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Tourism and climate change risks : opportunities and constraints in South Africa

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TOURISM AND CLIMATE CHANGE RISKS: OPPORTUNITIES AND CONSTRAINTS IN SOUTH AFRICA

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A Research Report submitted to the school of Geography and Environmental Studies, Faculty of Science, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science.

FOREWORD

It is evident from global climate model projections that climate change is happening. The tourism industry has an important role to play with regard to adapting to the projected impacts of climate change. Equally important, it should implement mitigation measures to reduce its contribution to climate change through emissions of greenhouse gasses. Climate change presents a new challenge and urgently requires informed strategic responses from the tourism industry, government, non-governmental organisations and researchers.

This research examines mitigation and adaptation strategies, both existing ones and those that are being developed, that can contribute to managing the projected impacts of climate change; it also attempts to identify challenges related to compiling and implementing effective climate change strategies in the nature-based tourism industry in South Africa. It is hoped that this research will provide decision makers such as international and national institutions and government departments with information regarding possible risks and opportunities in mitigation and adaptation responses in the tourism industry in South Africa.

During the course of this research, many of stakeholder representatives who participated in this research requested for more information on climate change and tourism, especially regarding the findings of this research. There was also a request from Mpumalanga Tourism and Parks Agency to present these findings at a workshop on climate change and nature-based tourism in August 2010. The researcher was unable to fulfil this request, but promised to send the stakeholder the findings from the research as soon as the research report was completed.

ABSTRACT

Global climate change, often referred to as 'global warming' is possibly one of the most serious environmental challenges facing the world this century (DEAT, 2004; IPCC, 2007). There have been several studies (e.g. Viner and Agnew, 1999; Higham and Hall, 2005; IPCC, 2007; Midgley *et al.*, 2008) on the potential impacts of climate change on the tourism sector and the likely effects are shown to be extremely wide ranging and may have far-reaching consequences for the tourism sector in many regions and areas of the world.

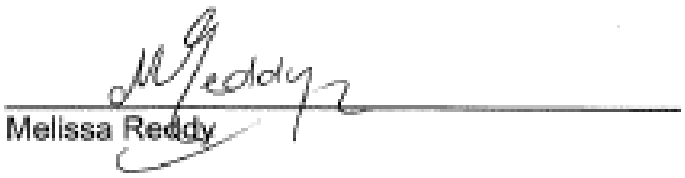
From a review of the literature it was evident that there was limited literature on the response to climate change by the tourism industry in terms of mitigation, adaptation and long- term strategic planning to manage future anticipated climate change impacts. Given this background, this research explores the tourism industry with regard to game and nature reserves in South Africa and probes the perceptions of climate change amongst park managers and tourism operators to understand their awareness regarding the projected impacts of climate change. Mitigation and adaptation strategies that were in place or being developed in the management of the game and nature reserves are identified and examined. Challenges that were experienced by the tourism managers/operators in promoting effective mitigation and adaptation strategies in the nature based tourism sector in South Africa are highlighted and discussed and recommendations are provided.

Purposeful sampling was employed in the research and the stakeholders were identified according to their important roles in the South African Tourism Industry with regard to game and nature reserve management. These included the Department of Environmental Affairs and Tourism, South African National Parks (SANParks), South African National Botanical Institute (SANBI) and the Provincial Park Managers which comprises the Eastern Cape Parks, Gauteng Department of Agriculture and Rural Development (GDARD), Ezemvelo KZN Wildlife, Limpopo Tourism and Parks Board, Mpumalanga Parks Board, North West Parks and Tourism Board and Cape Nature. The research data was collected using open-ended questionnaires and interviews with the stakeholders.

Results of this research showed that there was a basic understanding of climate change and its associated impacts on tourism consistent with what is being established in the scientific literature. Despite this awareness among relevant stakeholders, there was however not much formal long-term strategic planning or mitigation and adaptation plans in place to manage or 'manage' the suggested projected impacts of climate change on the tourism industry. The research results also highlighted many challenges experienced by the nature- based tourism sector.

DECLARATION

I declare that this research report is my own unaided work. It is submitted for the degree of Master of Science in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any other degree or examination in any other university.



Melissa Reddy

19 day of OCTOBER 2011.

ACKOWLEDGEMENTS

I would like to thank the following people:

1. My supervisor, Professor Coleen Vogel, for her motivation, energy and guidance.

2. My Dad and Mum, who have always been and always will be my inspiration and my gurus.

3. My wonderful husband and family for always being willing to assist and support me.

4. Proffy, for being the best big brother in the world.

5. The managers at SANBI, SANParks and the Provincial Parks for making time to assist me in this research and for giving me as much information as they could.

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ABBREVIATIONS

CEO	Chief Executive Officer
CFR	Cape Floristic Region
CGCM	Canadian Centre for Climate Modelling and Analysis, Canada
C-Plan	Conservation Plan
COP	Conference of the Parties
CSIR	Centre for Scientific and Industrial Research
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DACE	Department of Agriculture, Conservation and Environment
DAEA	Department of Agriculture and Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
GCM	General Circulation Model
GDP	Gross Domestic Product
GDARD	Gauteng Department of Agriculture and Rural Development
GFDL	Geophysical Fluid Dynamics Laboratory
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
KZN	KwaZulu-Natal
MEC	Member of Executive Council
MRI	Meteorological Research Institute
NCCC	National Climate Change Committee
REDD	Reducing Deforestation and Forest Degradation
SAEON	South African Environmental Observatory Network
SANBI	South African National Botanical Institute
SANparks	South African National Parks

SIDP	Safer Island Development Programme
SRES	Special Report on Emissions Scenarios
UK	United Kingdom
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNWTO	World Tourism Organisation [an agency of the United Nations]
US	United States
WWF	World Wide Fund for Nature

CHAPTER ONE: BACKGROUND TO RESEARCH, RESEARCH AIM, RESEARCH QUESTIONS AND RESEARCH METHODOLOGY

1.1 Introduction

This chapter outlines the background of the research on the impacts of climate change on the tourism industry. The research aim, questions and methodology are also introduced.

1.2 Background to the Research

According to the Intergovernmental Panel on Climate Change (IPCC, 2007), it is evident from observations on continents and most oceans that many natural systems are being affected by regional climate changes, especially with regard to temperature increases. Africa has been identified as one of the most vulnerable continents in this regard (Boko *et al.*, 2007). This situation is aggravated by the interaction of multiple stresses (e.g. poverty, complex governance, limited access to capital) occurring at various levels, as well as low adaptive capacity, thus placing Africa increasingly at risk to the projected impacts of climate change (Boko *et al.*, 2007). Some key vulnerabilities are summarised in Table 1.1.

Table 1.1: IPCC identification of key vulnerabilities relating to developing countries and small island states, and their impact on risk

Systems processes or groups at risk	Prime criteria for key vulnerability	Relationship between Temperature and risk. Temperature change by 2100 (relative to 1990-2000)
Africa	Distribution, Magnitude, Timing, Low Adaptive Capacity	**0-2°C** Tens of millions of people at risk of increased water stress; increased spread of malaria. **>2°C** Hundreds of millions of additional people at risk of increased water stress; increased risk of malaria in highlands; reductions in crop yields in many countries, harm to many ecosystems such as Succulent Karoo.
Asia	Distribution, Magnitude, Timing, Low Adaptive Capacity	**0-5°C** About 1 billion people would face risks from reduced agricultural production potential, reduced water supplies or increases in extreme events.
Latin America	Magnitude, Irreversibility, Distribution, and Timing, Low Adaptive Capacity	**0–1°C** Tens of millions of people at risk of water shortages. **1–2°C** Many endemic species at risk from land-use and climate change. **2-3°C** More than a hundred million people at risk of water shortages; low-lying coastal areas, many of which are heavily populated, at risk from sea-level rise and more intense coastal storms. **>3°C** Widespread loss of biodiversity, particularly in the Amazon
Small Islands	Irreversibility, Magnitude, Distribution, Low Adaptive Capacity	Many islands already experiencing some negative effects. **0-1°C** Increasing coastal inundation and damage to infrastructure due to sea-level rise.

Source: Schneider et al. (2007) cited in Simpson et al. (2008)

The tourism industry has been recognised as the fourth largest generator of foreign exchange in South Africa; its contribution to the economy is 8.2% (Spenceley, 2001). Tourism has been accepted by the South African government, business and labour as one of the key drivers for job growth, wealth creation and economic empowerment. A number of initiatives have been implemented by government to build on and increase the economic benefits from domestic,

regional and international tourism (Department of Environmental Affairs and Tourism[1] [DEAT], 2000). The projected impacts of climate change on Africa may impact the tourism industry, making it vulnerable to changes associated with climate change. This in turn could affect the economic growth of South Africa.

South Africa has many tourism attractions. These include beach holidays along the coast, with good shopping opportunities in and around major cities such as Cape Town and Durban. Nature-based and adventure tourism in the country include safari tourism, whale watching, white-river rafting, hiking, bird watching, 4x4 trails, bush survival, deep-sea fishing, hunting and diving (DEAT, 1999a cited in Spenceley, 2001). There are also opportunities for tourists who are interested in the culture of South Africa with its rich tribal history, plentiful museums, unique archaeological sites, battlefields and monuments (DEAT, 1999a cited in Spenceley, 2001). The tourist destination most frequently chosen by the foreign visitor market is game and nature reserves (61% in August 1999), followed by visits to historical sites (37%) (DSI, 1999a cited in Spenceley, 2001).

The tourism sector is closely linked to climate change as it a contributor to climate change with regard to emissions, but it is also affected by the possible projected impacts of climate change. Tourism involves the movement of people from their homes to other destinations by air, land and water transportation. Emissions from transportation and accommodation services and other tourism activities are contributors to the increasing concentrations of global greenhouse gases in the atmosphere. The projected impacts of climate change can affect the length and quality of tourism seasons, and increase or decrease the attractiveness of tourist destinations. Changes in climate can also affect the natural environmental resources that support key tourist attractions – for example, biodiversity, wildlife and snow.

According to the United Nation's World Tourism Organization (UNWTO) (2009), there are four broad categories of climate change impacts that will affect the global tourism and travel sector:

- Direct climate impacts

  Changes in the length and quality of climate determine tourism seasons (e.g. sun and sea or winter sports holidays) could have a major impact on competitive relationships between destinations and intra-regional tourism flows (UNWTO, 2009)

  It has been concluded by the IPCC (2007) that increases in the frequency or magnitude of certain weather extremes (e.g. heat waves, droughts, floods, tropical cyclones) are possible as a result of projected changes in climate. According to UNWTO (2009), the tourism sector will

[1] In 2009, the DEAT was restructured into two separate departments – the Department of Environmental Affairs and the Department of Tourism.

be affected by these changes through, for example, increased infrastructure damage, additional emergency preparedness requirements, business interruptions, and higher operating expenses (due to, for example, higher insurance premiums, backup water and power systems, and evacuations).

- Indirect environmental change impacts:

The natural environment is a critical resource for tourism. As a result any changes in natural conditions due to climate-induced environmental changes will have major consequences for tourism destinations. Changes in climate will affect water availability, biodiversity and landscape aesthetics, alter agricultural production, and increase natural hazards, coastal erosion and inundation, damage to infrastructure and the increasing incidence of vector-borne diseases. Tourist attractions may become less appealing to visitors if the quality of attractions decreases (UNWTO, 2009).

- Impacts of mitigation policies on tourist mobility

National or international mitigation policies that seek to reduce greenhouse gas emissions (GHG) may cause an increase in transport costs and altered environmental attitudes, resulting in tourists changing their travel patterns (UNWTO, 2009).

- Indirect societal change impacts

According to the UNWTO (2009), it is envisaged that the impacts of climate change, including adapting to those changes, will have an economic cost. Climate change may threaten future economic growth and even the political stability of some nations. Any such reduction of global Gross Domestic Product (GDP) due to climate change is projected to have negative implications for anticipated future growth in tourism.

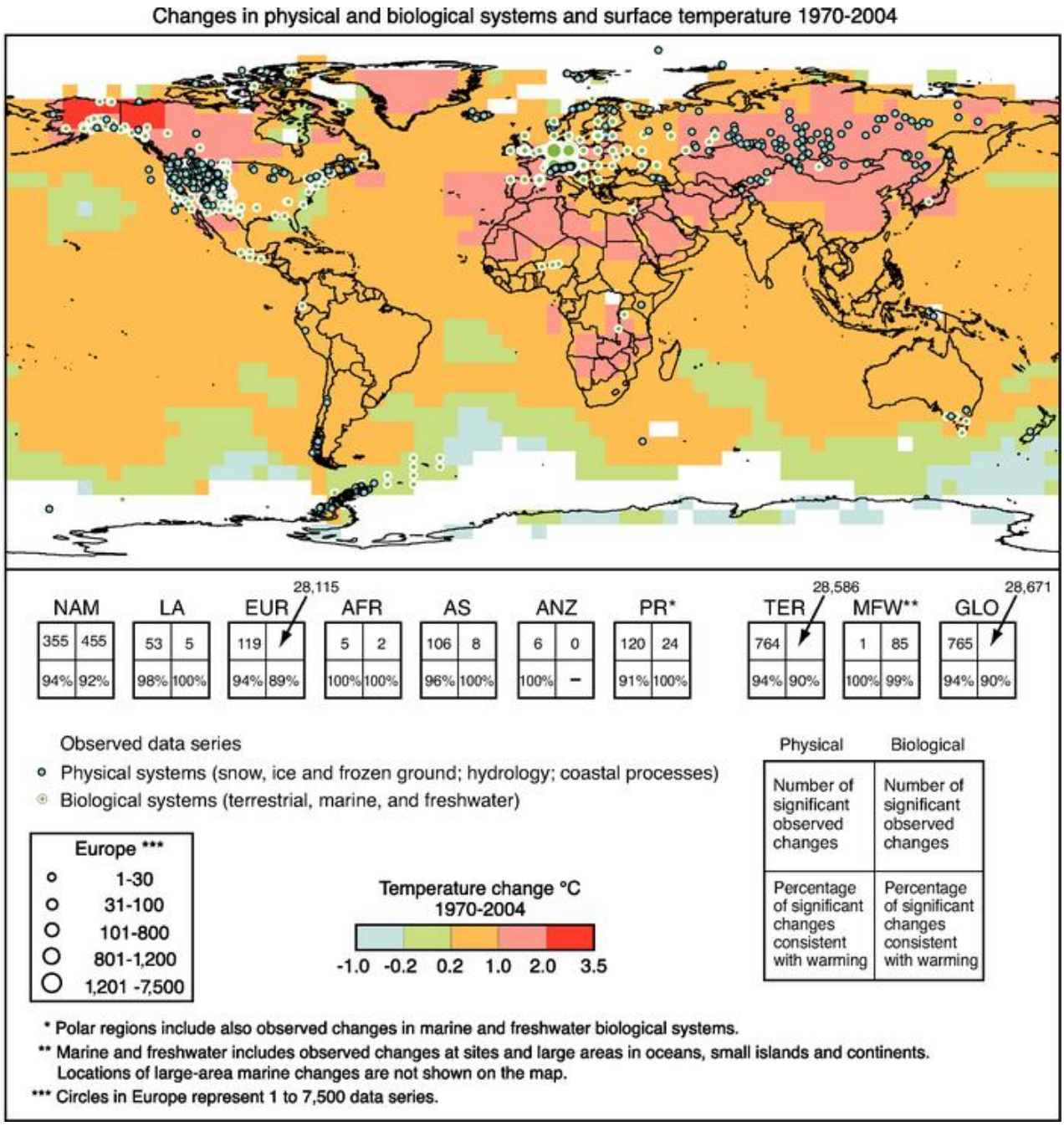
Due to the complex nature of the interactions that exist between tourism, climate, the environment and society, it is challenging to separate the direct observed impacts of climate change upon tourism activity (Rozenweig *et al.,* 2007 cited in Simpson *et al.*, 2008).

According to Boko *et al*., (2007), increased research is necessary in order to understand both the short-term and long-term interactions between vulnerability and adaptation to climate change as well as the variability and the consequences of climate variability and change both in the short - and long-term on the tourism sector in Africa.

According to Maddison (2001) cited in Hamilton (2004), five clusters of literature on climate change and tourism have started to grow. For example, there are a few studies that build statistical models

of behaviour of certain groups of tourists as a function of weather and climate, and a few studies on recreational behaviour (Hamilton, 2004). Secondly, there are many studies that examine the projected impacts of climate change on particular tourist destinations (Abegg, 1996 cited in Hamilton, 2004; Viner and Agnew, 1999; Higham and Hall, 2005, Midgley *et al.*, 2008). Some studies "try to define indicators of the attractiveness of certain weather conditions to tourists" (Matzarakis, 2002 cited in Hamilton, 2004, 3). There are also studies "that use simulation models of the tourism sector" (Hamilton *et al.,* 2003, cited in Hamilton, 2004, 3), and studies that analyse the economic implications of changes in tourism (Berritella *et al*., 2004 cited in Hamilton, 2004). It is evident that a comprehensive, quantitative message does not emerge from the diversity of literature on climate change and tourism. Notwithstanding this lacuna, one clear qualitative message that does arise is that climate change could well have considerable effects on tourism and recreation (Hamilton, 2004). A challenge with assessing the relationship between climate change and tourism is that both direct and indirect effects vary to a great extent with location (Gössling and Hall 2006a, b; Wilbanks *et al*., 2007 cited in Simpson *et al*., 2008: 24).

With regard to studies in Africa, very few regional or sub-regional climate change scenarios using regional climate models have been created (Figure 1.1). This has been due mainly to restricted computational facilities and lack of human resources as well as problems of insufficient climate data (Hudson and Jones, 2002; Swart *et al.*, 2002; Jenkins *et al*., 2002 cited in Boko *et al.*, 2007). The IPCC (2007) assessments include global maps of climate change within which Africa is featured; they also discuss some of the impacts and vulnerabilities that may occur along with changing climate in Africa, using various scenarios and model projections as guides.



(Source: IPCC, 2007, 32).Notes: Locations of significant changes in data series of physical systems (snow, ice and frozen ground; hydrology; coastal processes) and biological systems (terrestrial, marine and freshwater biological systems) are shown together with surface air temperature changes over the period 1970-2004. White areas do not contain sufficient observational climate data to estimate a temperature trend. The 2 x 2 boxes show the total number of data series with significant changes (top row) and the percentage of those consistent with warming (bottom row) for (i) continental regions: North America (NAM), Latin America (LA), Europe (EUR), Africa (AFR), Asia (AS), Australia and New Zealand (ANZ), and Polar Regions (PR) and (ii) global-scale: Terrestrial (TER), Marine and Freshwater (MFW), and Global (GLO)

Figure 1.1: Changes in physical and biological systems and surface temperature 1970-2004.

It must also be noted that many authors (Agoumi, 2003; Legesse *et al*., 2003; Conway, 2005; Thorton *et al*., 2006 cited in Boko *et al.,* 2007) have warned against the over-interpretation of

results as there are limitations and uncertainties with regard to some of the projections and climate models used. According to the IPCC (2007), very few assessments of impact of projected climate change on tourism in Africa are currently available, particularly those using scenarios and General Circulation Model (GCM) outputs. Thus the modelling of climate changes, and its impact on human behaviour and other factors, is extremely difficult. It is therefore essential that research regarding the impacts of climate change on the tourism sector in Africa is improved because the tourism sector is an important economic activity in Africa (Table 1.2). According to the IPCC report (2007), there is a need to further expand regional climate models and sub-regional models at a scale that would be meaningful to decision-makers and to incorporate stakeholders in framing some of the issues that may require more investigation. There is also a need to develop this knowledge base at a local level as well as enhancing the transfer of knowledge of adaptive and mitigative capacities from other environments and jurisdictions (Nurse & Moore, 2005 cited in Simpson *et al*., 2008).

It is therefore evident that despite the widespread concern on global climate change, there are many gaps in the literature on tourism and climate change. An important area that requires more research and will be beneficial to discussions on climate change and tourism is studies on *case-specific tourism operators/institutions* and their response to climate change or current climate change mitigations and adaptation strategies utilised. The present knowledge on current climate change adaptations utilized by the tourism sector to cope successfully with future climate change is currently very limited. Studies (e.g. Becken, 2004; Jones and Scott, 2006; Simpson *et al.,* 2008) that have examined the climate risk of tourism operators have consistently found a low level awareness of climate change and possible impacts as well as little evidence of long-term strategic planning to manage the potential risks related to climate change and tourism. There thus is a need to better understand the present awareness, perception, any portfolio and responses to climate change by different tourism institutions in the tourism sector. There is wide variation regarding the level of tourism and climate change knowledge per region (Table 1.2). Africa is reflected as extremely poor. It is therefore important to understand the response to climate change by tourism managers/operators with regard to countries in Africa that may be affected by climate change. It will also be beneficial to understand the many challenges that are being experienced regarding climate change mitigation and adaptation implementation of the tourism sector so that improvements can be made.

Table 1.2: Relative level of tourism-specific climate change knowledge and estimated impact of climate change on tourism by region

Region	Estimated impact of climate change on tourism	Relative level of tourism-specific climate change knowledge
Africa	Moderately to strongly negative	Extremely poor
Asia	Weakly to moderately negative	Extremely poor
Australia and New Zealand	Moderately to strongly negative	Poor to moderate (high in Great Barrier Reef)
Europe	Weakly to moderately negative	Moderate (high in alpine areas)
Latin America	Weakly to moderately negative	Poor
North America	Weakly negative	Moderate (high in coastal and ski areas)
Polar regions	Weakly negative to weakly positive	Poor
Small islands	Strongly negative	Moderate (highest with respect to impacts on reef systems)

Source: Hall (2008), derived from Gössling & Hall (2006a), IPCC (2007b) and UNWTO-UNEP-WMO (2008) cited in Simpson et al. (2008:25).

Early assessments of climate models projected a future warming of 0.2^{o}C to 0.3ºC per decade (Viner and Agnew, 1999). More recent assessments project a warming of about 0.2°C per decade for a range of Special Report on Emissions Scenarios (SRES) emission scenarios over the next two decades (IPCC, 2007). Even if the concentrations of all greenhouse gases and aerosols had been kept constant at year 2000 levels, a further warming of about 0.1°C per decade would be anticipated (IPCC, 2007).

Climate change impacts are expected to present themselves in many different ways, depending on underlying local conditions. The most severe impacts would be associated with sea-level rise on small island states like the Maldives, which is a popular tourist destination and particularly vulnerable to sea-level rise. Increases in temperature will cause discomfort in many areas and resorts in, for example, the Eastern Mediterranean, where the number of days above 40ºC is estimated to increase (Viner and Agnew, 1999). Winter tourism is also projected to be affected, as the Alps and other skiing destinations experience less snowfall resulting in shorter skiing seasons (Viner and Agnew, 1999). The distribution of wildlife in parks and nature reserves could be affected, as climate change could affect vegetation and ecological zones sustaining the wildlife. The establishment of most parks and nature reserves has been based on animal distribution as well as climate conditions; adjoining areas of land are experiencing increasing pressure from human interventions. Thus any redistribution in wildlife and flora due to climate changes could threaten tourist attractions in certain areas. Climate change is also projected to increase the

frequency of flooding, droughts and land degradation, thus reducing the possibility of wildlife safaris and other recreational activities in Africa (Viner and Agnew, 1999).

The IPCC Africa Chapter presented some of the impacts and vulnerabilities that could arise under a changing climate in Africa using various scenarios and model projections.

> Under the medium-high emissions scenario (SRES A1B, see the special report on Emissions scenarios: Nakićenović *et al*., 2000 cited in Boko *et al*., 2007, 443), used with 20 General Circulation Models (GCMs) for the period 2080-2099, annual mean surface air temperature is expected to increase between 3 and 4°C compared with 1980-1999 period, with less warming in equatorial and coastal areas (Christensen *et al*., 2007 cited in Boko *et al*., 2007, 443).

Other experiments showed higher levels of warming – up to 7°C for Southern Africa in September to November with the A1FI emissions scenario during the period 2070-2099 (Ruosteenoja *et al*., 2003 cited in Boko *et al.*, 2007).

Various climate change projections for both rainfall and temperature have been undertaken for Africa and South Africa. Some of these are discussed here. According to various early GCM results for the South African Country Study on Climate Change, average temperature increases varied from 1°C to 3°C, with some localised areas having higher levels of change projected in some seasons; trends regarding warming were slightly higher over the western part of South Africa (Kiker, 2000). Rainfall patterns were variable in terms of time of year and geographic locations with some model agreement on lesser rainfall amounts in western areas; precipitation levels were projected to decrease by 5-10% (Kiker, 2000).

Another range of early climatic change scenarios for the African continent of which South Africa's was derived was produced in 2001 by Hulme *et al*.; all projected warming (Preston-Whyte and Watson, 2005).They also admitted to a reduced level of confidence in providing scenarios projecting future rainfall scenarios, although South Africa and Namibia were identified as experiencing 'significant' decreases in rainfall. According to Preston-Whyte and Watson (2005), early studies (e.g. Midgley *et al.,* 2001) projected that the apparent climatic change scenario for South Africa would be an increase in January temperatures along the coast of 0.5°C to 1.0°C by 2050. The central interior and Northern Cape would experience increases of 2.5°C to 4.5°C. There would also be a decrease in summer rainfall of between 5% in the northern part of the country to 25% in the Eastern and Southern Cape, and Western Cape would experience a substantial decrease in winter rainfall (Preston-Whyte and Watson, 2005).

More recent assessments project increased summer rainfall over the convective region of the central and eastern plateau and the Drakensberg Mountains in South Africa (Hewitson and Crane, 2006 cited in Boko *et al*., 2007). A decrease in early summer (October to December) rainfall and an increase in late summer (January to March) rainfall over the eastern parts of Southern Africa were projected using Regional Climate Models (Tadross *et al.,* 2005b cited in Boko *et al*., 2007). According to Midgley *et al., (*2008), higher temperatures are projected over the whole of South Africa through to the twenty-first century, and there will be drier conditions as higher temperatures increase evaporation rates. According to Midgley *et al.,* (2008), many of the climate models run by the IPCC agree that there will be a decrease of 20% or more in the rainfall of the western and Southern Cape.

Many studies have strongly indicated that biodiversity in South Africa is at risk due to such projected changes in climate. The South African Country Study on Climate Change, for example, showed that the most dramatic responses to climate change would be in the biodiversity and human health sectors (Kiker, 2000). The most notable projected impacts are expected to occur in the western, central and northern parts of the country, including loss or displacement of the Succulent Karoo Biome situated along the west coast and the interior coastal plain (Kiker, 2000). There will also be an extensive eastward shift of the Nama-karoo Biome across the interior plateau, and a reduction of the Savanna Biome on the northern side of the country with its growth into the Grassland Biome (Kiker, 2000). The species-level analysis in the South African Country Study on Climate Change indicated that the species composition is likely to alter in all biomes, and that this change in species mix will result in major vegetation structural changes in some biomes. There will also be an alteration of the bio-climate for nature reserves of the arid west and central parts of South Africa (Kiker, 2000).

According to more recent studies, the flexibility of many ecosystems is likely to be challenged in this century by projected climate change and associated disturbances such as flooding, drought, wildfire, insects, ocean acidification and other global change drivers (land-use change, pollution, over-exploitation of resources) (IPCC, 2007). It is projected that if increases in global average temperature exceed 1.5-2.5°C, about 20-30% of plant and animal species assessed so far are likely to be at increased risk of extinction (IPCC, 2007). There are projected to be major changes in ecosystem structure and function, species' ecological interactions, and species' geographical range due to increases in global average temperature and associated atmospheric carbon dioxide concentrations (IPCC, 2007). This will have negative consequences for biodiversity, and for ecosystem goods and services such as water and food supply (IPCC, 2007).

According to projections by the South African National Botanical Institute (SANBI), initial assessments reveal that the climatically suitable area for many vulnerable biomes in South Africa

may shrink by up to 55%, with the greatest impacts being projected in the western part of South Africa (www.sanbi.org). In the Fynbos and Succulent Karoo Biomes, hundreds of species have been identified as being at risk. Species in other biomes are also at risk.

These changes in ecosystems and loss in biodiversity may result in significant costs to the tourism industry in South Africa. Places of interest like wildlife areas and parks may attract fewer tourists due to changing climate conditions (Boko *et al.*, 2007). Nature tourism in South Africa is already highly dependent on wildlife and biodiversity. The *South Africa Environment Outlook Report* on the state of the environment in South Africa, for example, does highlight South Africa's response to biodiversity loss with regard to international agreements, national policy, legislation, control and rehabilitation programmes, and bioregional plans and programmes (DEAT, 2006). However, there is limited information on mitigation or adaptation strategies with regard to climate change impacts on biodiversity and wildlife.

The Department of Environmental Affairs and Tourism holds the primary responsibility and authority for biodiversity conservation in South Africa, but this responsibility is shared with other national departments including the Department of Water Affairs and Forestry and the Department of Agriculture. The South African Biodiversity Institute is a technical body responsible for the centralised monitoring and reporting on the status of the country's biodiversity. South African National Parks (SANParks) is the leading statutory conservation authority responsible for over 3 750 000 ha of protected land in 21 national parks (DEAT, 2006). These institutions and organisations – namely the Department of Environmental Affairs and Tourism, the South African National Biodiversity Institute, South African National Parks and the provincial parks – were identified as key in terms of their responsibility and authority in biodiversity conservation for this research.

1.3 Justification for the Research

From the initial literature review that was conducted for this study, it was evident that there is a significant limitation to research on the tourism sector and climate change, particularly in developing countries and specifically with regard to how the tourism sector is responding to climate change in terms of mitigation and adaptation strategies. There was a substantial amount of research on the physical impacts of climate change on biodiversity in Africa and South Africa. The most common writers on this were Kiker (2000), Preston-Whyte and Watson (2005), Boko *et al*., (2007), Midgley *et al.,* (2008) and Knoesen *et al.,* (2009*)*. However, there has been little research on the social dimensions – on tourism institutions and park managers and their perceptions, interaction or response to the projected impacts of climate change in terms of mitigation and adaptation strategies.

This research tries to fill this gap in the literature by exploring the nature-based tourism sector in South Africa. It focuses on the following key institutions and park managers – Department of Environmental Affairs and Tourism, South African National Biodiversity Institute, South African National Parks and the Provincial Parks.

1.4 Research Aim

The aim of this research is to explore climate change risk management in the nature-based tourism sector in South Africa. Key stakeholders include DEAT, SANBI, SANparks and the Provincial Park managers. The central aim is to understand how these stakeholders perceive climate change, assess interventions (mitigation and adaptation strategies) to manage climate change, and to identify some of the challenges that they are experiencing in promoting effective mitigation and adaptation climate change strategies in the tourism sector.

1.5 Research Questions

The overall aim of this research as outlined above is reflected in the following three research questions:

- How do stakeholders in the nature-based tourism sector in South Africa perceive risks regarding the projected impacts of climate change?
- What mitigation and adaptation strategies are in place or being planned in the nature-based tourism sector (in addition to business as usual) in response to the present and projected impacts of climate change?
- What challenges are experienced by the nature-based tourism sector in promoting effective mitigation and adaptation strategies?

In the final analysis, this research provides information on the following:

- An understanding of mitigation and adaptation strategies that are in place or being planned towards managing climate change in the nature-based tourism sector in South Africa.
- Identification of challenges and problem areas regarding developing and implementing effective climate change strategies and adaptations in South Africa.
- Provision of information regarding possible bottlenecks in mitigation and adaptation responses in the tourism industry in South Africa to decision-makers such as national and international institutions and government departments.

1.6 Research Methodology

1.6.1 Overview

The methodology guiding this research is derived from a range of available methods including: literature reviews, questionnaires and stakeholder interviews. As mentioned earlier in this chapter, present research has shown that there are limited detailed assessments on how the tourism sector in South Africa and other developing countries are managing or responding to the risk of climate change. The most popular activity undertaken by the foreign visitor market is visiting game and nature reserves in South Africa (61% in August 2009) (DSI, 1999a cited in Spenceley, 2001). This aspect of the tourism sector was therefore explored by interviewing stakeholders that have an important role in the tourism industry in managing South Africa's nature and game reserves. This was done to gain an understanding of stakeholder perceptions and interventions with regard to climate change and climate variability, as well as challenges that are experienced by the nature-based tourism sector in promoting effective mitigation and adaptation strategies.

In this section, the sampling method, research process and data collection methods are described.

1.6.2 Sampling method

Determining sample sizes in qualitative research can be difficult as there are no definite guidelines to be followed. The sample will depend on the nature of the analysis to be performed, the desired precision of estimates one wishes to achieve, the kind and number of comparisons that will be made, the number of variables that have to be examined simultaneously, as well what can be done with the available time and resources (Mugo, 2006). Purposeful sampling enables the selection of information-rich cases for detailed study. The sample must be determined on the basis of the purpose and rationale for each study and the sampling strategy used to achieve the study's purpose (Mugo, 2006).

> Sampling is the act, process, or technique of selecting a suitable sample, or a representative part of a population for the purpose of determining parameters or characteristics of the whole population (Mugo, 2006, 1).

Purposeful sampling was employed in this research. The stakeholders that were identified to participate in this research were DEAT, SANBI, SANParks and the six provincial parks (Table 1.3). They were chosen because of their important role in the tourism sector in managing South Africa's nature and game reserves. The stakeholder's representatives were either interviewed or asked to

complete a questionnaire. All representatives of the stakeholders (Table 1.3) that the interviewer had access to were from 'management' and they played an important role in biodiversity planning and assessing the impacts of projected climate change.

Table 1.3: Key stakeholders identified for this research and their areas of responsibility

Stakeholder	Responsibility	Areas managed	Represented by;
Cape Town, Cape Nature	Provincial responsibility to promote and ensure nature conservation, render services and provide facilities for research and training, and generate income.	24 wilderness areas and nature reserves found along the Garden Route, Little Karoo, Cape Karoo, Overberg, Winelands and West Coast.	Manager –Scientific Services
East London-Eastern Cape Nature	Provincial responsibility for biodiversity conservation inside the Nature Reserves.	12 parks.	Head –Scientific Services
Mpumalanga Park Board-Nelspruit	Provincial responsibility to mange biodiversity and ecosystems throughout Mpumalanga.	13 wilderness areas and public nature reserves in Mpumalanga.	Scientific Services – Acting Biodiversity Planning Manager
Limpopo Tourism-Polokwane	Provincial responsibility to promote, foster and develop tourism within Limpopo.	50 provincial nature reserves including Kruger National Park, Mapungubwe and Marakele.	Manager, Tourism and Parks
KZN –Ezemvelo KZN Wildlife	Provincial responsibility to preserve and maintain representative samples of all ecosystems occurring naturally in the province and to allow people access to these areas.	80 protected wildlife areas.	Ecosystem Ecologist
North West Parks-Mafikeng	Provincial responsibility to manage national parks and provincial reserves.	14 national parks and provincial reserves within North West provincial borders.	Regional Ecologist – Ecological Services
DEAT	National responsibility in terms of tourism growth and development	National and provincial parks and nature reserves.	Chief Director –Planning, Coordination and Information Management (and Climate Change Adaptation)
Gauteng Department of Agriculture and Rural Development (GDARD)	Provincial responsibility for natural resource management and sustainable development in the Gauteng area.	5 nature reserves in Gauteng.	Ecological Decision Support, Directorate of nature Conservation

SANParks	National responsibility with regard managing indigenous flora, fauna, landscapes and associated cultural heritage of the country in all national parks.	20 national parks	Senior General Manager –Planning and Wildlife Management
SANBI	National responsibility relating to the full diversity of South Africa's fauna and flora, as well as building on internationally respected programmes in conservation, research, education and visitor services.	9 botanical gardens in South Africa	Chief Director –Climate Change and Bio-adaptation Division

The role of the Department of Environmental Affairs and Tourism regarding tourism is to:

> fulfil the national government's role towards creating the conditions for responsible tourism growth and development by promoting and developing tourism, thereby increasing job and entrepreneurial opportunities and encouraging the meaningful participation of previously disadvantaged individuals. The focus will be on facilitating the growth of the tourism industry by providing support to the public and private sectors, and the broader community (www.deat.gov.za).

This research probed this aspect by examining whether climate change and its projected impacts on the tourism industry are considered at the national level, and what mitigation and adaptation measures are being implemented.

SANParks was identified as a key stakeholder because it is "the leading conservation authority in all national parks around this country, responsible for 3 751 113 hectares of protected land in 20 national parks" (www.sanparks.org). SANParks which operates under a parastatal form of management manages a system of parks which comprises indigenous fauna, flora, landscapes and associated cultural heritage of the country. The national parks are: Groenkloof, Kruger, Table Mountain, Marakele, Golden Gate, Camdeboo, Mountain Zebra, Addo Elephant, Tsitsikamma, Knysna, Wilderness, Bontebok, Agulhas, West Coast, Karoo, Namaqua, Ai-Ais/Richtersveld, Augrabies, Kgalagadi, Mapungubwe, Tankwa Karoo and Mokala (www.sanparks.org).

SANBI was established in September 2004 through the implementation of the National Environmental Management: Biodiversity Act (RSA, 2004). The Act expanded the mandate of SANBI's predecessor, the National Botanical Institute to include responsibilities relating to the full spectrum of South Africa's biodiversity as well as expanding all programmes in conservation, research, education and visitor services developed over the past century(www.sanbi.org). SANBI which is a parastatal organisation was identified as a key stakeholder for this research because it manages nine botanical gardens in South Africa – Free State Botanical Gardens, Hantam

Botanical Gardens, Harold Porter Botanical Gardens, Karoo Desert, Kirstenbosch, KwaZulu-Natal Botanical Gardens, Lowveld Botanical Gardens, Pretoria Botanical Gardens and Walter Sisulu National Botanical Gardens.

Eastern Cape Parks is a public entity established in terms of the Provincial Parks Board Act (RSA, 2003. Its mandate is to manage biodiversity conservation inside the province's nature reserves. "It is striving to be one of the world's renowned biodiversity conservation agencies and prides itself in its unique rich biomes and malaria free network of Provincial Nature Reserves" (www.ecparks.co.za). Eastern Cape Parks was identified as a key stakeholder in this research because it manages twelve parks in Eastern Cape.

The functional responsibilities of the Gauteng Department of Agriculture and Rural Development (GDARD) are primarily focused on natural resource management and sustainable development. The priorities of the Department are reflected by the existence of programmes in agriculture, veterinary services, natural resource management, conservation, environmental planning and impact assessment, and integrated waste management and pollution abatement (www.gdard.gpg.gov.za).

GDARD was identified as a key stakeholder for this research because it manages the following five nature reserves in Gauteng: Marievale Reserve, Roodeplaat Reserve, Suikerbosrand Reserve, Alice Glockner Reserve and the Abe Bailey Reserve.

Ezemvelo KZN Wildlife is the conservation management agency in KwaZulu-Natal (www.kznwildlife.com). The province has a range of landscapes, including the sub-alpine heights of the Ukhahlamba Drakensberg Park, the grasslands and mist belt forests of the Natal Midlands, the golden beaches that stretch from Umtamvuna in the south to Kosi Bay in the north, and the subtropical thorn savannahs of Zululand and Maputaland where wild animals roam free in the Hluhluwe Imfolozi Park (www.kznwildlife.com). Ezemvelo KZN Wildlife manages more than 80 protected wildlife areas to achieve two main objectives. The first of these is to preserve and maintain representative samples of all the ecosystems occurring naturally in the province. The second objective is to allow people access to and sustainable benefits from these areas (www.kznwildlife.com). Ezemvelo KZN Wildlife was therefore selected as a key stakeholder for this research.

The Limpopo Tourism and Parks Board was established in terms of the Northern Province Tourism and Parks Board Act (RSA, 2001). Its mandate is to promote, foster and develop tourism to and within the province. "Limpopo is home to numerous nature reserves and parks" and was therefore chosen as a key stakeholder for this research (www.golimpopo.com). Some of the well-known national parks include Greater Limpopo Park (Kruger National Park), Mapungubwe and Marakele,

as well as approximately 50 provincial nature reserves that reflect the diversity of this part of the world. Limpopo Tourism and Parks have the dual task of ecological conservation of the nature reserves as well as the development of eco-tourism projects in collaboration with local communities (www.golimpopo.com).

The mission of the Mpumalanga Parks Board is to manage biodiversity and ecosystems throughout Mpumalanga, for the socio-economic benefit of present and future generations; it is responsible for managaing thirteen wilderness areas and public nature reserves (www.mpumalangaparksboard.com).

North West Parks and Tourism Board is a governmental organisation responsible for managing 14 national parks and provincial reserves within the province's borders. The most well-known are the Pilanesberg and Madikwe National Parks. The province also shares the Magaliesberg Protected Natural Environment with Gauteng (www.tourismnorthwest.co.za).

Cape Nature is a public institution and has a statutory responsibility for biodiversity conservation in Western Cape. It is administered by the Western Cape Nature Conservation Board Act (RSA, 1998). It is mandated to promote and ensure nature conservation, render services and provide facilities for research and training, and generate income (www.capenature.co.za). There are 24 wildeness areas and nature reserves which can be found along the Garden Route and Little Karoo, Cape Karoo, Overberg, Winelands and West Coast.

1.6.3 Data collection methods

As indicated earlier, several methods were used to undertake this research. Two distinct approaches to research methodology were identified: qualitative and quantitative. Qualitative research explores attitudes, behaviour and experiences through such methods as interviews or focus groups, and attempts to get an in-depth opinion from participants (Sanchez, 2006). Qualitative research can therefore be seen as a naturalistic, interpretive approach concerned with understanding the meanings which people attach to phenomena (actions, decisions, beliefs, values, etc.) within their social worlds (Ritchie and Lewis, 2003). A qualitative approach was adopted for this research project in addressing research questions that require an understanding of social phenomena and the meanings that people bring to them.

The research data were collected using open-ended questionnaires. An open-ended questionnaire allows respondents to use their own words when replying to questions. The main open-ended questionnaire is a 'critical incident' type of questionnaire in which respondents explain in their own words both good and bad experiences as well the circumstances which led up to them and what happened afterward. Open-ended questionnaires are useful in the investigative phase of the

research or when looking for specific responses or answers that can't be summarised in a numeric code (Kirakowski, 2000). The disadvantages of open-ended questionnaires are that they can be time-consuming and the interviewer may misinterpret a response. The advantages include allowing the respondents greater freedom of expression, avoiding bias due to limited response ranges, and allowing the respondents to elaborate on and qualify their answers (Galloway, 1997).

The open-ended questionnaires for this research were structured to explore the respondents' understanding of climate change, the mitigation and adaptation plans that have been developed to managed climate change, and bottlenecks or challenges that were experienced by the respondents.

The stakeholder's representatives (Table 1.3) were either interviewed or asked to complete a questionnaire. All representatives of the stakeholders were from 'management' and they played an important role in biodiversity planning and assessing the impacts of projected climate change.

The interviews were guided by open-ended questionnaires. Table 1.4 represents stakeholders who were interviewed, those who completed the questionnaires, as well as limited responses and no responses received from the stakeholders. From the ten identified stakeholders, only one did not respond at all: Limpopo Tourism. The research results are therefore based on the open-ended questionnaire responses from the nine stakeholders as represented in Table 1.4.

Table 1.4: Stakeholder engagement and participation

Stakeholder	Completed Questionnaire	Participated in Interview	Limited Response	No Response
Cape Town, Cape Nature	X	X		
East London-Eastern Cape Nature	X			
Mpumalanga Parks Board-Nelspruit	X	X		
Limpopo Tourism-Polokwane				X
KZN –Ezemvelo KZN Wildlife	X			
North West Parks-Mafikeng	X			
DEAT			X	
GDARD	X			
SANParks	X	X		
SANBI	X			

1.6.4 Documentary and textual analysis

Various documents and texts from the tourism sector and on climate change were reviewed to gain an understanding of the impacts of climate change on the tourism sector, with specific emphasis on the impacts on the different ecozones in South Africa. The review also examined what has been implemented regarding climate change mitigation and adaptation strategies for the tourism sector in this country.

1.7 Ethical Issues

The ethical issues of this research were considered before and during the interview process. The research proposal and various ethical issues were examined by the Wits Ethics Committee and a protocol was awarded. Stakeholders that were identified to participate in this research were given the Participant Information Sheet and the Consent Form for participation in the research study. The participant information sheet explained the aims and benefits of the research as well as their right

to withdraw from the research study at any time. A copy of the Participant Information Sheet, Consent Form and Protocol from the Human Research Ethics Committee are attached in Appendix A.

1.8 Limitations of the Study

The researcher was unable to secure interviews with some stakeholders due to their unwillingness and time constraints. Where it was not possible to schedule an interview; the open-ended questionnaire as well as the ethics participant information sheet and consent form was emailed to the stakeholder for completion. From the ten identified stakeholders, there was no response from one stakeholder: Limpopo Tourism. Information for this research was received from the other nine stakeholders identified to participate in this research.

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Chapter 1 Summary

There is presently a significant limitation to research on the tourism sector and climate change in developing countries, specifically with regard to how the tourism sector is responding to climate change in terms of mitigation and adaptation strategies. The most attractive tourist activity undertaken by the foreign-visitor market is visiting game parks and nature reserves in South Africa. This research explores the attitudes of tourism sector mangers and stakeholders, with regard to how they perceive climate change, mitigation and adaptation strategies, and challenges that they are experiencing in promoting effective mitigation and adaptation strategies. Purposeful sampling was employed in the research. The stakeholders were identified based on their significant roles in the South African tourism industry with regard to game and nature reserve management. The researcher used open-ended questionnaires and interviews to collect data.

In the next chapter, present and future climate change impacts on biodiversity and projected impacts on tourism in South Africa are explored.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

In this chapter, projected climate change impacts on the global tourism sector are discussed. Impacts on biodiversity in South Africa and associated possible impacts on tourism are explored by reviewing possible climate change impacts on the seven South African biomes. A general overview of responses to climate change with regard to mitigation and adaptation strategies in the tourism sector is provided towards the end of this chapter.

2.2 Projected Climate Change Impacts on the Global Tourism Sector

There have been several studies on the projected impacts of climate change on the tourism sector (Viner and Agnew, 1999; Higham and Hall, 2005; IPCC, 2007; Ehmer and Heymann, 2008; Midgley *et al*., 2008). The findings are extremely wide-ranging and may have extensive consequences for the tourism sector. Several of these are discussed here.

Climate change brings more risks than opportunities for the international tourist sector (Ehmer and Heymann, 2008). The projected impacts from climate change (IPCC, 2007) will bring about regional and seasonal changes in tourist flows, which will result in both winners and losers (Ehmer and Heymann, 2008). For example, some resorts are likely to become less attractive to tourists as temperature and humidity increase above comfort levels (such as the Eastern Mediterranean). In Europe, those countries that could gain include the Benelux countries, Denmark, Germany and the Baltic States (Ehmer and Heymann, 2008). Other destinations, like the United Kingdom (UK) may become more attractive for tourists as good summer weather becomes more of a certainty (Viner and Agnew, 1999). The effect of projected sea-level rise, storm surges and erosion will severely impact recreation and tourist activities associated with coastal areas. Decreasing snow cover is projected to affect low-lying ski resorts in the European Alps and the Australian Alps (Viner and Agnew, 1999). Another tourism destination that is also extremely vulnerable to climate change is the Maldives as any further increase in sea-level rise will not only threaten their tourism industry but possibly the very existence of the islands. According to Ehmer and Heymann (2008), Canada, New Zealand and the United States (US) may find themselves on the winning side of climate change. Summer tourism in Canada will benefit, as rising temperatures will contribute to extending the summer season and moderating the sometimes harsh climate

It was evident from the literature that the projected impacts of climate change is likely to affect many countries but to differing degrees (Viner and Agnew, 1999; IPCC, 2007; Ehmer and Heymann, 2008; Midgley *et al.,* 2008). Especially for countries which put a lot of reliance on tourism as a driver of economic development, climate change may bring additional burdens and

economic setbacks (Ehmer and Heymann, 2008). In Europe this is relevant to Malta, Cyprus, Spain, Austria and Greece. The Bahamas and Jamaica will be disproportionately affected in the Caribbean. In Asia, Thailand and Malaysia will be affected, and in Africa Tunisia and Morocco will be affected. The island states in the South Pacific and the Indian Ocean are particularly reliant on tourism. The economic setbacks will be very serious if tourists stay away from these areas (Ehmer and Heymann, 2008).

As stated earlier, studies conducted by the IPCC (2007) confirm that Africa is one of the most vulnerable continents to climate variability and change. This is mainly due to multiple stresses and low adaptive capacity in Africa. Even though adaptation to current climate variability is taking place; this may be inadequate for future changes in climate (Boko *et al*., 2007). Africa is known for wildlife safaris and nature tourism. The projected impacts of climate change would particularly damage tourism in Africa if it were to change the natural characteristics of the biomes. The financial adaptability of African tourist destinations to the projected impacts of climate change is lower than that of, for example, Europe, and this is a challenge for Africa (Ehmer and Heymann, 2008). All in all, it seems that African countries are among the losers from the projected impacts of climate change (Ehmer and Heymann, 2008).

2.3 Projected Climate Change Impacts on Biodiversity in the Tourism Sector in South Africa

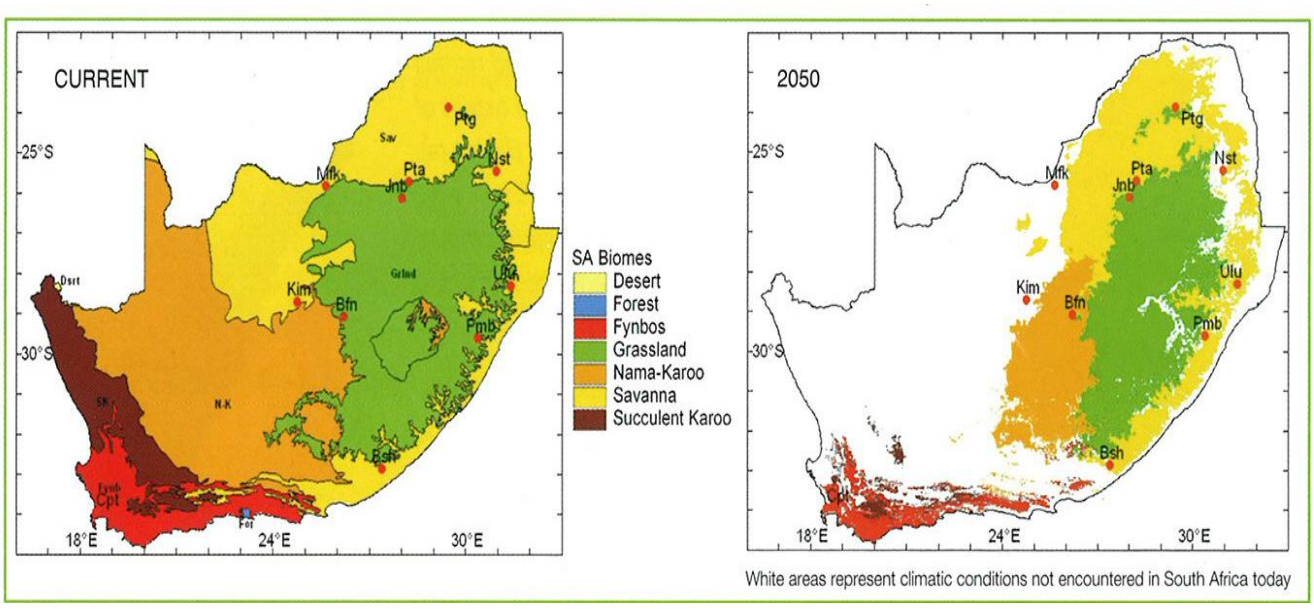
There are a number of uncertainties and issues of concern associated with the science of climate change. The IPCC (2007) has stated that "most of the observed increase in global average temperatures since the middle of the twentieth century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations". According to the IPCC (2007), very few assessments of projected impacts on tourism and climate change are available, particularly those using scenarios and GCM outputs. The modelling of climate changes, as well as human behaviour and other factors, is extremely difficult.

> Although scientific evidence is still lacking, it is probable that flood risks and water-pollution-related diseases in low-lying regions (coastal areas), as well as coral reef bleaching as a result of climate change, could impact negatively on tourism (McLeman and Smit, 2004 cited in Boko *et al.,* 2007, 450).

It is also possible that wildlife areas, parks and other African tourist areas may become less attractive due to projected climate changes.

Even though there are currently few regional studies on the impacts of or response to climate change as it may affect nature tourism in Africa, there have been some studies on the present and future impacts of climate change in South Africa. These are discussed here.

The rich and diverse vegetation of South Africa is categorised into biomes with specific climate and vegetation types. There are seven South African biomes, namely Desert, Forest, Fynbos, Grassland, Nama-Karoo, Savanna and Succulent Karoo (Midgley *et al.*, 2008). The Fynbos and Succulent Karoo Biomes are located in the western parts of South Africa, particularly in areas where rain falls in winter (Midgley *et al.*, 2008). The Nama-Karoo Biome spreads over much of the arid interior and is characterised by hardy bushes and grasses. The Grassland Biome is located in the summer rainfall areas and dominates much of the highveld. The growth of trees in the Grassland Biome is restricted by frost (Midgley *et al.*, 2008). The Savanna's vegetation is predominant in the coastal and lowveld regions, which are warmer in winter. The Forest Biome in the Southern Cape and a tiny area of true Desert in the Northern Cape have been identified as the smallest biomes (Midgley *et al.*, 2008). According to some scenarios, it is projected from climate models that within 50-100 years, the biomes could be reduced to 35-55% of their present area (Midgley *et al.*, 2008) (Figure 2.1).



Source: Midgley et al., 2008, 5.

Figure 2.1: Biomes of South Africa as mapped in the year 2000 and the potential effect of global climate change on the biomes

Several recent South African studies strongly indicate that biodiversity in Southern Africa is at risk due to the projected impacts of climate change. According to Midgley *et al.* (2008), one of the greatest challenges is to understand how climate change may impact plant biodiversity 'hotspots'.

Hotspots are “areas featuring exceptional concentrations of endemic species and experiencing exceptional loss of habitat” (Myers *et al*., 2000). They may have many endemic species that can only be found in that particular area and not in any other area. One example of a global hotspot is the Succulent Karoo Biome which is known for having the richest succulent flora in the world (Midgley *et al.*, 2008). A disturbing projection by the South African Country Study on Climate Change is the likelihood that the country could lose its Succulent Karoo Biome (Kiker, 2000). “These plants live on the edge of survival, completely dependent on low but fairly reliable winter rainfall. If the climate of this region becomes any drier, the effects on the entire biome will be devastating” (Midgley *et al.*, 2008, 5). This could have major implications on the tourism potential of the Succulent Karoo Biome.

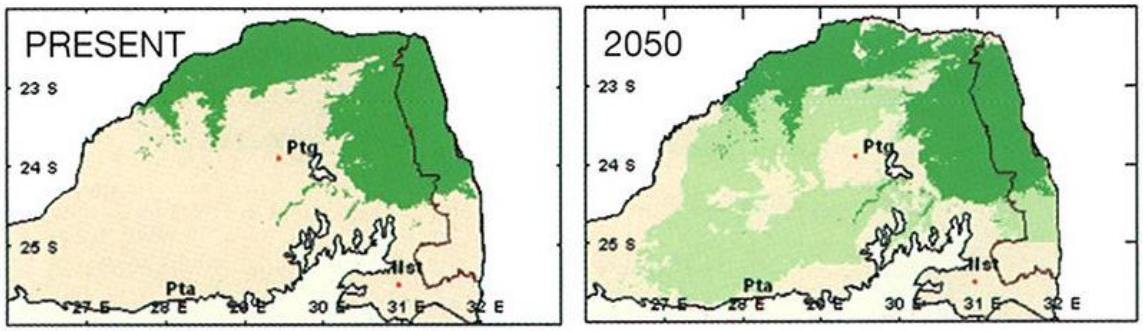
The South African Country Study on Climate Change (2000) projected that the most dramatic responses to climate change would be in the biodiversity and human health sectors – for example the area that climatically suits South Africa’s seven existing terrestrial biomes are estimated to shrink by 40% by 2050 (South African Environment Outlook, 2006). According to Kiker (2000), the largest losses are projected to occur in the western, central and northern parts of the country.

It is estimated that 44 per cent of plant species and 80 per cent of animal species will experience changes to their distribution ranges DEAT, 2006). The change in species composition will result in major vegetation structural changes in some biomes, especially in the Grassland Biome where almost the entire biome is vulnerable to a potentially large number of invading savanna tree species (Kiker, 2000). The Grassland Biome is located at altitudes where frost is responsible for restricting woody plant growth and assists in retaining the grassland biome by killing the seedlings of many trees and shrubs that would otherwise grow there. Due to projected increases in temperatures, frost will become less common or the growing season for trees might lengthen; as a result woody plants might be able to invade grasslands, transforming them into savanna (Midgley *et al.*, 2008). As a result of this, most of the area currently occupied by grasslands may decrease (Kiker, 2000).

Warming conditions may also cause the area of upland grasslands to contract and become less suitable habitats for animals like the mountain zebra and bontebok (Preston-Whyte and Watson, 2005). The popular leisure activity of fly fishing could also be affected, as trout are unable to survive in water temperatures above 21°C (Preston-Whyte and Watson, 2005). It is also projected that there will be an alteration of the bio-climate in the nature reserves of the arid west and central parts of the country, while those nature reserves of the eastern and highland regions are better buffered and will not be affected as much (Kiker, 2000).

The Fynbos Biome is known for its extraordinarily rich flora, with at least 5 600 of the 8 000 plant species being endemic to the region (Midgley *et al.*, 2008). The Fynbos Biome is recognised as part of one of only six floral kingdoms in the world. Climate change is projected to seriously threaten the Fynbos Biome over the next 50-100 years (Midgley *et al.*, 2008). Fires are projected to become more common and widespread due to the climate becoming hotter and drier. This will affect the Fynbos, as local extinctions could result if plants are not old enough to set seeds before they are burned. Plants depend on animals for their survival in terms of pollination and seed dispersal. Climate changes affect plants and animals in different ways. Presently there is not enough knowledge on the physiology of indigenous plants and animals, but it can be projected that climate change could disturb these essential relationships (Midgley *et al.*, 2008).

The Savanna Biome is located mainly in the north and east of South Africa and provides the bread and butter of SA's nature tourism. It is also extensive north of the border, where some types of savanna vegetation occur in warmer and drier climates (Midgley *et al.*, 2008). According to Midgley *et al*., (2008), Savanna is a term that describes many different vegetation types. It includes the arid camel-thorn veld of the Kalahari to the bush-veld and the coastal woodlands of KwaZulu-Natal. This Biome supports most of the large charismatic mammals that tourists come to see. It is projected that as the climate changes, there may be changes in Savanna plant species as some species disappear, shrink or expand (Midgley *et al.*, 2008). An example of this is the mopane tree (*Colophospermum mopane*), which is increasing its range in the Limpopo and Mpumalanga Lowveld. Mopane trees could colonise the southern parts of the Kruger National Parks (Figure 2.2). This will not be good for tourism as these trees do not favour the diversity of large mammals that most tourists visit the Park to see (Midgley *et al.*, 2008).



Current distribution of mopane trees in the Kruger National Park

Predicted distribution of mopane trees in the Kruger National Park

Source: Midgley et al., 2008, 9.

Figure 2.2: Present and predicted distribution of mopane trees in the Kruger National Park

According to a study done by Erasmus et al., (2002) on the likely impacts of climate change on South Africa's fauna, the Kruger National Park case study "revealed that 66% of all species found in the Kruger National Park and included in this study were lost (< 50 % probability of occurrence). This included 97% of the bird species and 52% of the Red-data and vulnerable species". This study highlighted the extensive range shifts due to the projected impacts of climate change.

The Tsitsikamma Forest located in the mountains surrounding Knysna in Western Cape is the only large park in the Forest Biome (Preston-Whyte and Watson, 2005). Acidification projected from climate change could bring about disappearance of as much as a fifth of the forest by 2050 (Hulme, 1996 cited in Preston-Whyte and Watson, 2005). This loss will negatively affect hiking trails through the forest as well as severely impact the popular otter trail. This trail is the park's key attraction and extends over 67 kilometres of extremely rugged coastline. The hiking trail offers magnificent vistas, good birding and possible encounters with the otters when crossing river mouths, as well as sightings of dolphins and whales off the coast (Preston-Whyte and Watson, 2005). Several studies project a 25 cm rise in mean sea level by 2050 (Hulme *et al*., 2001 cited in Preston-Whyte and Watson, 2005). This could have the effect of increasing the salinity of the water in river mouths, which would reduce their suitability as otter habitats, thereby negatively affecting its attractiveness to tourists.

According to Knoesen *et al*. (2009), in a study conducted on the Orange-Senqu River Basin in South Africa, many ecosystems may be potentially damaged by climate change. Species extinction is also projected to occur in some cases. For example, temperature changes in air and water, as well as the greater or lesser availability of water, may force species to migrate to other areas for survival.

2.4 Mitigation and Adaptation Responses in the Tourism Sector

According to the IPCC (2007), mitigation with respect to climate change means implementing policies to reduce GHG emissions and to enhance sinks. Mitigation is a challenge for the tourism sector because tourism-related emissions are increasing rapidly while climate change mitigation initiatives have to mediate between often-conflicting objectives, such as reducing emissions and at the same time promoting tourism which is essential for economic development. According to Simpson *et al.* (2008), mitigation in the tourism industry can be achieved through technological innovation and market mechanisms. Behavioural changes are also important, as an increasing number of human beings participate in tourism and considerable reductions in greenhouse gases can be attained through changing behaviour.

Even though societies have a long record of managing the impacts of events related to weather and climate, additional adaptation measures will be required to reduce the undesirable impacts of projected climate change (Parry *et al.,* 2007). Adaptive responses range from purely technological (e.g. sea defences), through behavioural (e.g., altered food and recreational choices), to managerial and policy (e.g. planning regulations) (IPCC, 2007). According to the IPCC (2007), adaptation is already occurring in many sectors but more extensive adaptation is required to reduce vulnerability to climate change. The IPCC (2007) has identified barriers, limits and costs related to the implementation of adaptation, some of which are not fully understood. For developing countries, the IPCC (2007) has identified availability of resources and building adaptive capacity as important challenges.

According to the IPCC (2007), neither adaptation nor mitigation alone can avoid all the projected impacts of climate change. However; adaptation and mitigation together can significantly reduce the projected risks. The capability to implement adaptation and mitigation measures is dependent on socio-economic and environmental circumstances, as well as the availability of appropriate information and technology (IPCC, 2007).

The central theme of the Climate Change and Tourism Conference held in Tunisia on 9-11 April 2003 was to recognise that there is a two-way relationship between tourism and climate change. On the one side, the tourism industry has a responsibility to minimise its impact on the environment and on the emission of greenhouse gases which in turn contribute to climate change. On the other side, projected changes to the world's climate may have a direct impact on many tourism destinations, ultimately affecting the tourism industry as well as other economic sectors. The tourism industry therefore needs to be made aware of these impacts and to respond appropriately with regard to implementing mitigation and adaptation strategies (UNWTO, 2003).

Even though there have been limited studies on the tourism industry's response to climate change, examples of some efforts highlighting adaptation and mitigative responses are discussed below.

The Maldives has developed a comprehensive programme of domestic adaptation to the projected impacts of climate change. Tourism is one of the country's most important sources of foreign exchange, and the Indian Ocean tsunami of 2004 severely affected the tourism industry (Simpson *et al*., 2008). The cost of direct damage to the tourism business and infrastructure was estimated at over $100 million (Simpson *et al*., 2008). The Safer Island Development Programme (SIDP) was aimed at providing the infrastructure needed to adapt to natural disasters, including those brought about by climate change (Simpson *et al*., 2008). Work has concentrated on reinforcing vital infrastructure, especially with regard to transport and communications (Cameron, 2009). Public services – including water supply, electricity generation, and the provision of health care and

education – are being strengthened against climate threats. Flood defences have also been constructed, and measures are being taken to reduce coastal erosion (Cameron, 2009).

In another example, there have been water shortages for accommodation providers and tour operators due to increasing incidence of droughts in Tobago, the Caribbean and Fiji. Response measures that may be coupled with adaptation measures at the resort level involved actions on both supply and demand, such as small-scale infrastructure improvements (e.g. rainwater collectors, increasing storage tank capacity, converting toilets to salt water supply, and adding diesel-powered desalination capacity), water conservation (including the use of water-saving devices, guest and employee education, revised landscape practices and limited use of pools), sustainability planning by considering long-term weather forecasts, water source management and recycling of water (Simpson *et al*., 2008).

With respect to some examples of initial mitigation, Spier Leisure's hotel and conference centre in Western Cape, subcontracted enterprises involving a cheetah centre, raptor centre, restaurants and shops. Spier Leisure monitors the energy consumption from electricity, petrol, diesel and gas, and sets targets to reduce its annual energy consumption. Energy metres have been installed across the estate for each business unit so that consumption can be monitored. Hot water timers have been reset to be on for eight hours rather than 16 hours each day, and energy-saving bulbs have been installed in all 155 hotel rooms and some common areas (Simpson *et al*., 2008).

Chumbe Island is a tourism destination in Zanzibar, Tanzania. It is privately managed and protects a biodiversity-rich coral reef system. Many climate change mitigative measures have been implemented to make Chumbe's seven bungalows a unique eco-friendly destination. Each bungalow collects its own freshwater supply from rainwater during the rainy season. Complex filtration systems are used to filter the water, which is stored and then used for the shower and hand-basin system. The used water from the showers and basins is filtered and sent to specially sealed plant beds so that no polluted water goes to the protected sanctuary. Photovoltaic panels on roofs provide ample environmentally friendly electricity for normal usage. The open design of the bungalows promotes maximum through-draft for cooling, which is a form of natural air conditioning (Simpson *et al*., 2008).

There are several schemes in Africa that recognise and reward tourism organisations or lodges for their eco-friendliness and sustainability. Every year the World Travel & Tourism Council (WTTC) awards the very best in sustainable tourism with its Tourism for Tomorrow Awards. This is one of the highest accolades in the global Travel & Tourism industry. They are aimed at recognising best practice in sustainable tourism within the industry worldwide.

The 2011 WTTC Global Tourism Business Award was won by Intrepid Travel for having demonstrated best practices in sustainable tourism at a large company level. Intrepid Travel is a tour operator that takes approximately 100,000 travellers to 130 countries each year. The company has demonstrated environmentally-friendly practices such as measuring, reducing and auditing their carbon emissions at 30 global offices and also actively supports health care, education, human rights, child welfare, and sustainable development in the areas that Intrepid Travel visits.
www.tourismfortomorrow.com

The 2011 WTTC Conservation Award was won by Singita Pamushana in Zimbabwe for its successful partnership with the local Malilangwe Trust in helping rehabilitate and protect 122,789 acres of degraded wildlife habitat that had suffered from years of poaching. The Malilangwe Wildlife Reserve comprises of 38 different habitats that are home to four percent of all bird species in the world, including rare and endangered animals. The lodge and the Trust employ over 200 staff, almost all local Zimbabweans and provide drinkable, clean borehole water and a nutritional outreach programme to more than 10,000 villagers in the area.
www.tourismfortomorrow.com

South African has the Imvelo Awards which creates significant awareness of environmental management issues in the South African tourism industry. This recognition by the Tourism Industry is important in promoting sustainable tourism and implementing mitigation and adaptation actions to manage the projected impacts of climate change.

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Chapter 2 Summary

Climate change and the resultant impact on biodiversity have the potential to affect the tourism sector in South Africa. The vegetation of South Africa is rich and diverse and has been characterised into seven biomes which have specific climate and vegetation types (Midgley *et al.*, 2008)*. The South African Country Study on Climate Change suggests that the Succulent Karoo Biome, which is arguably the world's most botanically diverse arid region, could be lost and this could severely impact its tourism potential (Kiker, 2000). The largest losses in South Africa are expected to occur in the western, central and northern parts of the country. According to the IPCC (2007), adaptation and mitigation together can significantly reduce the projected risks of climate change. The following chapter presents the findings from stakeholder questionnaires and interviews, as well as a discussion of research results.*

CHAPTER THREE: RESEARCH RESULTS

3.1 Introduction

This chapter begins by presenting the findings from the stakeholder questionnaires and interviews as well as a discussion of the research results with regard to the perception of stakeholders regarding climate change in the nature-based tourism sector. Mitigation and adaptation strategies that are in place or being developed are discussed, and challenges experienced by the stakeholders in the nature-based tourism sector in promoting effective mitigation and adaptation strategies are highlighted.

The stakeholders included the Department of Environmental Affairs and Tourism (DEAT), South African National Parks (SANParks), the South African National Botanical Institute (SANBI) and the managers of various provincial parks – Eastern Cape Parks, the Gauteng Department of Agriculture and Rural Development (GDARD), Ezemvelo KZN Wildlife, Limpopo Tourism and Parks Board, Mpumalanga Parks Board, North West Parks and Tourism Board and Cape Nature. The stakeholders were identified according to their significant roles in the South African tourism Industry with regard to game and nature reserve management.

3.2 Research Results

The discussions and findings from the stakeholder questionnaires and interviews are summarised below.

3.2.1 Cape Nature

Cape Nature perceives that climate change will affect the tourism sector in Western Cape. This stakeholder believes that there will be warming and drying in Western Cape, with more significant disasters such as fires and storms. These scenarios are informed by the Draft Climate Change Strategy and Action Plan for Western Cape (Baard, 2007). If Western Cape is affected by such changes, tourism activities and enterprises may also be affected.

Cape Nature is concerned about the impact of climate change, as it manages one of the world's crown jewels – the Cape Floristic Kingdom (CFR), which has exceptional plant diversity and endemicity. Cape Nature is aware of some the impacts of climate change in its area. According to Cape Nature, the number of days of minimum temperature is going to become less and this will impact the biodiversity. The pattern of winter rainfall is also going to change. There may, for example, be more severe rain storms in the Southern Cape.

Cape Nature relies on SANBI, SANParks and other researchers for research on climate change. It does not conduct any research itself as it does not have the resources for this. They are also guided by the Western Cape Provincial Department of Environmental Affairs and Development Planning. Cape Nature is familiar with GCMs, but it does not use any models to inform strategic planning regarding climate change.

Although Cape Nature does not have any formal mitigation and adaptation plans and strategies with respect to climate change, there are many projects which could potentially be adapted to this purpose. These projects, which are discussed below, were captured in a memo compiled by Cape Nature (2007) as well as during the interview with Cape Nature:

- The Cape Action Plan for people and the environment includes planning and landscape initiatives like the Greater Cedarberg Biodiversity Corridor Project and the Gouritz initiative. Part of this includes planning for climate change. Adaptive and systematic conservation plans were created and implemented. This includes creating corridors in the Cedarberg Biodiversity corridor using parks, nature reserves and conservation stewardship programmes. “The Cape Nature C.A.P.E. Fine-scale Biodiversity Planning project is aimed at the identification of Critical Biodiversity Areas in the Western Cape which will among other inform the establishment of protected area corridors and protected area expansion strategies, with the aim to mitigate against and adapt to climate change” (Baard, 2007, 1).

- Energy-saving initiatives like using energy-saving light bulbs are being employed, as well as water-saving devices and solar systems in the tourism development section.

- Cape Nature is also involved with monitoring plants and animals for early detection of changes – for example, long-term indicators of climate change, the long-term frog programme and a specific programme on threatened frogs. These are known to be the best indicators. “Two long-term frog monitoring sites at Swartboschkloof and Landroskop, and a long-term monitoring project on the melanistic and high altitude dwarf crag lizard in the Hottentots Holland Nature Reserve, aim to document the response of these sensitive and indicator species to climate change” (Baard, 2007,1). The long-term waterfowl monitoring project and the Cape Vulture monitoring projects are also aimed at understanding and documenting the response of these species to climate change (Baard, 2007).

- Cape Nature’s post-fire Protea monitoring, which is undertaken throughout the protected area network and in response to fire-ecological management, is intended

to document the response of these indicator species to climate change (Baard, 2007).

- Cape Nature's Fire History Project is primarily aimed at analysing the fire-ecological response to long -term climate change. Cape Nature, in partnership with the Centre for Scientific and Industrial Research (CSIR), is analysing the long-term fire history of the CFR to determine whether or not there has been a change in historic fire patterns (Baard, 2007).

- Cape Nature is involved in the current studies on identifying links between ground and surface water in the Table Mountain Sandstone Aquifers. This is to inform management response to the potential impact of bulk water abstraction from the Cape Fold Mountains, which is indirectly aimed at understanding the potential impact of climate change (Baard, 2007).

- Cape Nature is also a formal implementing agent collaborating with the SANBI Climate Change Research Group. Dr Guy Midgley and others are involved in planning research into climate change and playing an important role in facilitating research activities on and access to protected areas (Baard, 2007).

- Cape Nature has links to the ecohydrological research and monitoring project run by Professor. Jonathan Silvertown of the Open University in the UK. This project is directly aimed at quantifying the potential impact of climate change on the Cape Floristic Region's landscapes and ecosystems (Baard, 2007).

- Cape Nature's association with the South African Environmental Observatory Network (SAEON) is focused specifically at creating long-term monitoring sites to facilitate and improve data collection on climate change (Baard, 2007).

- Cape Nature is in the process of collating all the current weather data into a central repository and communicating it to the correct partners to assist in building a database for climate change.

Some of the challenges that Cape Nature has been experiencing in developing and implementing mitigation and adaptation strategies for climate change include capacity and institutional changes such as the following:

- There has not been a central person or team involved specifically with climate change.
- There is no focused programme on climate change at Cape Nature.

The Provincial Department of Environmental Affairs and Developmental Planning play an important role in climate change. The co-ordination and communication lines are open; there is a very strong relationship between Cape Nature and the Provincial Department.

The main challenge limiting mitigation and adaptation to the projected impacts of climate change at Cape Nature is a lack of human resources and capacity. Tourism has a significant impact on biodiversity, and Cape Nature does not have sufficient infrastructure to deal with mitigation and adaptation to the projected impacts of climate change. It is in the difficult position of having to promote tourism development as well as protecting biodiversity. Increased tourism development increases the possibility of climate change and also exposes more elements of the ecosystem to threat. If you push tourism, this will affect biodiversity. So Cape Nature has to balance both.

3.2.2 Mpumalanga Tourism and Parks

Mpumalanga Tourism and Parks are concerned about the impact of climate change and perceive that it will be a key risk to manage in the future. Climate change will first impact the biodiversity and then will affect tourism, but this will occur slowly and over a long period of time. There will not be a large impact on tourism, but tourism will definitely be affected. There may be extreme storms, and emergency preparedness will thus be important.

The Scientific Services department was requested by their Chief Executive Officer (CEO) to develop a Climate Change Strategy. Mpumalanga Tourism and Parks were aware of some of the impacts of climate change in its area, which has had extreme events such as storms. There has also been an increase in the thickening of woody vegetation, possibly related to increases in carbon dioxide, although few studies have been undertaken to confirm this. There has been no monitoring or long-term data collection to specifically examine changes in biodiversity due to climate change. GCM models have not been used to inform strategic planning. Mpumalanga Tourism and Parks is thinking of using GCMs for future programmes on threatened species.

No formal mitigation and adaptation plans and strategies have been undertaken. A climate change strategy is presently being developed and the Mpumalanga Biodiversity Conservation Plan will be reviewed to consider climate change in conservation planning as this was not done initially. Some of the challenges that Mpumalanga Tourism and Parks has been experiencing with regard to compiling and implementing such strategies include:

- Staffing issues related to leadership problems: There was no direction in the overall management of Tourism and Parks initially but this has since been resolved.
- Vacancies: There is no budget to fill positions specific to climate change efforts.
- Funding for research projects is a problem. There have been many funding, but they have not taken up. Tourism is a priority, and the budget is spent more on tourism activities and less on conservation.
- Training: It is difficult to procure funding for this.
- There is no university in Mpumalanga, so additional resources for monitoring of climate change are limited.

There are challenges regarding the co-ordination and communication between government departments and Mpumalanga Tourism and Parks. For example, there is very little communication from DEAT in terms of strategies and objectives related to the projected impacts of climate change

The roles and responsibilities are not clearly defined at provincial level. One of the enabling factors promoting mitigation and adaptation to climate change by the tourism sector is that carbon trading opportunities are becoming available. KwaZulu-Natal is presently investigating these. The main factors limiting mitigation and adaptation to climate change by Mpumalanga Tourism and Parks are the limited budget and the staff vacancies.

3.2.3 North West Parks and Tourism Board

The North West Parks and Tourism Board perceives that climate change does affect the tourism sector. It is concerned about the projected impacts of climate change on the provincial parks and nature reserves. The Board has seen changing patterns and trends in some of the climatic variables – for example, dry seasons becoming longer as well as below-average rainfall in some areas. The Board does not use models for projecting climate change. It is guided by global projections (e.g. NASA studies on the ozone layer, IPCC documents and publications by other agencies), and relates those to its area.

The North West Parks and Tourism Board has not compiled or implemented any formal mitigation and adaptation plans and strategies with respect to climate change. It is involved with projects such as reducing fire frequencies and reviewing animal-stocking plans, including game removals in order to ease pressure on vegetation. The Board was not sure about the observed variable weather patterns and whether these are related to global climate change or whether is was just normal variation**.**

Some of the challenges experienced by the North West Parks and Tourism Board are highlighted below;

- No clear communication between North West Parks and the provincial Department of Agriculture and Environment (DACE) or the national DEAT on the issue of responding to the projected impacts of climate change.
- Lack of co-ordination between North West Parks and the government departments.
- Not enough data and projection models for GCMs.
- General lack of buy-in from the political fraternity on environmental issues, including climate change.

Some of the enabling factors promoting mitigation and adaptation to climate change are:

- Senior management has gradually come to understand the impact of climate change in North West Parks reserves.
- Weather patterns are changing.

3.2.4 Eastern Cape Parks

Eastern Cape Parks does not perceive that the projected impacts of climate change will affect tourism in its parks. It is aware of the possible impacts of climate change on the reserves that they manage, as many of them are small (under 10 000 ha). It believes that it is unlikely that they will experience significant impacts due to climate change in the medium term (that is, the next five years). That does not mean, however, that longer-term planning is not important. Eastern Cape Parks is not aware of any impacts on their parks and reserves which can unequivocally be attributed to climate change. It is aware of GCMs but does not use them or any climate models to inform its decisions.

Mitigation plans include a move to low-energy technology, elementary carbon-use auditing and reduction target setting. Adaptation is found in the form of seeking a legislative mandate to work outside of the current reserves so as to improve the likelihood of being able to better conserve biodiversity.

One of the bottlenecks that Eastern Cape Parks has been experiencing in the implementation of the mitigation and adaptation strategies is that it is a very young institution (only five years old), and is still grappling with putting the basics of conservation management in place. This and funding constraints are the main constraints. There is also very little communication from government departments with regard to climate change strategies. Eastern Cape Parks does have a supportive board and executive which is an enabling factor, but budgetary constraints and other priorities are disenabling factors.

3.2.5 South African National Botanical Institute

According to SANBI, they are not aware of a conclusive study that confirms whether climate change is affecting or will affect the tourism sector in South Africa. In theory, the projected impacts of climate change could affect all sectors. There are two key aspects – the direct effects of climate change on tourism, and the impact of international agreements on carbon emissions reductions, which may affect tourism if international travel is curtailed. On the other hand, it could also promote tourism which is targeted at and marketed as using sustainable principles.

SANBI is concerned about the impact of climate change. It has conducted early analyses of its local energy use and has begun reducing some wasteful practices and infrastructure. SANBI plans plan to engage its gardens' network within a national framework that may involve adaptation aspects, including through assisting in the collection of seeds for long-term storage in collaboration with the Kew Gardens International Millennium Sandbank Project.

SANBI has played a lead role in the Intergovernmental Panel on Climate Change and South Africa's National Climate Change Committee (NCCC). It has contributed to and is involved in the co-ordination of several national and regional policy documents. SANBI has been leading the process of producing South Africa's Second National Communication, which is a report to the Conference of the Parties[2] (COP). The report outlines South Africa's strategies in dealing with mitigation and adaptation to climate change, the status of the country's greenhouse gas inventory, and any other information relevant to the objectives of the United Nations Framework Convention on Climate Change (UNFCCC) (www.sanbi.org).

Some of the bottlenecks that SANBI has been experiencing in the implementation of the mitigation and adaptation strategies include: lack of skills capacity, knowledge and information; uncertainty with regard to international negotiations; and long-term climate scenarios. Co-ordination and communication between the different government departments and SANBI is improving through developing structures.

According to SANBI, a major disabling factor limiting mitigation and adaptation to climate change by the tourism sector is the lack of a comprehensive analysis of the risks and opportunities.

[2] The Conference of the Parties, as the supreme body of the United Nations Framework Convention on Climate Change, shall keep under regular review the implementation of the Convention and any related legal instruments that the Conference of the Parties may adopt, and shall make, within its mandate, the decisions necessary to promote the effective implementation of the Convention (Article 7, UNFCCC).

3.2.6 South African National Parks

According to SANParks, they are not familiar with conclusive evidence that climate change is affecting the tourism sector. However, there is evidence that climate change is affecting certain organisms – for example, Koekoboom trees – and that biodiversity is being affected which in turn will affect tourism. Future impacts of climate change are unknown as local climate change models are currently still very limited.

Notwithstanding these challenges, SANParks considers the impact of climate change as well as changes in the world economy in its long-term scenario planning. SANBI and SANParks work closely together on research and response plans. SANParks is not aware of the impacts of climate change specific to national parks. As part of its scenario planning, it also has to consider climate change impacts. It has not measured specific impacts in terms of factors such as carbon footprint. SANParks is aware of GCMs but does not use any of them to inform its strategic planning. The group relies mostly on SANBI for this research. SANParks does not have any formal mitigation and adaptation plans specific to climate change. General biodiversity strategies are developed to encourage and manage biodiversity related to the landscape and friendly linkages.

Some of the bottlenecks that SANParks have been experiencing in the implementation of the mitigation and adaptation strategies include;

- Funding – short of finance due to the economic recession.
- Awareness and attitudes on climate change: There is a high level awareness at the top but there is limited awareness on the ground. Those at the grass roots feel that there are more important issues to deal with.

There have been initiatives on climate change run by DEAT, like the climate change summit. Climate change has been factored into national response plans on biodiversity. There seems to be good awareness and communication from DEAT but implementation across the board is weak. Conservation management itself is fragmented; there are opportunities for learning to take place. There is not much communication between the provincial park authorities.

Some of the enabling factors promoting mitigation and adaptation to climate change by the tourism sector include:

- International profile on climate change: a lot of sensitivity to climate changes.
- There are many good scientists in the field who are specialists in climate change.

Some of the disabling factors limiting mitigation and adaptation to climate change by the tourism sector include;

- Current economic climate and its impact on climate change.
- Immediate short-term urgencies outweighing long-term, less urgent issues.
- Regional climate change models are limited, and there is no real certainty on the impact of climate change.

3.2.7 Gauteng Department of Agriculture and Rural Development

According to GDARD, in theory climate change will have an impact on tourism. However, no scientific monitoring specifically for climate change has been done to confirm anything in this regard. Many indirect observations have been done, but the reasons behind any unusual event are speculative at this stage. GDARD is concerned about the impact of climate change on the provincial parks and nature reserves. These changes are very speculative at this stage mainly due to the lack of capacity to do proper scientific work in this regard. Proper monitoring is needed to confirm any impacts that may be already developing. GDARD has not developed any capacity to work with GCMs.

Mitigation and adaptation plans and strategies compiled by GDARD have been incorporated into their Conservation Plan, but only to a limited extent. Some of the bottlenecks that GDARD has been experiencing in the implementation of the mitigation and adaptation strategies include lack of capacity and strategic vision and poor management of human resources**.** The co-ordination and communication between the different government departments and GDARD is also poor. The collapse of so many municipalities is evidence of this trend in government to keep on appointing staff without the necessary skills.

3.2.8 Ezemvelo KZN Wildlife

Ezemvelo KZN Wildlife was of the opinion that climate change may affect the tourism sector, and is concerned about the projected impacts. These impacts may cause considerable damage to infrastructure. It may cause flooding which may wash away roads, bridges and paths which would require extra capital to repair. Rising sea levels cause damage to coastal protected areas. Increased disease – for example, the spread of malaria to previously unaffected areas – may limit tourist numbers in these areas. Droughts may lead to camp closures due to the unavailability of water for these camps. These projections are based on the IPCC (2007) reports. Ezemvelo KZN Wildlife is guided by these reports, and has modelled rainfall and temperature changes across the province using regional climate models and downscaled models such as those developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Geophysical Fluid

Dynamics Laboratory (GFDL), the Meteorological Research Institute (MRI) and the Canadian Centre for Climate Modelling and Analysis, (CGCM).

Ezemvelo KZN Wildlife is presently developing a policy and response strategy, and is working hard at increasing its protected-area network through a protected area expansion strategy and stewardship programme. It has developed a system of macro-ecological corridors, all of which have as one of their aims the mitigation of climate change by absorbing some of the likely changes. For example, processes are being set in place to reduce the carbon emission of the organisation and its camps. Ezemvelo KZN Wildlife has a conservation plan for the province which aims to facilitate decision making for land use and conservation planning which aims to meet development and biodiversity conservation goals in KZN. Its overall goal is to conserve viable representatives of the province's indigenous biodiversity (at genetic, species and ecosystem levels) and the processes that support it. The organisation has identified the need to consider facilitated adaptation in the future – for example, species translocation, *ex-situ* conservation and matrix management for species occurring outside of the reserves.

KZN Wildlife is aware of and concerned about climate change impacts both provincially and more broadly. Climate change impacts in other areas may drive impacts in the province through immigration and changed agricultural practices (food production and biofuel pressures), leading to further land transformation and direct loss of biodiversity through loss of habitat. It has modelled rainfall and temperature changes across the province using regional climate models and downscaled models. The projected climate-change scenarios for KZN include a slightly higher projected rainfall with greater inter-rainfall durations leading to increased erosion and flood risk. It is anticipated that sea-level rise will affect coastal areas and estuaries, as global sea-level observing data for Durban indicates a 2.7 cm increase every ten years. A rise in sea temperature is projected which will affect coral reefs, fish stocks and nurseries. Some of the proposed human interventions to climate change could pose a risk to biodiversity. Species with low temperature tolerance will recede up the altitude gradient and some may become locally extinct. Trees will out-compete grasses, and grasslands with their high biodiversity will diminish. Savanna woodlands will become thicket and forest, and the savanna fauna will be replaced by thicket and forest fauna. Species associations will change, leading to novel vegetation types. An increase in fire risk is anticipated. Alien species may be further spread by climate change. Stream-flow reduction is projected. Human and animal diseases may increase because of increased winter temperatures and increased rainfall. There will be significant negative effects on potential home-range size and species richness across almost all animal and plant taxa, especially with concomitant land transformation (IPCC, 2007).

Ezemvelo KZN Wildlife is still in the process of developing its climate change strategy and mitigation response, but has already put several plans into action as outlined above.

Some of the bottlenecks that KZN Wildlife has been experiencing in the implementation of the mitigation and adaptation strategies include: a lack of suitably scaled data to use in modelling, a lack of biological knowledge of climate change impacts on lesser known species and insufficient financial and human resources to implement the strategies. Small value has been placed on ecosystem services and biodiversity. Current conservation areas and their capacity to support species will be challenged, and potential conflicts between species habitat and human development activities need to be addressed. Further development will reduce the ability of natural ecosystems to absorb climate change impacts and provide free essential eco-services. The maintenance of a connected landscape will become more difficult but will require that further transformation of the landscape is curtailed. The public will need to be better educated on climate change impacts and how to reduce their carbon footprint.

There are obvious deficiencies with regard to governance, co-ordination and communication between the different government departments and KZN Wildlife, but effort is being put into inter-governmental collaboration – for example, working with the provincial DAEA and SANBI.

There are some enabling factors promoting mitigation and adaptation to climate change. In general there is greater awareness and appreciation of climate change and its impacts. Certain industries, businesses and individuals are starting to take action of their own accord. A small percentage of tourists are starting to demand that climate change mitigation is in place.

However, developing countries and poor communities are ill-equipped to adequately deal with the impacts of climate change, and most countries and industries are not prepared to put their development potential and bottom line at risk from poorly perceived climate change risks.

3.2.9 Department of Environmental Affairs and Tourism

The South African government regards climate change as one of the greatest threats to our planet and to our people, and also believes that climate change, if unmitigated, also has the potential to weaken many of the positive advances made in meeting South Africa's own development goals and the Millennium Development Goals (www.deat.gov.za).

DEAT is the lead agency for directing and planning the national climate change response programme and has the responsibility of ensuring that South Africa's international obligations in terms of climate change – UNFCCC and the IPCC – are fulfilled.

The responsibility for this activity can be found within the Sub-Directorate for Global Climate Change, which lies within the Directorate for Air Quality in the Environmental Quality and Protection Branch. A Sub-Directorate for Ozone Layer Protection can also be found within the Air Quality Directorate (www.deat.gov.za).

A National Climate Change Conference took place early in 2009, and formally laid the foundations for a participatory process that concluded in a National Climate Change Response Green Paper as part of government's response to the global phenomenon. This Green Paper was recently released in November 2010 for public comment. This policy will translate into a legislative, regulatory and fiscal package by 2012.

During the course of this research, the Tourism Sector in DEAT started work on scoping the sector and defining the climate change issues within that sector as a baseline towards developing a tourism response to climate change. Therefore, at national level, the response to climate change and its projected impacts on the tourism industry was still in its infancy. This was evident in the research findings, as 56% of the stakeholders interviewed indicated that there was limited or no communication and guidance from the national and provincial departments with regard to managing the projected impacts of climate change on the tourism sector.

3.3 Discussion

The findings of this research regarding the perception of stakeholders about mitigation and adaptation strategies that are in place or being prepared and challenges or barriers experienced by the nature-based tourism sector concerning climate change in South Africa is discussed below. These findings will also be compared with the few studies that were found, as the literature on climate change and nature-based tourism is still in its infancy.

Overall, there was a basic awareness on the projected impacts of climate change among all stakeholders consulted, and they did agree that climate change would affect the tourism sector. Climate change is expected to affect biodiversity, which in turn will impact on tourism. According to SANBI and SANParks, there have not, however, been any comprehensive and conclusive studies that could confirm whether climate change will or is affecting the tourism sector in South Africa, and over what time scale. Eastern Cape Parks believed that climate change would be a problem in the longer run but that it was not currently a priority issue.

It is evident that there is a two-way relationship between tourism and climate change. Tourism has an obligation to minimise its impact on the environment by reducing greenhouse gas emissions which contribute to climate change; on the other hand, projected changes to the world's climate could have a direct impact on many tourism destinations, and the tourism sector will have to be made aware of these impacts and adapt its activities (World Tourism Organisation, 2003).

Most of the stakeholders consulted (67%) did not have any formal mitigation and adaptation plans or long-term strategies with respect to climate change, but they did implement some projects which formed part of their mitigation and adaptation responses to climate change. A third (33%) of the stakeholders were in the process of compiling formal climate change response plans and strategies. A formal climate change response strategy was being compiled by Mpumalanga Tourism and Parks, and the Mpumalanga Biodiversity Conservation Plan will be reviewed to consider climate change in conservation planning as this was not done before. Ezemvelo KZN Wildlife was working on a climate change policy and response strategy. The Tourism Department in DEAT has just started work on analysing their sector and defining the climate change issues in order to provide a baseline towards developing a tourism response to climate change.

There were many challenges identified by the stakeholders (Table 3.1). Approximately half (56%) of the stakeholders identified human resource issues like high turnover of staff and not being able to train and create capacity as major challenges. Financial resources or funding constraints were highlighted by 33% of the stakeholders. Without funding they did not have the resources to manage significant issues like the impacts of climate change. There was limited or no communication and guidance from the national and provincial departments with regard to responding to climate change. This was a huge challenge for 56% of the stakeholders. One stakeholder also identified lack of strategic vision from senior management as a problem. Limited awareness of climate change and its projected impacts were identified by 33% of the stakeholders. Limited scientific evidence, not enough data, uncertainty and lack of a clear analysis of the risks regarding climate change and tourism were identified as problems by 33% of the stakeholders.

Table 3.1: Summary of key challenges identified by the research

Stakeholders	Lack of Capacity and Human Resources	Lack of Financial Resources	Limited or No Communication and Guidance from National and Provincial Government – Weak Institutions	Limited or No Strategic Vision	Limited Awareness	Limited Scientific Evidence or Not Enough Data
Cape Nature	√					
Mpumalanga Tourism and Parks	√	√	√		√	
Eastern Cape Nature	√	√	√			
Ezemvelo KZN Wildlife			√			
North West Parks			√		√	√
DEAT						
GDARD	√		√	√		
SANParks		√			√	√
SANBI	√					√

These results were consistent with some of the findings from other literature sources. Studies that have examined the climate change risk appraisal of tourism managers and operators have found low levels of concern and awareness and lack of strategic planning (mitigation and adaptation) in anticipation of projected climate change impacts (Becken, 2004; Jones and Scott, 2006; Simpson *et al.,* 2008). A study conducted by Becken (2004) identified the main barriers to climate change adaptation and mitigation for tourism in Fiji to be lack of knowledge, lack of incentives by government, lack of finance, lack of skilled staff, lack of technological solutions, lack of adequate

legislation that requires compliance, lack of recognition on the part of customers, lack of time, customer expectations that counteract specific measures, and no perceived need for any measures. There was a general lack of data or scientific evidence to fully assess the situation in terms of mitigation and adaptation strategies that could be developed. Possibly due to the lack of data and information, not much had been done to raise awareness and understanding of how climate change and tourism interact (Becken, 2004). Lack of knowledge on the part of accommodation managers was most commonly identified as a barrier for implementing climate change mitigation and adaptation strategies in Becken's study. Lack of financial resources was identified as another common barrier in managing the impacts of climate change on the tourism sector. Lack of capacity with regard to skilled staff and at an institutional level was also identified as another barrier (Becken, 2004).

A study by Saarinen and Tervo (2006) on the perceptions of Finnish nature-based tourism entrepreneurs was conducted by interviewing nature-based tourist entrepreneurs in northern and south east Finland. They found that generally the entrepreneurs were aware of the issue of global climate change but that half of the interviewees did not believe that the phenomenon of climate change actually existed and would influence the region's tourism industry in the future. This study also found that there were almost no adaptation strategies, probably the result of the scepticism towards climate change.

Many studies have highlighted the need for practical research on the vulnerability and anticipated projected impacts of climate change on tourism (Higham and Hall, 2005; Boko *et al*., 2007; Simpson *et al*., 2008). These studies highlight the uncertainty associated with future climate change scenarios, and state that present data systems fail to capture the microclimatic characteristics of specific tourism destinations. Consistent with these studies, the findings from this research also identified limited scientific evidence, not enough data, uncertainty and lack of a clear analysis of the risks regarding climate change and tourism as challenges.

According to the World Wide Fund for Nature (WWF, 2003), most authorities in protected areas are still not taking the issue of the impacts of climate change on protected areas seriously. In many countries, this was mainly due to the immediate pressures on parks and shortages of resources, which means there is no time to worry about and address the future projected impacts of climate change. According to Higham and Hall (2005), the response of the tourism and hospitality industry to the projected impacts of climate change has largely been one of denial. This was due to many factors including a lack of resources, uncertainty regarding climate change projections and the ineffectiveness of short-term responses to climate change. In this research, stakeholders were eager to understand and manage the projected impacts of climate change but were unable to do so due to other challenges. These challenges were similar to those identified by the WWF (2003)

and Higham and Hall (2005), including lack of capacity, lack of financial resources, limited strategic vision, uncertainty and lack of a clear analysis of the risks regarding climate change and tourism.

According to Jones and Scott (2006), the implications of projected global climate change for nature-based park tourism has only recently begun to be assessed. In Canada, climate change research has focused on the projected impacts on ecosystems and the associated implications for conservation policy and planning (Scott and Suffling, 2000; Scott, Malcolm and Lemieux, 2002; Scot, 2003 cited in Jones and Scott, 2006). Scott and Suffling (2000) cited in Jones and Scott (2006) found that a more detailed analysis of park tourism was needed in order to better understand the projected impacts of climate change on nature-based tourism and the implications for park management.

As mentioned earlier (IPCC, 2007), effective climate policy would involve a portfolio of adaptation and mitigation actions which would include technological, institutional and behavioural options, the introduction of economic and policy instruments to encourage the use of these options, and research and development to reduce uncertainty and to enhance the options' effectiveness and efficiency. According to Boko *et al*., (2007), adaptation to the projected impacts of climate change in Africa is not an option but a necessity due to the covariant mix of climate stresses and other factors (Thornton *et al*., 2006 cited in Boko *et al*., 2007). Factors that can modify adaptive capacity include wealth, technology, education, information, skills, infrastructure, access to resources, and various psychological factors and management capabilities (Block and Webb, 2001; Ellis and Mdoe, 2003; Adger and Vincent, 2005; Brooks *et al.,* 2005; Grothmann and Patt, 2005 cited in Boko *et al.,* 2007). Institutions and effective governance systems, civil and political rights and literacy are important for adaptation to be successful and sustainable (Brooks *et al*., 2005 cited in Boko *et al.,* 2007). From this research it was evident that the institutional arrangements – namely the role players and different government departments involved in tourism – did not have clear communication and guidance from the national and provincial departments in responding to the projected impacts of climate change. This can be attributed to the fact that the National Tourism Sector in DEAT had recently started work on analysing their sector and defining the climate change issues in order to develop a baseline towards developing a tourism response to climate change. Therefore, at a national level, the response to climate change and its projected impacts on the tourism industry is still in its infancy. It is clear from the literature that institutions and effective governance systems are critical for effective mitigation and adaptation to the projected impacts of climate change.

It was therefore evident from this research and from reviewing the literature that much more needs to be done to incorporate mitigation and adaptation management strategies into future impact assessments and management of projected climate change impacts in the tourism sector. It was

also clear that the response in terms of mitigation and adaptation options of government and tourism operators remains unclear. Mitigation and adaptation opportunities and strategies are an important area for future research with regard to the projected climate change impacts on the tourism sector.

3.4 Addressing the Challenges

As outlined in Chapter Two, there was much literature and various scenarios on present and future climate change impacts on biodiversity which are projected to affect the tourism sector. From the research that was conducted it seems that most of the stakeholders were eager to understand about climate change and its impacts but were limited in their action due to many significant challenges that need to be managed in their sector. It is important that all stakeholders involved in tourism with regard to the management of parks and nature reserves consider climate change risks, mitigation and adaptation in future plans, as tourism is one of the most significant and promising economic activities in South Africa.

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Chapter 3 Summary

The results of this research, which focused on the management of nature reserves and parks, found that there was a basic understanding of climate change and its associated impacts among the stakeholders. There was not much formal long-term strategic planning or mitigation and adaptation plans in place to manage climate change. The research results also highlighted many challenges experienced by the tourism sector. These challenges included high turnover of staff, inadequate training and creation of capacity, and limited awareness of climate change and its impacts. Inadequate funding, limited or no communication and guidance from the national and provincial departments and no strategic vision from senior management were also highlighted as challenges. Limited scientific evidence, uncertainty and lack of a clear analysis of the risks regarding climate change and tourism was identified as problems.

The next chapter will highlight the key findings and make recommendations for stakeholders in the tourism sector to consider when creating conditions and compiling long-term strategic plans for managing the impacts of climate change.

CHAPTER FOUR: CONCLUSION AND RECOMMENDATIONS

4.1 Introduction

This chapter highlights the key findings from this research. Recommendations are outlined that can be considered by the tourism sector in developing and implementing long-term strategic plans and managing the impacts of climate change.

4.2 Key Findings

The key findings of this research are as follows:

- There was a general awareness of the projected impacts of climate change among all stakeholders consulted.
- Most of the stakeholders consulted (67%) did not have any formal mitigation and adaptation plans and long-term strategies with respect to climate change. However, they had implemented some projects which formed part of mitigation and adaptation responses to climate change. Some stakeholders (33%) were in the process of compiling formal climate change response plans and strategies.
- Most of the stakeholders were limited in their responses (mitigation and adaptation plans) to climate change due to many significant challenges that need to be managed. Approximately half (56%) of the stakeholders identified human resource issues like high turnover of staff and not being able to train and create capacity as a challenge. Funding constraints was highlighted by 33% of the stakeholders. There was limited or no communication and guidance from national and provincial departments with regard to responding to climate change (56% of the stakeholders). There was also limited understanding of climate change and its projected impacts (33% of the stakeholders). Limited scientific evidence, not enough data, uncertainty and lack of a clear analysis of the risks regarding climate change and tourism were identified as constraints by 22% of the stakeholders.
- It was evident from this research and from reviewing other literature that the tourism sector needs to do more in responding to the projected impacts of climate change. It was also evident that the response in terms of formal mitigation and adaptation options of government and tourism operators remains unclear and in its infancy. Mitigation and adaptation opportunities and strategies are an important area for future research with regard to the projected climate change impacts on the tourism sector.

4.3 Conclusion

From the research that was done for this study, it was evident that many ecosystems in South Africa will be affected by the projected impacts of climate change. These projected changes in ecosystems and loss in biodiversity may cause significant costs to the tourism industry. Nature

tourism in South Africa is highly dependent on wildlife and biodiversity, as the most popular activity undertaken in South Africa by the foreign visitor market is visiting game and nature reserves. Although the projected impact of climate change on the tourism sector is likely to be profound, a high level of uncertainty surrounds future climatic conditions and precisely how they will affect the tourism industry (Higham and Hall, 2005).

What is necessary, however, is that the tourism sector adapts to climate change and, as important, implements mitigation measures to reduce its contribution to climate change through emissions of greenhouse gases. Climate change presents a new challenge and demands the attention of, and informed strategic responses from, the tourism industry, government, non-governmental organisations and researchers from different academic backgrounds (Higham and Hall, 2005).

Presently, most of the stakeholders in nature-based tourism that were consulted for this research were limited in their response to managing climate change because they were occupied by many other significant challenges that need to be managed in their sector. Very limited climate change strategic plans, adaptation and mitigation plans had been implemented in the tourism sector. It is important that the tourism sector in South Africa implement long-term strategies to manage the impacts of climate change because the tourism sector is one of the most important and promising economic activities in South Africa. The recommendations suggested in this chapter should be considered to assist the nature-based tourism sector with moving forward and implementing long-term strategic plans to manage the projected impacts of climate change.

4.4 Recommendations

It is important that the tourism sector in South Africa implement long-term strategies to manage the impacts of climate change. The following are recommendations that should be considered when compiling such plans.

4.4.1 Climate change management and effective policy implementation

There were many challenges identified during the research which included weak institutions, limited funding, limited capacity, no strategic vision, lack of awareness and limited communication. These were understood as barriers to effective climate change management. The government needs to create conditions to enable effective climate change management. There is a great need for policy, legal and financial frameworks to support sustainable tourism within the context of climate change.

The following is a list of adaptation measures aimed at the tourism sector that should be considered when planning government policies:

- Devise effective control systems to ensure that policies are implemented and monitored.
- Set up fiscal incentives (e.g. accelerated depreciation) or financial assistance for changes or modifications to the built tourism infrastructure (e.g. expanding flood drainage provisions in hotel properties or redeveloping further back from beaches).
- Promote more public investment in infrastructure for new tourism developments (e.g. land preparation, coastal defences or supporting infrastructure investment).
- Compile legislation to transform planning policies, zoning and land use priorities.
- Provide training and awareness to the tourism sector to help it understand and deal with the possible consequences of climate change, including assistance with practical issues such as risk assessments and the "hazard' mapping of sites and zones.
- Review policies at national tourism offices to ensure that promotional and marketing activities are tailored to new climatic realities (World Tourism Organisation, 2003; Dodds and Kelman 2008 cited in Simpson *et al*., 2008).

4.4.2 Financial resources

Innovative funding solutions are needed. Networking and keeping communication lines open is a stepping stone to obtaining financial assistance. The government also needs to allocate a specific budget for enabling effective climate change management for sustainable tourism, which must go hand in hand with policy and legal frameworks.

4.4.3 Perceptions of climate change and capacity building

Seacrest et al. (2000) cited in Lowe et al. (2005, 7), "stated that the perception of climate change, like other environmental problems, is 'rooted in moral decay and human indifference', suggesting the public will often conclude there to be no available solution to climate change". Most scientists have recognised that human behaviour is the main cause of the climate crisis that we have today (Benson, 2008). Understanding human behaviour, and learning how to change it, can be seen as one of the best hopes for a solution regarding creating an awareness on and managing the projected impacts of climate change. It is clear that values, beliefs, thoughts and social relationships influence the way people perceive risks associated with climate change and these are therefore key when it comes to reducing carbon emissions or dealing with rising sea levels and changing weather patterns (Benson, 2008).

Individuals and governments of developing countries are faced with problems which are perceived as more urgent and tangible than adapting to the threat of climate change, for example poverty,

diseases such as HIV and malaria, and conflict. This is especially true when climate change is presented in a long-term, abstract or academic manner (Postnote, 2006).

People have different perceptions of climate change and its impacts, which affect their responses. There is therefore an urgent need to build capacity for understanding climate change, adaptation and mitigation. This needs to be done consistently across the national and provincial government departments, national and provincial park managers, and all tourism organisations at national, regional and destination level. Forums, awareness campaigns and communication channels should be established as this is the first step in building capacity and ensuring that all stakeholders and organisations involved in climate change management in the tourism sector have the same objectives in striving to manage climate change and its impacts.

4.4.4 Gaps in knowledge and limited scientific evidence

In order to make the most informed decisions about climate change impacts and mitigation and adaptation responses, tourism operators, organisations and all levels of government need good, accurate and value-adding information. There are large information gaps in the field of climate change and tourism in South Africa, as mentioned earlier in this research. There is limited information at regional levels to evaluate the types and severity of climate change impacts on the tourism sector. Therefore, there needs to be more investment in science and information (Simpson *et al.,* 2008). According to Boko *et al*., (2007), much of the research on climate change has been driven by the atmospheric sciences community and biophysical scientists. However, it would be beneficial to include the sociological and economic sciences.

4.4.5 Trans-disciplinary work

Scientists and policy makers are increasingly realising the need for a better understanding of institutions and how they frame global environmental change. Institutions are “systems of rules, decision-making procedures, and programmes that give rise to social practices, assign roles to the participants in these practices, and guide interactions among the occupants of the relevant roles” (International Human Dimensions Programme [IHDP], 2005, 27). The institutional landscape is critical in effectively compiling and implementing mitigation and adaptation strategies.

From the research results communication, information and awareness were identified as problems, from the national and provincial government departments to the provincial parks. There are many agencies, institutions and organisations involved in adaptation and mitigation strategies, as well as stakeholders like national governments and provincial governments, public and private sector and international bodies and researchers. It is important to have interdepartmental and trans-

disciplinary approaches for the successful implementation of adaptive and mitigation strategies and for effective leaning and communication to take place (Simpson *et al.,* 2008).

Institutional dimensions and governance play an important role in effectively compiling and implementing adaptation strategies. "'One size will not fit all' as local complexity and changing 'situational' contexts are key when designing adaptive intervention strategies to climate variability" (Reid and Vogel, 2006, 204). Institutions thus play an important role in both causing and addressing large-scale environmental changes. The institutional arrangements – namely the role players and different government departments involved in tourism and climate change mitigation and adaptation strategies as well as their roles, responsibilities and objectives – must be clearly defined and communicated to all stakeholders in the tourism sector.

4.4.6 Adaptation plans

The United Nations Development Programme (UNDP) framework provides four guiding principles for adaptation that are applicable to tourism (UNDP, 2005 cited in Simpson *et al*., 2008).

- Place adaptation in a development context.

The projected impacts of climate change could harmfully affect a country's sustainable development in many ways, such as affecting water resources, energy, health, agriculture and biodiversity, which can all affect the tourism sector. Therefore, the process of adaptation in the tourism sector cannot commence in isolation but needs to be integrated within the broader context of a country's sustainable development policies and strategies, and consider impacts and adaptations in other sectors (Simpson *et al.,* 2008).

- Build on current adaptive experience to cope with future climate variability.

An extensive range of tourism stakeholders need to be involved in the adaptation process due to their diverse experience and expertise with adapting to current climate variability, as the tourism sector is known for having tremendous experience in coping with climate variability (Simpson *et al.,* 2008).

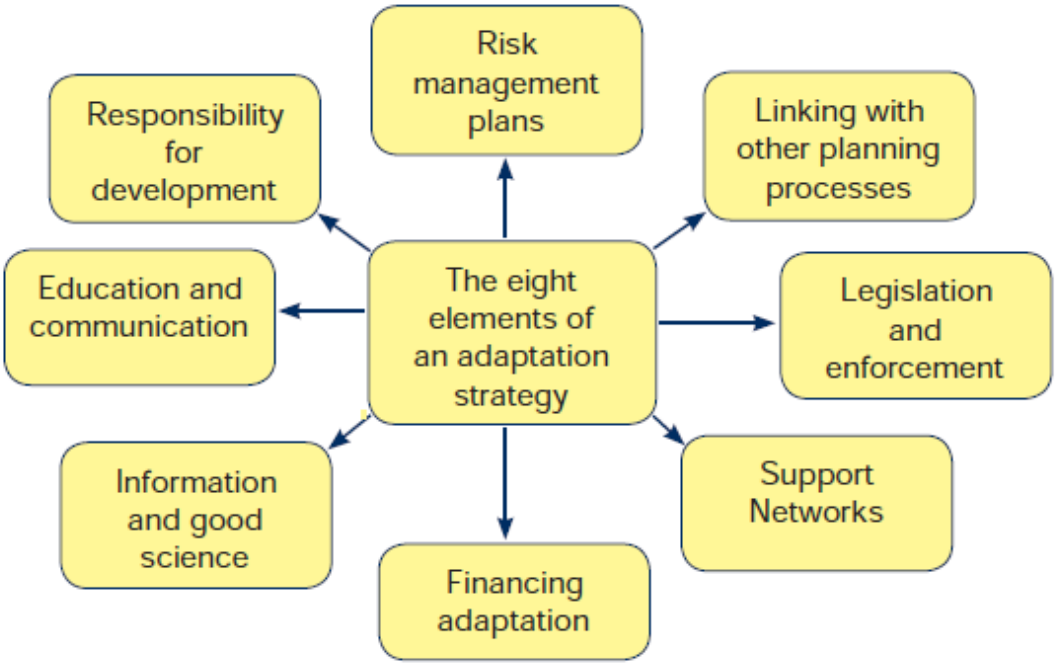
- Recognise that adaptation occurs at different levels, particularly at the local level.

Adaptation can be co-ordinated strategically at the national level but implementation often takes place at the local destination, business or project level. Climate change is not just a challenge for government; involvement of the tourism industry is also important as it is their operations that will be affected (Simpson *et al.,* 2008).

- Recognise that adaptation is an ongoing process.

Most adaptation frameworks realise that adaptation will be a continual process of implementing and evaluating strategies as climate conditions continue to change over time (Simpson *et al.,* 2008).

There are a number of key elements that should be considered for any adaptation strategy. These are outlined in Figure 4.1.



Source: Tompkins et al., 2005 cited in Simpson et al., 2008, 33.

Figure 4.1: Essential elements of an adaptation strategy

The World Tourism Organisation (2003) identified the following adaptation measures for consideration by the tourism sector:

- Using built attractions to replace natural attractions if the appeal of the latter diminishes – for example, the installation of an ice rink or spa facilities.
- Developing alternative marketing strategies to deal with an expanding or diminishing market (including stronger promotion of domestic tourism).
- Co-operating and liaising with governments in order to deal with problems such as those associated with health, availability of water and vulnerability of infrastructure.
- Recognising the vulnerability of some ecosystems and adopting measures or adaptation responses to protect them as far as possible.
- Introducing more innovative or alternative attractions, such as the sinking of a ship to provide a focus for divers to replace lost coral dive sites.

- Recognising that the tourism sector must meet more stringent insurance conditions.

The following options were identified by Maltitz *et al.,* (2006) as potential adaptations to prevent extinction of biodiversity given the projected impacts of climate change:

- Do nothing or maintain the current conservation strategy.
- Consider migratory corridors.
- Reconfigure the reserve system to strategically conserve areas that accommodate climate change.
- Manage biodiversity in areas outside of reserves through matrix management.
- Translocate species into new habitats.
- Engage in ex-situ conservation, which could include gene banking, cryopreservation, zoos and botanical gardens.

Due to the possible impacts of climate change over the next 50 to 200 years, many species will have to move from their current locations to areas with more suitable climates. A multitude of strategies will be needed to facilitate this process and to minimise species loss. Realigning nature reserves and ensuring that areas outside reserves are biodiversity friendly is important in creating an environment that enables species migration. Ex-situ conservation may be necessary for species with no future habitats (Maltitz *et al*., 2006).

The Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change highlighted many key areas with regard to reducing the impacts of climate change on biodiversity and increasing the resilience of biodiversity to climate change by reducing non-climatic stresses in combination with conservation, restoration and sustainable management strategies (Secretariat of the Convention on Biological Diversity, 2009). Some of the options highlighted in this report to increase the adaptive capacity of species and ecosystems to the projected impacts of climate change include:

- Reduce non-climatic stresses, including pollution, over-exploitation, habitat loss and fragmentation, and invasive alien species.
- Conservation and sustainable use practices must be more widely adopted, for example, through the strengthening of protected area networks.
- Facilitate adaptive management by reinforcement of monitoring and evaluation systems.
- Relocation, assisted migration, captive breeding, and *ex-situ* storage of germ plasm could assist in maintaining the adaptive capacity of species. These measures, however, are often expensive, less effective than *in situ* actions, and not relevant to all species. They are also usually feasible only on a small scale and rarely maintain ecosystem functions and services.

Ecosystem-based adaptation, which integrates the use of biodiversity and ecosystem services into an overall adaptation strategy, is important in contributing to the conservation of biodiversity. It includes the sustainable management, conservation and restoration of ecosystems to provide services that assist people in adapting to the projected impacts of climate change.
Examples of ecosystem-based adaptation activities include:

- Coastal defence to decrease coastal flooding and coastal erosion. This can be undertaken through the maintenance and/or restoration of mangroves and other coastal wetlands.
- Sustainable management of upland wetlands and floodplains for preservation of water flow and quality.
- Conservation and restoration of forests for the stabilisation of land slopes and regulation of water flows.
- Creation of different agroforestry systems to manage and cope with the increased risk from changed climatic conditions.
- Conservation of agrobiodiversity. This will make available specific gene pools for crop and livestock adaptation to climate change (Secretariat of the Convention on Biological Diversity, 2009).

4.4.7 Climate change mitigation

"Climate change mitigation involves technological, economic and social changes and substitutions that can help to achieve reductions in greenhouse gas emissions" (Hall & Williams 2008; UNWTO-UNEP-WMO 2008; Simpson *et al*., 2008a cited in Simpson *et al*., 2008, 66). Mitigation can be achieved by improving energy efficiency, using more renewable energy, carbon offsetting strategies, sustainable destination planning and management, as well as changes in business practices (Simpson *et al.,* 2008).

According to Simpson *et al*., (2008, 67), "the overall objective of climate change mitigation strategies, policies and activities in the tourism sector is to contribute to the achievement of 'carbon neutrality' in the sector". Carbon neutrality can be understood as the total set of policies that an institution or business uses when it estimates its known greenhouse gas emissions, implements measures to decrease them, and purchases carbon offsets to "neutralize" those emissions that remain with regard to all activities directly controlled by the organisation, including travel, purchasing of goods and services and the daily behaviour of employees (Simpson *et al*., 2008). Carbon neutrality can therefore be achieved "by improving the way the organisation operates and by improving efficiency of operations" (Simpson *et al*., 2008, 67).

According to Simpson *et al.,* (2008), with regard to the carbon neutrality concept, there are four main steps which can be considered in a successful mitigation policy that can be implemented by a tourism business or institution as a practical response to climate change. These four steps are as follows:

- "The first step is to eliminate the emission of greenhouse gases by keeping away from certain activities that can be avoided without a considerable change to the tourism product or service quality.
- The second is to reduce the emission of greenhouse gases by focusing on energy efficiency practices in specific activities.
- The third step is to substitute practices that are responsible for a large amount of greenhouse gas emissions with practices that have a lower carbon footprint.
- The final step is for the institution or business can offset remaining emissions to achieve full carbon neutrality" (Simpson *et al.*, 2008, 68).

According to the Secretariat of the convention on Biological Diversity (2009), a portfolio of land-use management activities including Reducing Deforestation and Forest Degradation (REDD) can cost-effectively contribute to mitigating climate change and conserving biodiversity. This portfolio includes the protection of natural forest and peatland carbon stocks, the sustainable management of forests, the use of native assemblages of forest species in reforestation activities, sustainable wetland management, restoration of degraded wetlands and sustainable agricultural practices. These activities, in addition to stringent reductions in fossil fuel emissions of greenhouse gases, play an important role in limiting increases in atmospheric greenhouse gas concentrations and human-induced climate change, and conserving biodiversity which is critical for the nature-based tourism sector (Secretariat of the Convention on Biological Diversity, 2009).

Many ecosystems in South Africa will be affected by the projected impacts of climate change as discussed in the study. These projected changes in ecosystems and loss in biodiversity may cause significant costs to the tourism industry if not managed appropriately. From this study, it was evident that very limited climate change strategic plans, adaptation and mitigation plans had been implemented in the tourism sector. It is therefore imperative that the tourism sector adapts to climate change and implements mitigation measures to reduce its contribution to climate change through emissions of greenhouse gases. Climate change urgently requires informed strategic responses from, the tourism industry, government, non-governmental organisations and researchers from different academic backgrounds (Higham and Hall, 2005). The recommendations suggested in this chapter should be considered by the nature-based tourism sector in managing the projected impacts of climate change.

REFERENCES

Baard, E.H.W. 2007. *Cape Nature Involvement and Response to the Western Cape Climate Change Response Strategy and Action Plan.* Memo to the Cape Nature Conservation Committee.

Becken, S. 2004. *Climate Change and Tourism in Fiji: Vulnerability, Adaptation and Mitigation.* Suva, Fiji: University of the South Pacific.

Benson, E. 2008. *Society's Grand Challenges: Insights from Psychological Science, Global Climate Change.* Washington: American Psychological Association.

Boko, M., I. Niang, A. Nyong, C. Vogel, A. Githeko, M. Medany, B. Osman-Elasha, R. Tabo and P. Yanda. 2007. *Africa. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* M. L. Parry, O.F Canziani, J.P.Palutikof, P.j. van der Linden and C.E hanson, Eds. Cambridge, UK: Cambridge University Press.

Cameron, E. 2009. China Dialogue: Isles at the Climate-change Forefront. Available online at: http://www.chinadialogue.net/article/show/single/en/2726-Isles-at-the-climate-change-forefront. Accessed August 2009.

Department of Environmental Affairs and Tourism (DEAT). 2000. Initial National Communication under the United Nations Framework Convention on Climate Change. Pretoria: DEAT.

Department of Environmental Affairs and Tourism (DEAT). 2004. *A National Climate Change Response Strategy for South Africa.* Pretoria: DEAT.

Department of Environmental Affairs and Tourism (DEAT). 2006. *South Africa Environment Outlook: A Report on the State of the Environment.* Pretoria: DEAT.

Ehmer, P. and E. Heymann. 2008. *Deutsche Bank Research: Climate Change and Tourism: Where will the Journey Lead?* Available online at: http://www.dbresearch.com/PROD/DBR_INTERNET_EN-PROD/PROD0000000000222943.pdf. Accessed July 2010.

Erasmus, B. F. N., Van Jaarsveld, A. S., Chown, S. L., Kshatriya, M. and Wessels, K. J. 2002. Vulnerability of South African animal taxa to climate change. Global Change Biology, 8: 679–693.

Galloway, K. 1997. *Advantages and Disadvantages of Open-ended Questionnaires***.** Available online at: http://www.tardis.ed.ac.uk/~kate/qmcweb/q6.htm. Accessed April 2009.

Hamilton, M.J and R.S.J. Tol. 2004. *The Impact of Climate Change on Tourism and Recreation.* Working paper FNU-52, Research Unit Sustainability and Global Change, Hamburg. Hamburg: University and Centre for Marine and Atmospheric Science.

Higham, J. and C.M. Hall 2005. Making Tourism Sustainable: The Real Challenge of Climate Change. In *Tourism, Recreation and Climate Change*, edited by C.M. Hall and J. Higham. Clevedon, UK: Channel View Publications.

International Human Dimensions Programme on Global Environmental Change (IHDP). 2005. *Science Plan: Institutional Dimensions of Global Environmental Change.* IHDP Report No. 16. Bonn, Germany.

Intergovernmental Panel on Climate Change (IPCC). 2007a. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change,* edited by M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson. Cambridge, UK: Cambridge University Press.

IPCC, 2007: *Summary for Policymakers. In: Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the*

Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 7-22.

Jones, B. and D. Scot. 2006. Climate Change, Seasonality and Visitation to Canada's National Parks*. Journal of Park and Recreation Administration*, 24(2): 42-62.

Kiker, G.A. 2000. South Africa Country Study on Climate Change: Synthesis Report for the Vulnerability and Adaptation Assessment Section*.* In: *Climate Change Impacts in South Africa. Report to the National Climate Change Committee*, edited by G. Kiker. Pretoria: DEAT.

Kirakowski, J. 2000. *Questionnaires in Usability Engineering.* Cork, Ireland: Human Factors Research Group.

Knoesen, D., R. Schulze, C. Pringle, M. Summerton, C. Dickens and R. Kunz. 2009. *Water for the Future: Impacts of Climate Change on Water Resources in the Orange-Senqu River Basin***.** Report to Newater, a project funded under the Sixth Research Framework of the European Union. Pietermaritzburg: Institute of Natural Resources.

Lowe, T., K. Brown, S. Dessai, Mde F. Doria, K. Haynes and K. Vincent. 2005. *Does Tomorrow Ever Come? Disaster Narrative and Public Perceptions of Climate Change.* Norwich: Tyndall Centre for Climate Change Research, University of East Anglia.

Maltitz Von, G.P. R.J. Scholes, B. Erasmus and A. Letsoal. 2006. *Adapting Conservation Strategies to Accommodate Impacts of Climate Change in Southern Africa,* AIACC Working Paper No.35. Washington.

Midgley, G.F., M.C. Rutherford, W.J. Bond and P. Barnard. 2008. *The Heat is on … Impacts of Climate Change on Plant Diversity in South Africa.* Cape Town: SANBI.

Mugo, F.W. 2006. *Sampling in Research*.
Available online at: http://*www.socialreserachmethods.net/tutorial/mugo/tutorial.htm.* Accessed April 2009.

Myers, N., Mittermeier, R.A., Mittermeier, C.G., da Fonseca, G.A.B. & Kent, J. 2000. *Biodiversity hotspots for conservation priorities*. *Nature* 403: 853–858.

Parry, M.L., O.F. Canziani, J.P. Palutikof and Co-authors. 2007: *Technical Summary. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds. Cambridge, UK: Cambridge University Press.

Preston Whyte, R.A. and H.K. Watson. 2005. Nature Tourism and Climatic Change in Southern Africa. In *Tourism, Recreation and Climate Change*, edited by C.M. Hall and J. Higham. Clevedon, UK: Channel View Publications.

Postnote, Parlimentary Office of Science and Technology. 2006. *Adapting to Climate Change in Developing Countries.* Number 269. Available online at: http://www.parliament.uk/documents/post/postpn269.pdf. Accessed August 2009.

Reid, P. and C. Vogel. 2006. Living and Responding to Multiple Stressors in South Africa: Glimpses from KwaZulu-Natal. *Global Environmental Change,* 16: 195-206.

Republic of South Africa (RSA). 1998. *Western Cape Nature Conservation Board Act*, Act 15 of 1998. Pretoria: Government Printer.

Republic of South Africa (RSA). 2001. *Northern Province Tourism and Parks Board Act,* Act 8 of 2001. Pretoria: Government Printer.

Republic of South Africa (RSA). 2003. *Provincial Parks Board Act,* Act 12 of 2003. Pretoria: Government Printer.

Republic of South Africa (RSA). 2004. *National Environmental Management Biodiversity Act,* Act 10 of 2004. Pretoria: Government Printer.

Ritchie, J. and J. Lewis. 2003. *Qualitative Research Practice: A Guide for Social Science Students and Researchers.* London: Sage.

Saarinen, J. and K. Tervo. 2006. Perceptions and Adaptation Strategies of the Tourism Industry to Climate Change: The Case of Finnish Nature-based Tourism Entrepreneurs. *International Journal of Innovation and Sustainable Development,* 1(3):214-228.

Sanchez, A. 2006. The Difference between Qualitative and Quantitative Research. Available online at: http://e-articles.info/e/a/title/THE-DIFFERENCE-BETWEEN-QUALITATIVE-AND-QUANTITATIVE-RESEARCH. Accessed April 2009.

Secretariat of the Convention on Biological Diversity. 2009. *Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change.* Technical Series No. 41. Montreal, Technical Series No. 41, 126 pages.

Simpson, M.C., S. Gössling, D. Scott, C.M. Hall and E. Gladin. 2008. *Climate Change Adaptation and Mitigation in the Tourism Sector: Frameworks, Tools and Practices*. Paris: UNEP, University of Oxford, UNWTO and WMO.

Spenceley, A. 2001. *Integrating Biodiversity into the Tourism Sector: Best Practice and Country Case Studies. Case Study of South Africa.* Pietermaritzburg: Institute of Natural Resources.

Viner, D. and M. Agnew. 1999. *Climate Change and Its Impacts on Tourism.* Norwich: Climatic Research Unit, University of East Anglia.

World Tourism Organization (UNWTO). 2003. *Climate Change and Tourism; Proceedings of the 1st International Conference on Climate Change and Tourism*, Djerba, Tunisia, 9-11 April 2003.

World Tourism Organization (UNWTO) 2009. *From Davos to Copenhagen and Beyond: Advancing Tourism's Response to Climate Change*. UNWTO Background Paper.. Available online at: http://ttyd.org.tr/images/cust_files/100520142347.pdf. Accessed August 2010.

Worldwide Fund for Nature (WWF). 2003. *No Place to Hide: Effects of Climate Change on Protected Areas*. Available online at: http://wwf.panda.org/what_we_do/where_we_work/arctic/publications/?8668/NO-PLACE-TO-HIDE-Effects-of-Climate-Change-on-Protected-Areas. Accessed December 2009.

Websites consulted

Cape Nature. www.capenature.co.za. Accessed July 2009.

Department of Environmental Affairs and Tourism (DEAT). www.deat.co.za. Accessed July 2009.

Eastern Cape Parks. www.ecparks.co.za. Accessed July 2009.

Gauteng Department of Agriculture and Rural Development (GDARD). http://www.gdard.gpg.gov.za. Accessed July 2009.

KwaZulu-Natal Wildlife. www.kznwildlife.com. Accessed July 2009.

Limpopp Tourism. www.golimpopo.com. Accessed July 2009.

Mpumalanga Parks Board. http://www.mpumalangaparksboard.com. Accessed July 2009.

North West Tourism. www.tourismnorthwest.co.za. Accessed July 2009.

South African National Botanical Institute (SANBI). www.sanbi.org. Accessed July 2009 and October 2010.

South African National Parks (SANparks). www.sanparks.org. Accessed July 2009.

Tourism for tomorrow. www.tourismfortomorrow.com Accessed October 2011

APPENDIX A: ETHICS PROTOCOL

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Reddy

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER H0 90205**
PROJECT	The tourism sector and climate change risks opportunities and constraints in South Africa
INVESTIGATORS	Ms M Reddy
DEPARTMENT	Geography
DATE CONSIDERED	13.02.2009
DECISION OF THE COMMITTEE*	Approved Unconditionally
NOTE:	

Unless otherwise specified this ethical clearance is valid for 2 years and may be renewed upon application

DATE 10.03.2009 **CHAIRPERSON** (Professor R Thornton)

cc: Supervisor : Prof C Vogel

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure a approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

Signature

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES