Mean	Std. Deviation
Total	**4.1**	**1.0**

4.5.4.5: Magnitude of indicators on components of tourism

On the other hand, the magnitude of indicators was rated as high (mean 4.0). These results show that the tourism industry is highly sensitive to the indicators of climate change, with a rating of 4, as shown Table 4.57.

Table 4.57: Magnitude of indicators (Hotel managers views)

Magnitude of indicators N= 36	Mean	Std. Dev.
Indicators on resources	4.0	1.0
Indicators on activities	3.9	1.0
Indicators on infrastructure	4.3	1.1
Indicators on services	4.0	1.0
Indicators on facilities	3.9	1.0
Total	**4.0**	**1.0**

4.5.4.6: Adaptation

Only 3 adaptation practices were adopted by more than 40% of the hotel managers (*promotion of conservation*, 91%; *education campaigns* (88%) and *enhancement of disaster preparedness* (72%). Although there exists opportunities for adaptations, a number of constraints were reported. Since averaging the percentage of respondents may not give the correct result, consultation with experts resulted to an adaptive capacity that is moderate, with a rating of 3. Generally, with the help of experts the tourism industry in Kenya was rated as highly sensitive, highly exposed and has a moderate adaptive capacity. Therefore the industry is highly vulnerable, with a rating of 4, as shown in Table 4.58.

Table 4.58: Vulnerability rating of the tourism industry to climate change in Kenya

Factor	**Description**	**Rating**
Exposure	High	4
Sensitivity	High	4
Adaptive capacity	Moderate	3
Vulnerability	**High**	**4**

4.5.4.7: Conceptual model for climate change vulnerability assessment for tourism

This study has constructed a vulnerability assessment conceptual model for tourism, suitable for developing countries, where most indicators of climate change are already evident. This bottom-up model, which ensures that adaptation is not treated as a residual at the end of the analysis and also ensures that its role is rightfully emphasized. The model involves assessment of sensitivity of tourism to climate change through

assessing the sensitivity of tourists to climate change indicators; the magnitude of indicators on components of tourism and seasonality of tourism due to weather. These factors are further assessed by rating tourists perceptions of climate change indicators; tourists rating of weather parameters and tourists perceptions of the factors defining weather. On the other hand, the exposure of tourism to climate change is assessed by rating the supply side indicators of climate change on tourism and the nature of occurrence of these indicators. Finally both current and planned adaption of tourism to climate change needs to be considered in order to establish the level of vulnerability of tourism to climate change, as shown in Figure 3.44.

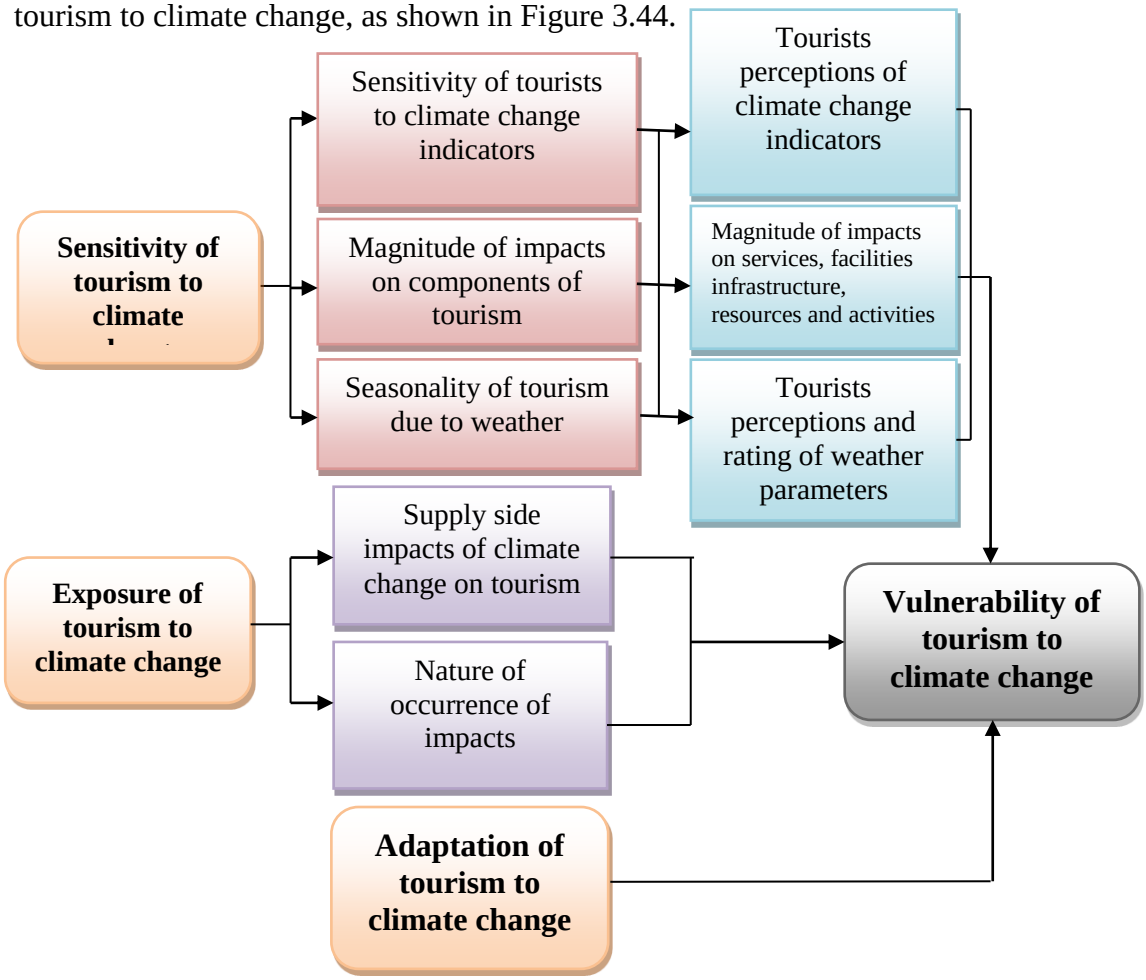

Figure 4.44: Conceptual model for climate change vulnerability assessment for tourism
Source: researcher, 2013

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1: Summary

Results are based on three main sources of primary data: questionnaires filled by hotel managers; questionnaires filled by tourists and interviews with key tourism and / or climate change experts. Three major tourists regions in Kenya were selected which were Nairobi, Coast and Central, which experience different climatic conditions. A total of 20 hotels were randomly selected out of the total 49, but only 18 successfully responded, resulting in 36 hotel managers (2 from each hotel) and 352 tourists (20 from each hotel). In addition, content analysis of key tourism and climate change policy were reviewed.

This study sought to explore the vulnerability of the tourism sector to the indicators of climate change. This was done by exploring the indicators of climate change on the tourism sector from both supply and demand side, analyzing the policy framework in Kenya and estimating the vulnerability level. Supply side was mainly represented by hotel managers and experts while the demand side was represented by tourists visiting Kenya. Results generally indicated that climate change indicators are currently affecting the tourism sector in the country. The supply side is affected by these indicators more than the demand side.

Indicators of climate change on tourism were divided into three: general, indirect and direct indicators. Then the magnitude and nature of indicators of climate change on the main components of tourism was rated. The study then explored the importance tourists put on weather parameters for tourism. Then Adaptation practices and opportunities were assessed. Content analysis of climate change and tourism policy was done. Using the results of all these analyses, a conceptual model for vulnerability assessment was used to rate the vulnerability level of the tourism industry in Kenya.

Generally, vulnerability is based on sensitivity, exposure and adaptation. The sensitivity of the tourism industry to climate change is defined by three main factors: sensitivity of tourists to climate change indicators; magnitude of indicators on components of tourism and the seasonality of tourism caused by weather factors. The sensitivity of tourists to climate change indicators is further defined by the tourists perceptions of climate change indicators; the tourists rating of weather parameters and the tourists perceptions of the factors defining weather.

Results showed that tourists visiting Kenya slightly agree that there is evidence of general indicators which are *too high temperatures, very strong winds* and *floods* in the country. This was dependent on the weather conditions prevalent during their stay in Kenya. However, they indicated that these climate change indicators have not resulted into *reduced beach use* and *reduction in overall satisfaction* yet.

In addition, tourists indicated that there was evidence of *disaster preparedness* but no evidence of *forest fires* and *water restrictions*. Experts reported that Kenya's weather and climate are a key attraction for tourism. Any changes in the climate system such as floods and high temperatures have impacted negatively on *landscape, habitats, wildlife* and *tourists activities*. However, the increased precipitation has caused more improvement to the industry than destruction. Also, according to the experts, tourists visiting Kenya may have slightly reduced due to the climate change mitigation policies being implemented in the European and other regions. Overall, the direct indicators are not too heavy on the tourism sector yet, while the general and indirect indicators are already a reality in the country.

The study also sought to find out how important various weather parameters are to tourists. To address this, tourists were asked what conditions characterized a day of unfavourable weather. The most highly rated variables were *presence of rain, presence of strong wind, high temperatures* and *high humidity.*

All the major climate change factors that is *comfortable temperatures, water temperature absence of rain, hours of sunshine* and *absence of strong wind* were rated as important and very important.

Generally hotel managers reported that climate change had adversely impacted on tourism *resources, activities, infrastructure, services* and *facilities*. The magnitude of indicators of climate change on the three main tourism resources in Kenya (*wildlife,*

beach and *sceneries)* was rated very highly by hotel managers. Climate change indicators have affected tourism services (*road transport, air transport* and *hospitality services)* highly. The tourist activities that have been highly impacted were *beach activities, game drives, sightseeing, adventure, trekking / walking, animal riding and camping*. *Business and conferencing* has not been highly affected probably since it takes place indoors. Tourism infrastructure (*roads, telecommunication, sewer system* and *airports/ airstrips)* has been highly affected by climate change indicators. Magnitude of indicators on facilities (*buildings, sites and equipment)* was high.

The 2nd quarter has been having substantially fewer international tourists arrivals than the other quarters since 1970. This could be because this is the highest rainy season in the country and some tourists facilities are often closed during this period. With the changing climate, seasonality of tourism caused by weather factors may adversely affect tourism in the country.

In this study, the exposure of the tourism industry to climate change was measured in terms of two categories of variables: (a) the indicators of climate change on tourism according to the hotel managers (general, indirect and direct) and (b) the nature of occurrence of these indicators.

The most significant general indicators affecting the tourism industry in Kenya are *increase in temperatures, changes in rainfall patterns, droughts* and *floods*. There is little evidence of *more intense storms.* Droughts are severe, frequent and prolonged,

causing variation in weather patterns, reduced levels of water and habitat loss. Floods are prolonged and frequent. There is heavy and unpredictable rainfall. The indirect indicators affecting Kenya's tourism include: *loss of species habitats, increased water stress, damage of attractions, reduced agricultural production, loss of livelihoods, loss of biodiversity, increase in diseases* and *reduced landscape beauty*.

High temperature is associated with uncomfortable weather, hot weather variations and temperature variations. Climate change had impacted on the ecosystems since there is evidence of coral bleaching, habitat loss, reduced water levels, reduction of wildlife and invasion of species. Factors that are exacerbating climate change include settlement, illegal logging, charcoal burning, cultivation and encroachment on habitat. Direct indicators of climate change on the tourism industry indicators were *reduced competitiveness, damage to infrastructure, damage to company property, loss of revenue, additional emergency preparedness, higher operating expenses, business interruptions, reduced quality of tourism, affected destination image* and *increased cost of adaptation*. The mean ranged between 3.6 and 4.4. However these indicators have not caused *reduction in tourist satisfaction* and *reduced length of tourism*.

The hotel managers and experts confirmed that the indicators of climate change occurring in Kenya are happening currently, in a sudden and surprising manner, in a nonlinear manner, are persistent, irreversible, unpredictable but have high potential for adaptation.

In order to evaluate the adaptation plans by tourists, they were asked what their response to any unfavourable climatic conditions experienced in Kenya would be. Only 12% of the tourists reported a change of destination during their next visit. This means that the appeal of Kenya as a tourism destination is still very high despite the climate change indicators affecting the destination. However, 12% who plan to change the destination due to climate change indicators may be a reason to increase the rate of climate change adaptation.

The most popular adaptation practices adopted by hotel managers in Kenya were *promotion of conservation*, education *campaigns* and *enhancement of disaster preparedness*. Other important practices such as *use of new technologies, product diversification, insurance, fund research on climate change, market diversification, change of building design or material, taken advantage of opportunities* were practiced by less than 40% of the hotels. These results were confirmed and further elaborated by experts who reported that the main adaptation efforts that are currently being practiced in the tourism industry were *change of governance, business adaption, technological adaptation, behavioural adaptation* and *training adaptation. Change of governance systems* entailed *disaster preparedness, national law and policy, data provision, economic adaptation, social adaptation, collaboration* and *fund research*. Business adaptation included *use of product diversification, market diversification, promotion of conservation, insurance, new technologies* and *disaster preparedness. T*echnological adaptation, included *cooling systems, innovation, scaling up of green investments, renewable energy* and *change of building designs.*

On future adaptation efforts, the experts emphasized that there is need to adapt to indicators of climate change on tourism through: *improving land management systems*; *enhancing disaster preparedness*; *wildlife adaptation*; *provision of data*; using *new technologies, starting education campaigns* on adaptation, *product diversification, market diversification,* f*unding research* and *take advantage of opportunities.* Since climate change data is highly dispersed, insufficient, difficult to access and not often packaged for the consumption of the tourism industry experts emphasized that data provided on climate change should be *affordable*, *up to date data*, *reliable data* and *correct scientific data*. In order to manage wildlife which is a key resource for tourism in Kenya, experts suggested that there when necessary, *wildlife translocation, watering the wildlife* and *feeding the wildlife* could be done during harsh climatic conditions. However, it was clear that many climate change-related decisions were still made without proper vulnerability and adaptation research.

Therefore there is need to link research with policy and strategy in climate change adaptation. The experts reported that climate change adaptation efforts in Kenya were being frustrated by limited finances, technologies, information and other factors. There also have been conflicts of interest, overdependence on tourism other economic sectors, changing social values and uncertainties on projections. Consequently, the experts recommended that there is need for collaboration amongst all stakeholders to solve these drawbacks.

The study also showed that the government of Kenya and other institutions are investing a lot of money into adaptation. Climate change will definitely cause a lot of harm, but will also result into a number of opportunities. Some of those reported by the experts were carbon trading and REDD+. The experts reported that Africa is highly vulnerable but remains least responsible for the GHG emissions which are causing the changes in the climate system. Therefore the experts' view is that developed nations should equitably carry the burden of mitigation and adaptation.

There was a general consensus among the experts that Kenya needs to be proactive in carrying out research and drafting policy on how to deal with climate change. Though major policy documents in the country such as the vision 2030 and the constitution of Kenya have barely addressed climate change, the country's efforts to develop policy through the National Climate Change Response Strategy (NCCRS) and the National Climate Change Action Plan (NCCAP) 2013 - 2017 may go a long way in dealing with climate change. From the main climate change and / or tourism documents content analysis, it is apparent that there is limited research and knowledge to identify climate change indicators in key sectors in the country, including tourism.

Sensitivity of tourists on weather parameters and climate change indicators ranges by tourists' country of residence, purpose of visit, age, marital status. The most sensitive tourists were those from cold regions, those on leisure travel, those that are older, those that are married and those staying in lower rated hotels. On the other hand, exposure level of the tourism industry depended mainly on the regions where the facilities are

situated. The coldest regions are experiencing the least indicators. Exposure does not depend on hotel rating. Limited adaptation efforts were being made by the tourism industry to address climate change.

From the regression analysis, it can be concluded that vulnerability depends on direct indicators, general indicators, indirect indicators and weather factors and magnitude of impacts on resources, infrastructure; facilities; activities; and services. A Vulnerability Scoping Diagramme (VSD) for tourism was constructed in order to describe the current vulnerability of tourism to climate change indicators in Kenya.

The exposure of the tourism industry to climate change was measured in terms of indicators of climate change on tourism according to the hotel managers (general, indirect and direct) and the nature of occurrence of these indicators. Results show that the tourism industry is highly exposed to the indicators of climate change with a rating of 4. Sensitivity was measured in terms of tourists perceptions and the magnitude of indicators on components of tourism. These results show that the tourism industry is highly sensitive to the indicators of climate change, with a rating of 4. The adaptive capacity was moderate, with a rating of 3. From these results, the tourism industry in Kenya is highly sensitive, highly exposed, has a moderate adaptive capacity and therefore highly vulnerable, with a rating of 4. Finally, a conceptual model for the assessment of climate change for the tourism sector is developed that addresses the three determinants of vulnerability: sensitivity, exposure and adaptation.

It is clear that climate change is threatening and will continue to threaten destinations putting at risk the continuation of tourism activities and therefore jeopardizing the development of those regions, like Kenya, which view tourism not only as a key driving force for their economy, but also as an important incentive for social and environmental conservation.

5.2: Conclusions

Sensitivity of the tourism industry to climate change varies according to The type of indicators, the purpose of travel, age, the class of accommodation facilities and marital status. The highest rated climate change indicator is *too high temperatures*. Therefore tourism stakeholders need to device ways of regulating temperatures in facilities, transportation systems and attractions. Tourists from countries such as Australia, South America and the rest of Africa are less sensitive to temperatures than those from countries that experience very cold temperatures such as North America, Asia and Europe. Africa and Australia are the least sensitive. Therefore market diversification especially to regional market needs to be emphasized. Leisure tourists are the most sensitive to the indicators followed by business tourism and then tourists visiting friends and relatives.

Diversification of market to business tourists can sustain tourism as climate changes. Older tourists are more sensitive to indirect climate change indicators than younger tourists. Therefore, marketers can heavily rely on younger tourists to ensure the sustainability of the industry. Tourists staying in three star hotels are the most sensitive

followed by four star and then five star hotels. Lower classified hotels need to install more weather regulating installations. Married tourists are the most sensitive to climate change indicators followed by single tourists and then the divorced. Kenya needs to diversify to a variety of tourist such as business tourists travelling without families and young single tourists.

The general climate change indicators; *increase in temperatures, changes in rainfall patterns, droughts* and *floods* are highly impacting on the tourism resources such *as attractions, wildlife habitats, biodiversity.* These indicators have also caused *increased water stress, reduced agricultural production, loss of livelihoods, increase in diseases* and *reduced landscape beauty, which all have a direct or indirect effect on tourism*. To a lesser extent, the indicators have reduced various competitiveness of the tourism industry, damaged infrastructure, loss of revenue, additional emergency preparedness and business interruptions. However, climate change indicators have not resulted to *reduction in tourist satisfaction* and *reduced length of tourism yet*. The following relationships were established:

Hotter regions in the country are experiencing more general, indirect and direct indicators than colder regions. Since tourism in the country is currently concentrated in hotter regions, product diversification to colder regions can sustain the industry in the era of climate change.

The indicators are felt uniformly despite the rating of the hotel. Services providers situated in similar regions are therefore experiencing impacts of climate change equally. The indicators of climate change occurring in Kenya are happening currently, in a sudden and surprising manner, in a nonlinear manner, are persistent, irreversible, unpredictable but have high potential for adaptation.

The appeal of Kenya as a tourism destination is still very high despite the climate change indicators affecting the destination. However adaptation is urgently required to not only attract new markets but also retain the current segments. Generally, the main adaptation efforts that are currently being practiced in the tourism industry are government efforts (such as disaster preparedness, national law and policy, data provision, economic adaptation, social adaptation, collaboration and fund research), business adaption (promotion of conservation, education campaigns and enhancement of disaster preparedness, use of product diversification, market diversification, insurance and new technologies), technological adaptation (cooling systems, innovation, scaling up of green investments, renewable energy and change of building designs), behavioural adaptation and training adaptation. Regions most impacted are practicing limited number of adaptation practices, although the few methods chosen are practiced by all the hotels.

Climate change data is highly dispersed, insufficient, difficult to access and not often packaged for the consumption of the tourism industry. It is clear that the tourism

industry in Kenya requires data and information that is affordable, up to date, reliable and correct scientifically.

Climate change adaptation efforts in Kenya were being frustrated by limited finances, technologies, information and other factors. There also have been conflicts of interest, overdependence on tourism other economic sectors, changing social values and uncertainties on projections. There are opportunities in increased rainfall, carbon trading and REDD+.

5.3: Recommendations

There is need to link research with policy and strategy in climate change adaptation in the tourism sector. Recommendations made from this study is divided into three; those that relate to policy, practice and methodology.

5.3.1: Recommendations on practice

The following recommendations relate to practice of tourism:

- **Climate-proof the tourism sector**

Extreme weather events and natural disasters are likely to have considerable impact on diversity, ecosystems and physical infrastructure. Therefore there is need to climate-proof tourism resources, infrastructure, services, facilities, and activities. For example, since tourists staying in three star hotels are the most sensitive to climate change indicators followed by four star and then five star hotels, the accommodation sector should climate-proof their facilities of all types. In addition, tourism stakeholders should install air conditioning facilities in hotter regions to ensure that tourists are shielded from too high temperatures.

- **Diversity the market**

Diversity the market according to various factors such as gender, marital status, activities and regions.

- ***Diversify to younger tourists***

Older tourists are sensitive to climate change indicators than younger tourists. Therefore, the tourism industry in the country should design youth-friendly products and put more efforts in marketing to this emerging segment.

- ***Marital status***

Married tourists are the most sensitive to climate change indicators. Since this is a major market segment, the tourism industry should look for ways of increasing comfort in facilities for all ages.

- ***Promote business tourism***

Since leisure tourists are very sensitive to climate changes, Kenya tourism industry may invest heavily in business tourism in its efforts to diversity and meet the country's vision.

- ***Promote domestic and regional tourism***

Since hotter areas such as Africa and Australia were the least sensitive to climate change indicators, then it may be more sustainable to diversify the tourism market by directing efforts into domestic and regional markets as well as unexploited markets such as Australia that normally experience hotter weather than Kenya.

- **Biodiversity management**

Many of the respondents supported assisted migration which entails the deliberate translocation of an imperiled species from one location to another.

- **Deal with habitat loss and invasive species**

Habitat loss and alien invasive species are likely to interact in negative ways with climate change. Since these are considered the two main threats to biodiversity, conservation responses will be challenged by these interactions. Research is needed in this area in order reduce the possible resultant negative impacts on tourism.

- **Diversity the tourism product**

Since hotter regions in the country are experiencing more indicators, the tourism industry in Kenya should be diversified to not only the hot regions, but also colder regions to ensure sustainability.

There should be sustained efforts towards creation of new conservation areas which will act as tourism attraction areas as well as serve for carbon sequestration. Emphasis should especially be on community based conservation and tourism areas.

- **Proper tourism planning**

The catastrophic nature of many events depends on the activities tourists are involved in. Therefore, although absolute safety in these activities can never be achieved, a sound

tourism plan should take into account the risks of floods, droughts, storms, fog and so forth in order to reduce potential damage.

- **Improving data availability, forecasting and providing decision-relevant information**

Kenya requires data and information that is affordable, up to date, reliable and scientifically correct. In the need to fill information gaps and build awareness, an important first step in this regard is to support the efforts of all stakeholders to implement the immediate adaptation priorities and to publicize these needs in a form that will encourage their adoption. This information should be packaged to best support effective decision-making under climate uncertainty. Climate change adaptation needs to make business sense. Business associations must play an important role in building the climate change adaptation capacity of their members.

A lot of education is required within the industry on the concept of climate change, its causes, and effects and on possible mitigation and adaptation measures.

Awareness needs to be created among the industry players and communities on alternative tourism areas and activities since this spreads the impacts.

- **Opportunities for climate change**

The sector should take advantage of opportunities such as increased rainfall, carbon trading and REDD+.

- **Involve all stakeholders**

There is need to have a national co-ordinated approach involving the Government and the private sector, the NGOs and also the local communities since one way of reducing impact is to diversify to community based tourism.

- **Technology transfer** to assist stakeholders adopt modern technologies to adapt
- **Adapt in other sectors such as health, agriculture and biodiversity**

Adaptation practices

The tourism sector in Kenya needs to work on several adaptation practices such as business, technological, governmental-related, financial, resources, behavioural, training and research. Figure 5.1 summarizes these adaptation practices.

Table 5.1: Adaptation practices for Kenya

No.	Type of adaptation	Examples of adaptation efforts
1	Business adaptation	Product diversification, market diversification, promotion of conservation, insurance, new technologies, disaster preparedness, low carbon development and access to finance
2	Technological adaptation	Cooling systems, innovation, scaling up of green investments, renewable energy, change of building designs and protection of resources using technology.
3	Government efforts	Disaster preparedness, national law and policy, data provision, economic adaptation, social adaptation, collaboration and funding research.
4	Financial adaptation	REDD+, Adaptation Fund, Government funding, private sector funding, NGO and other stakeholders funding efforts.
5	Resources adaptation	Wildlife translocation, watering wildlife; feeding wildlife; forests rehabilitation, conservation of coastal resources, establishment of wildlife corridors, collaboration with local communities, reduce habitat loss, deal with invasive species and conservation and management of scarce resources such as water.
6	Behavioural adaptation	Increase stakeholders awareness on climate change issues such as adaptation and mitigation. Redirect tourists away from vulnerable areas.
7	Training adaptation	Train stakeholders on adaptation and other aspects of climate change.
8	Research adaptation	Reduce knowledge gaps on climate change and tourism, improve climate projections, communicate information to end users.

5.3.2: Recommendations on policy

- Companies should account for ecosystem degradation within their operations
- Climate change and tourism policy should reflect plans for financial commitments, technology support and training to adequately assist developing nations in responding to climate change

- As much as developed nations contribute more to climate change than developing nations, action on climate change should be by all in order to secure the survival of the continent. For example reaforestion and aforestation should be enhanced.
- Kenya needs to be proactive in carrying out research and drafting policy on how to deal with climate change.
- Climate-proof all tourism policies
- It is better that Kenya submits a model for climate change response before one is thrust to them by developed countries.
- There is need to come up with action plans in safeguarding the ecosystems and infrastructure important for tourism.
- However there is a general lack of engagement by key stakeholders which extends to the parliamentary arena, in which few voices raise climate issues at the national level

5.3.3: Recommendations on methodology

It is recommended that climate change vulnerability be assessed using a bottom-up model, which ensures that adaptation is not treated as a residual at the end of the analysis and also ensures that its role is rightfully emphasized. The model involves assessment of sensitivity, exposure and adaptation. Sensitivity is measured by assessing the sensitivity of tourists to climate change indicators; the magnitude of indicators on components of tourism and seasonality of tourism due to weather. Exposure of tourism to climate change is assessed by rating the supply side indicators of climate change on tourism and the nature of occurrence of these indicators. Adaption of tourism to climate

change needs to be considered in order to establish the level of vulnerability of tourism to climate change.

5.4: Areas for further research

It is important to note that this research did not address the implications of climate change policies on tourism operators. Neither has it considered the global flow-on effects of climate change impacts and policies in other parts of the world and their potential effects on tourist arrivals and their destination choices or sustainability preferences. Such a study will give a complete analysis of the impacts of climate on tourism demand.

In addition, a detailed study of economic impacts of climate change on tourism resources will give a detailed analysis of the losses and gains caused by climate change.

A specific and detailed study on resources that tourism depends on will also give a more detailed analysis of the vulnerability of the tourism sector to climate change.

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7.0 APPENDICES

APPENDIX 1: LETTER OF INTRODUCTION

I am a student at Kenyatta University pursuing a Doctor of Philosophy Degree in Tourism Management. I am carrying out a study entitled '**VULNERABILITY AND ADAPTATION OF THE TOURISM SECTOR TO CLIMATE CHANGE IN SELECTED REGIONS IN KENYA'.** The purpose of this study is purely for academic pursuit. Your help in filling in the questionnaire will be highly appreciated. All information will be treated with strict confidentiality.

Yours faithfully,

Esther Munyiri

APPENDIX 2: QUESTIONNAIRE FOR TOURISTS

This study seeks to assess the vulnerability of tourism to the impacts of climate change. The information collected will be used for academic purpose only and the researcher will keep such information strictly confidential. Thank you for participating in this survey.

PART A: GENERAL INFORMATION

Please tick where appropriate

1. **Gender** [01] Male [02] Female
2. **Age** [01] below 20 years [02] 21-40 years [03] 41-60 years [04] Above 60 years
3. **Education level**

   [01] None [02] Primary [03] Secondary/High School

   [04]Tertiary College/University [05] Any other, specify_____
4. **Marital status** [1] Married [2] Single [3] Divorced [4] Other
5. **Country of residence** _____

SECTION B: VULNERABILITY OF TOURISM TO INDICATORS OF CLIMATE CHANGE

6. How important do you rate the following weather parameters for tourism in Kenya

	Unimportant	*Less important*	*Moderate*	*Important*	*very important*
Absense of rain	☐	☐	☐	☐	☐
Comfortable temperature	☐	☐	☐	☐	☐
Hours of sunlight	☐	☐	☐	☐	☐
Water temperature (eg swimming)	☐	☐	☐	☐	☐
Absense of cloud cover	☐	☐	☐	☐	☐
Absence of strong wind	☐	☐	☐	☐	☐

7. What are the conditions that characterize a day of 'unfavourable weather' for tourism?

Low temperatures ☐ High temperatures ☐
Presence of rain ☐ Cloudy sky ☐
Presence of strong wind ☐ High humidity ☐
Low humidity ☐

Other (please specify)_____

8. I have experienced or seen the following indicators of climate change during my visit to Kenya

	Strongly Disagree	*Disagree*	*Moderate*	*Agree*	*Strongly Agree*
Too high temperature	☐	☐	☐	☐	☐
Floods	☐	☐	☐	☐	☐
Very strong winds	☐	☐	☐	☐	☐
Water restrictions	☐	☐	☐	☐	☐
Weather disaster preparedness	☐	☐	☐	☐	☐
Forest fires	☐	☐	☐	☐	☐
Reduced beach use	☐	☐	☐	☐	☐
Reduced overall satisfaction	☐	☐	☐	☐	☐

Other (please specify)

_____

9. What would be your response to '**unfavourable weather'** during your next visit? I will choose:

Same destination, different dates ☐
Different destination ☐
No change ☐

10. What is the level of vulnerability of the tourism industry to the indicators of climate change?

Very High	*high*	*moderate*	*low*	*very low*
☐	☐	☐	☐	☐

11. Please give five (**5)** reasons (in order of priority) why you chose Kenya as a destination.

_____
__

12. What are some of the mitigation and adaptation measures that could be implemented at business and destination level (Please list in order of priority)?

_____
__

13. What is the future of Kenya as a destination in this era of climate change?

_____
__

14. Please give general comments on climate change and tourism.

_____
__

Thank you.

APPENDIX 3: QUESTIONNAIRE FOR STAKEHOLDERS

This study seeks to assess the vulnerability of tourism to the impacts of climate change. The information collected will be used for academic purpose only and the researcher will keep such information strictly confidential. Thank you for participating in this survey.

PART A: GENERAL INFORMATION

Please tick on the number where appropriate

1. Gender [01] Male [02] Female

2. Age [01] below 20 years [02] 21-40 years [03] 41-60 years [04] Above 60 years

3. Education level

[01] None [02] Primary [03] Secondary/High School [04]Tertiary College/University [05] Any other, specify_____
_

4. What tourism region do you work? (tick as many as appropriate)
[1] Nairobi [2] Central [3] Southern [4] Rift [5] North Rift
[6] Western [7] Northern [8] North Eastern [9] Eastern [10] Coast

5. Classification of your company eg 1-5 star; Class A; park / reserve etc (if applicable)

_____

6. How long have you worked in this circuit(s)?
[01] Less than 4 years [02] 5-9 years [03] 10-14 years [04] 15-19 years [05] 20-24 years [06] Over 25 years

PART B: VULNERABILITY OF TOURISM TO CLIMATE CHANGE

7. How would you rate the current climate change impacts affecting tourism in this area in terms of:

	Very High	*high*	*moderate*	*low*	*very low*	*eg*
General Impacts						
Increase in temperatures	☐	☐	☐	☐	☐	
Changes in rainfall patterns	☐	☐	☐	☐	☐	
Floods	☐	☐	☐	☐	☐	
Other (please specify)						
Direct impacts on tourism						
Reduced length of tourism	☐	☐	☐	☐	☐	
Reduced quality of tourism	☐	☐	☐	☐	☐	
Reduced competitiveness	☐	☐	☐	☐	☐	

Damage to infrastructure	☐	☐	☐	☐	☐	
Additional emergency preparedness	☐	☐	☐	☐	☐	
Higher operating expenses	☐	☐	☐	☐	☐	
	☐	☐	☐	☐	☐	
Business interruptions						
Affected destination image	☐	☐	☐	☐	☐	
	☐	☐	☐	☐	☐	
Reduction in tourist satisfaction						
Indirect impacts on tourism						
Damage to company property	☐	☐	☐	☐	☐	
Loss of revenue	☐	☐	☐	☐	☐	
Loss of cultural heritage	☐	☐	☐	☐	☐	
Loss of biodiversity	☐	☐	☐	☐	☐	
Loss of species habitats	☐	☐	☐	☐	☐	
	☐	☐	☐	☐	☐	
Species reduction						
Loss of livelihoods	☐	☐	☐	☐	☐	
Cost of adaptation	☐	☐	☐	☐	☐	

Reduced landscape beauty ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ___

Damage of attractions ___

Increase in diseases ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ___

More intense storms ___

Reduced agricultural production ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ___

Increased water stress ___

Other (please specify)
_____

8. What is the magnitude of indicators of climate change on the following aspects of tourism?

	Very High	*high*	*moderate*	*low*	*very low*	eg
Resources						
Wildlife	☐	☐	☐	☐	☐	___
Beach	☐	☐	☐	☐	☐	___
Sceneries	☐	☐	☐	☐	☐	___
Other (please specify) _____						
Activities						
Beach activities	☐	☐	☐	☐	☐	___

Game drives ☐ ☐ ☐ ☐ ☐

Sight seeing ☐ ☐ ☐ ☐ ☐

Business / conferencing ☐ ☐ ☐ ☐ ☐

Adventure ☐ ☐ ☐ ☐ ☐

Trekking / walking ☐ ☐ ☐ ☐ ☐

Animal riding ☐ ☐ ☐ ☐ ☐

Camping ☐ ☐ ☐ ☐ ☐

Camping ☐ ☐ ☐ ☐ ☐

Other (please specify)
_____

Infrastructure

Roads ☐ ☐ ☐ ☐ ☐

Telecommunication ☐ ☐ ☐ ☐ ☐

Sewer system ☐ ☐ ☐ ☐ ☐

Airports/ airstrips ☐ ☐ ☐ ☐ ☐

Other (please specify)
_____

Services

Road transport ☐ ☐ ☐ ☐ ☐

Air transport ☐ ☐ ☐ ☐ ☐

Hospitality services ☐ ☐ ☐ ☐ ☐

Other (please specify) _____

Facilities

Buildings ☐ ☐ ☐ ☐ ☐

Sites ☐ ☐ ☐ ☐ ☐

Equipment ☐ ☐ ☐ ☐ ☐

Other (please specify) _____

9. How do indicators of climate change affecting tourism occur in this area?

(a) Occurring currently ☐ also occurred 20 years ago ☐

(b) Sudden & surprising ☐ gradual ☐

(c) In a linear manner ☐ in a non-linear manner ☐

(d) Persistent ☐ not persistent ☐

(e) Reversible ☐ irreversible ☐

(f) Sudden ☐ gradual ☐

(g) Predicable ☐ Unpredictable ☐

(h) High potential for adaptation ☐ low potential for adaptation ☐

PART C: ADAPTATION OF THE TOURISM INDUSTRY TO THE INDICATORS OF CLIMATE CHANGE

10. My institution has implemented the following adaptation practices to curb climate change

No.	Adaptation Practice	Yes or No	If yes, please explain
1	Promote conservation		
2	Change of building design or material		
3	Insurance		
4	Product diversification		
5	Market diversification		
6	Education campaigns		

7	Use of new technologies		
8	Enhance disaster preparedness		
9	Fund research on climate change		
10	Taken advantage of opportunities		

Other (please specify)

_____
__

11. What is the level of vulnerability of the tourism industry to the indicators of climate change?

Very High	*high*	*moderate*	*low*	*very low*
☐	☐	☐	☐	☐

12. What opportunities have been brought about by climate change (list in order of priority)?_____
_

13. What constraints have you encountered in adapting to impacts of climate change -in order of priority? _____

14. What climate change impacts are you not able to address (list in order of priority)?
_____
__

15. What is the future of the tourism industry in Kenya in the era of climate change - in order of priority? _____

Thank you.

APPENDIX 4: INTERVIEW SCHEDULE FOR EXPERTS

This study seeks to assess the vulnerability of tourism to the impacts of climate change. The information collected will be used for academic purpose only and the researcher will keep such information strictly confidential. Thank you for participating in this survey.

1) What is the name of your institution?
2) Which climate change impacts are evident in Kenya?
3) Which of these climate change impacts affect tourism?
4) Which tourism activities are affected? Eg beach activities, viewing of wildlife, sightseeing, business/ conferencing, adventure, trekking/ walking, animal riding, camping etc.
5) Which tourism resources are affected? eg wildlife, beach, sceneries,
6) Which tourism infrastructure is affected? Eg roads, telecommunication, sewer system etc.

7) Which tourism facilities are affected? eg buildings, sites, equipment etc.
8) Which tourism services are affected? eg transportation, hospitality etc
9) What are current practices of adaptation?
10) What are the opportunities for adaptations
11) What constraints does the country face in adapting to climate change?
12) What would you consider as key indicators of vulnerability in general and specific to tourism in Kenya
13) What is the future of Kenya as a tourist destination in the era of climate change?

APPENDIX 5 : PHD WORKPLAN AND SCHEDULE

No.	Scheduled Activity	Duration	Starting Date	Ending Date
1	Development of PhD Concept	3 Months	October, 2010	December, 2010
2	Review of PhD Concept by Supervisors	1 Month	December, 2010	January, 2011
3	Defense of PhD Concept at IBP Seminar	1 Day	January, 2011	January, 2011
4	Development of PhD Proposal	7 Months	February, 2011	August, 2011
5	Review of PhD Proposal by Supervisors	1 Month	September, 2011	October, 2011
6	Defense of PhD Proposal	1 Day	October, 2011	October, 2011
7	Corrections to PhD Proposal	2 Months	November, 2011	December, 2011
8	Data Collection and Field work	7 Months	January, 2012	July, 2012
9	Data Coding and Analysis	4 Months	August, 2012	November, 2012
10	Report Writing	3 Months	December, 2012	February, 2013
11	Development of Final report	5 Months	March, 2013	July, 2013
12	Presentation of Draft reports for Supervisor review	5 Months	August, 2013	December, 2013
13	Presentation of Final report at School level	1 Months	December, 2013	December, 2013
14	Corrections	1 Month	January, 2014	January, 2014
15	Final submission for examination	1 day	February 2014	February 2014

16	Defense	1 day	March 2014	March 2014

APPENDIX 6: RESEARCH BUDGET

No.	Activity	Cost	Total
1.	**Travel and related subsistence costs** Travel 2 days @ week for 6 months in 10 tourist regions in Kenya	80,000	80,000
2.	**Research remuneration costs** Research assistants (5)	50,000	50,000
3.	Accommodation costs 2 nights @ week for 6 months @2000	90,000	90,000
4.	**Supplies** Office stationery and supplies	20,000	20,000
5.	**Labour** Typing and typesetting	10,000	10,000
6.	**Equipment** Computer software Camera	40,000 20,000	60,000
	Total		**310,000**

APPENDIX 7: CLASSIFIED HOTELS IN KENYA

	Name of hotel	*Address*	*No. of beds*	*Location*	*Region*
1	Hemingways resort	P.O BOX 267, Watamu	154	Malindi	Coast
2	The whitesands hotel	P.O BOX 90173, Mombasa	716	Kilifi	Coast
3	Sun "N" sand beach resort	P.O BOX 2, Kikambala	600	Kilifi	Coast
4	Severin sea lodge	P.O BOX 82169, Mombasa	380	Kilifi	Coast
5	Nyali beach hotel	P.O BOX 90581, Mombasa	240	Kilifi	Coast
6	Mombasa serena beach hotel	P.O BOX 90352, Mombasa	348	Kilifi	Coast
7	Indian ocean beach club	P.O BOX 73, Ukunda	200	Kwale	Coast
8	Travelers tiwi beach hotel	P.O BOX 1877, Ukunda	420	Kwale	Coast
9	Travellers beach hotel	P.O BOX 87649, Mombasa	576	Mombasa	Coast
10	Leisure lodge limited	P.O BOX 84383, Mombasa	506	Kwale	Coast
11	Leopard beach hotel	P.O BOX 34, Ukunda	318	Kwale	Coast
12	L.T.I kaskazi beach	P.O BOX 138, Ukunda	382	Kwale	Coast
13	Leisure lodge and golf resort	P.O BOX 84383 Mombasa	506	Kwale	Coast
14	Lawfords hotel and beach club	P.O BOX 20, Malindi	300	Malindi	Coast
15	Mombasa beach hotel	P.O BOX 90414, Mombasa	302	Kilifi	Coast
16	Diani sea resort	P.O BOX 37, Ukunda	340	Kwale	Coast
17	Diani reef grand hotel	P.O BOX 35, Ukunda	600	Kwale	Coast
18	Baobab beach resort	P.O BOX 99527, Mombasa	230	Kwale	Coast
19	Indiana beach apt. hotel	P.O BOX 82662, Mombasa	81	Mombasa	Coast
20	Southern palm beach resort	P.O BOX 363, Ukunda	398	Kwale	Coast
21	Kilifi baharini resot	P.O BOX 93, Malindi	54	Malindi	Coast

22	Woburn residence club	P.O BOX 33, Malindi	28	Malindi	Coast
23	Reef hotel	P.O BOX 82234, Mombasa	252	Mombasa	Coast
24	Bahari beach hotel	P.O BOX 82662, Mombasa	200	Mombasa	Coast
25	Hotel intercontinental	P. O. BOX 30353-00200, Nairobi	770	Nairobi	Nairobi
26	Grand regency	P. O. BOX 57549, Nairobi	388	Nairobi	Nairobi
27	Hilton hotel	P .O. BOX 30624-00100, Nairobi	353	Nairobi	Nairobi
28	The Norfolk hotel	P. O. BOX 40064, Nairobi	334	Nairobi	Nairobi
29	Nairobi serena	P. O. BOX 46302, Nairobi	283	Nairobi	Nairobi
30	The Stanley	P .O. BOX30680, Nairobi	434	Nairobi	Nairobi
31	Safari park hotel	P. O. BOX 45038, Nairobi	285	Nairobi	Nairobi
32	Windsor golf country club	P .O. BOX 45587, Nairobi	260	Nairobi	Nairobi
33	Nairobi safari club	P. O. BOX 43564, Nairobi	282	Nairobi	Nairobi
34	Fair view hotel	P. O. BOX 40842, Nairobi	167	Nairobi	Nairobi
35	The bounty hotel	P. O. BOX 75200, Nairobi	100	Nairobi	Nairobi
36	Utalii hotel	P. O. BOX 31052, Nairobi	105	Nairobi	Nairobi
37	Marble arch hotel	P.O. BOX 12224, Nairobi	77	Nairobi	Nairobi
38	Landmark hotel	P.O. BOX 14287, Nairobi	242	Nairobi	Nairobi
39	Holiday inn	P. O . BOX 66807, Nairobi	342	Nairobi	Nairobi
40	Ambassadeur hotel	P. O . BOX 30399, Nairobi	190	Nairobi	Nairobi
41	Silver springs	P.O . BOX 61367, Nairobi	184	Nairobi	Nairobi
42	Six Eighty hotel	P.o . Box 43436, Nairobi	544	Nairobi	Nairobi
43	Outspan hotel	P. O . BOX 24, Nyeri	90	Nyeri	Central
44	Sportsman arms hotel	P. O . BOX3, Nanyuki	125	Nanyuki	Central
45	Mt. Kenya safari club	P.O BOX 35,Nanyuki	230	Nanyuki	Central
46	Mountain lodge	P.O BOX 48690, Nairobi	81	Nyeri	Central
47	The ark	P.O BOX 449, Nyeri	122	Nyeri	Central
48	Tree tops lodge	P.O BOX 24,Nyeri	100	Nyeri	Central
49	Aberdare country club	P.O BOX 449, Nyeri	92	Nyeri	Central
50	Mara simba lodge	P.O BOX 84334, Mombasa	168	Narok	Southern
51	Mpata safari club	P.O BOX 58402, Nairobi	46	Narok	Southern
52	Mara sena lodge	P.O BOX 48690, Nairobi	148	Narok	Southern
53	Amboseli serena safari lodge	P.O BOX 48690, Nairobi	182	Kajiado	Southern
54	Ol tukai lodge	P.O BOX 47557, Nairobi	160	Kajiado	Southern
55	Olonana camp	P.O BOX 59749, Nairobi	32	Narok	Southern
56	Kichwa tembo camp	P.O BOX 74957, Nairobi	80	Narok	Southern
57	Mara safari club	P.O BOX 58581, Nairobi	100	Narok	Southern
58	Mara sopa lodge	P.O BOX 72630, Nairobi	200	Narok	Southern
59	Mara safari club	P.O BOX 58581, Nairobi	90	Narok	Southern
60	Sarova mara camp	P.O BOX 855, Narok	155	Narok	Southern
61	Keekorok lodge	P.O BOX 40075, Nairobi	168	Narok	Southern
62	Siana springs camp	P.O BOX 74888, Nairobi	80	Narok	Southern
63	Voyageur safari lodge	P.O BOX 74888, Nairobi	165	Narok	Southern
64	Voi safari lodge	P.O BOX 565, Voi	104	Voi	Southern
65	Finch hattons tented lodge	P.O BOX 24423, Nairobi	70	Taita Taveta	Eastern
66	Severin safaris camp	P.O BOX 82169, Mombasa	50	Taita taveta	Eastern
67	Saltlick safari lodge	P.O BOX 30624, Nairobi	192	Taita taveta	Eastern
68	Kilanguni serena lodge	P.O BOX 48690, Nairobi	112	Taita Taveta	Eastern
69	Taita hill safari lodge	P.O BOX 30624,Nairobi	120	Taita taveta	Eastern
70	Hotel sirikwa	P. O BOX 3361, Eldoret	210	Eldoret	North Rift
71	Lake Baringo country club	P.O BOX 33,Kampi ya samaki	96	Baringo	North Rift
72	Baringo island camp	P.O BOX 1141,Nakuru	51	Baringo	North Rift
73	Samburu serena safari lodge	P.O BOX 48690, Nairobi	124	Samburu	Northern
74	Shaba sarova lodge	P.O BOX 72493, Nairobi	170	Isiolo	Northern
75	Sweet waters tented camp	P.O BOX 763, Nanyuki	60	Laikipia	Northern
76	Samburu intrepids	P.O BOX 74888, Nairobi	54	Samburu	Northern
77	Samburu lodge	P.O BOX 47557,Nairobi	120	Samburu	Northern
78	Merica hotel	p.o . Box 560, Nakuru	144	Nakuru	Rift
79	Lake naivasha simba lodge	P.O BOX 66601, Nairobi	140	Nakuru	Rift
80	Sarova lion hill lodge	P.O BOX 7094,Nakuru	134	Nakuru	Rift
81	Greater rift valley lodges golf resort	P.O BOX 227, Naivasha	62	Naivasha	Rift
82	Lake naivasha country club	P.O BOX 15, Naivasha	102	Naivasha	Rift
83	Lake naivasha sopa resort	P.O BOX 72630,Nairobi	160	Nakuru	Rift
84	Lake nakuru lodge	P.O BOX 561, Nakuru	140	Nakuru	Rift

Source: GoK, 2003

58%, that is 49 out of 84 of all tourist hotels are found in Nairobi, Mombasa and Central circuits.

APPENDIX 8: SAMPLED HOTELS

S/No.	*Name*	Circuit	Star	Random Sample	Select
1	Grand regency	Nairobi	5	2	√
2	The Norfolk hotel	Nairobi	5	4	√
3	The Stanley	Nairobi	5	6	√
4	The bounty hotel	Nairobi	3	38	√
5	Jacaranda hotel	Nairobi	3	41	√
6	Six Eighty hotel	Nairobi	3	45	√
7	Fair view hotel	Nairobi	4	19	√
8	Diani sea resort	Coast	3	52	√
9	Indiana beach apt. hotel	Coast	3	55	√
10	Southern palm beach resort	Coast	3	56	√
11	Reef hotel	Coast	3	59	√
12	Severin sea lodge	Coast	4	20	√
13	Indian ocean beach club	Coast	4	23	√
14	Travellers beach hotel	Coast	4	25	√
15	Leisure lodge limited	Coast	4	26	√
16	The whitesands hotel	Coast	5	11	√
17	Sportsman arms hotel	Central	3	47	√
18	Mountain lodge	Central	4	35	√
19	Tree tops lodge	Central	3	83	√
20	Mt. Kenya safari club	Central	5	17	√

APPENDIX 9: HOTELS WITH SUCCESSFUL RESPONDENTS

S/No.	*Name*	Circuit	Star	Random Sample	Select
1	Grand regency	Nairobi	5	2	√
2	The Norfolk hotel	Nairobi	5	4	√
3	The bounty hotel	Nairobi	3	38	√
4	Jacaranda hotel	Nairobi	3	41	√
5	Six Eighty hotel	Nairobi	3	45	√
6	Fair view hotel	Nairobi	4	19	√
7	Diani sea resort	Coast	3	52	√
8	Indiana beach apt. hotel	Coast	3	55	√
9	Southern palm beach resort	Coast	3	56	√
10	Reef hotel	Coast	3	59	√
11	Severin sea lodge	Coast	4	20	√

S/No.	*Name*	Circuit	Star	Random Sample	Select
12	Indian ocean beach club	Coast	4	23	√
13	Travellers beach hotel	Coast	4	25	√
14	Leisure lodge limited	Coast	4	26	√
15	The whitesands hotel	Coast	5	11	√
16	Sportsman arms hotel	Central	3	47	√
17	Mountain lodge	Central	4	35	√
18	Mt. Kenya safari club	Central	5	17	√