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CLIMATE CHANGE-RELATED HUMAN SECURITY THREATS TO BORDER INTEGRITY AND SAFEGUARDING FOR SOUTH AFRICA

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A research report submitted to the Faculty of Management, University of the Witwatersrand, in 33% fulfilment of the requirements for the degree of Masters of Management (in the field of Security).

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ABSTRACT

Climate change is a very current and contentious issue that has received a lot of attention during the past two decades because of its global influence and impact. Climate change affects the entire globe and the impact is mostly continental and regional and is not limited along state borders. Whether a person or group believe in the existence of global warming or not, the scientific evidence leaves no doubt that the climate is changing (Mazo, 2010: 9). Climate change influence the environment people live in and have a direct impact on all aspects of their daily lives.

In a globalized world almost all problems cross borders, and environmental issues have long been recognized as among the most international and the most transnational of all (Parsons, 2009: 5). Climate change acts as a “threat multiplier” by exacerbating existing vulnerabilities, and must be analysed in relation to the adaptive capacity of those affected (individuals, communities and states), taking account of the wider political, socio-economic and demographic context (ACCES, 2011: 9).

Although climate change has a global impact, the African continent is likely to be more severely affected than other regions of the globe and it will have a profound negative impact on all facets of human security.

Long-term shifts in the climate seem likely to catalyse conflict by creating or exacerbating food, water and energy scarcities, triggering population movements, and placing larger groups of people in competition for more and more limited resources. Increased climate variability, including the greater frequency of extreme weather events, will also complicate access to resources, thereby exacerbating conditions that are conducive to promoting conflict.

Southern Africa is described as a predominantly semi-arid region with high intra-seasonal and inter-annual rainfall variability, with extreme events such as droughts and floods occurring frequently. In Southern Africa, there has been an increase in inter-annual variability of rainfall over the past 40 years, with more intense and widespread droughts. Floods and droughts in Southern Africa are gradually increasing in number and frequency as well and already the entire region is considered a climate change "hotspot".

As can be seen from the findings of the various chapters, climate change has a very complex predicted impact on all the dimensions of human security and a few major key issues in this regard came to light. These issues include urbanisation, migration, environmental degradation and biodiversity loss, water scarcity, spread of diseases, slow onset climate change, economic decline and poverty, criminality and conflict. The most profound issues that will have an impact on South African border integrity and safeguarding include urbanisation, migration, environmental degradation and biodiversity loss, water scarcity, spread of diseases, economic decline and poverty, criminality and conflict. Migration can be singularly highlighted as it has the potential to amplify and exacerbate all of the abovementioned issues.

States have national security strategies and policies in order to guide policy and legislation to adequately protect the state from threats and to determine national security priorities. Border safeguarding is an important aspect of state security and strategy, policy and legislation, informed by the national security strategy and policy, constantly have to evolve and adapt to changes in the threat pattern affecting states.

The border safeguarding environment of any state is very complex and faced with multiple external and international threats. Climate change-related human security threats will further amplify and complicate these threats as the impact of climate change becomes more pronounced in the southern African region. In order for South Africa to successfully address these threats in the border safeguarding environment it is important that a sound National Security Strategy and Policy provide focus and priorities for all government departments involved. This is a very complex field with multiple factors and only the key issues are highlighted and discussed in this paper.

DECLARATION

I declare that this report is my own, unaided work. It is submitted in partial fulfilment of the requirements of the degree of Masters of Management (in the field of Security) in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.

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Magriet Vorster

May 2014

DEDICATION

To my best friend, Jousie Verwey, that kept me motivated throughout the tough times and my cats that kept me company during the long lonely nights in front of the computer.

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GLOSSARY OF TERMS

(Terminology not addressed in Chapter 2)

•**Environmentally Induced Migration** - Environmental migrants are persons or groups of persons who, for compelling reasons of sudden or progressive change in the environment that adversely affects their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad (IOM, 2007a: 12).

•**Food Security** - Food security requires that all people at all times have both physical and economic access to basic food (Hoste, 2009: 5).

•**Mixed Migration Flows** - the IOM defines mixed flows as "complex population movements including refugees, asylum-seekers, economic migrants and other migrants. It concern irregular movements, frequently involving transit migration, where persons move without the requisite documentation, crossing borders and arriving at their destination in an unauthorised manner (IOM, 2007a: 12).

•**Net Migration Rate** -This entry includes the figure for the difference between the number of persons entering and leaving a country during the year per 1,000 persons (based on midyear population). An excess of persons entering the country is referred to as net immigration (e.g., 3.56 migrants/1,000 population); an excess of persons leaving the country as net emigration (e.g., -9.26 migrants/1,000 population). The net migration rate indicates the contribution of migration to the overall level of population change. The net migration rate does not distinguish between economic migrants, refugees, and other types of migrants nor does it distinguish between lawful migrants and undocumented migrants (CIA, 2012a).

LIST OF ABBREVIATIONS

ACCES - Africa, Climate Change, Environment and Security Dialogue

BUHI - Botswana Upper High Influence

ENSO - El Niño Southern Oscillation

GCM – General Circulation Model

GDP - Gross Domestic Product

ICJ – International Court of Justice

IIED - International Institute for Environment and Development

IISD - International Institute for Sustainable Development

IOM - International Organisation for Migration

IPCC - Intergovernmental Panel on Climate Change

ISS - Institute for Security Studies

ITCZ - Inter-Tropical Convergence Zone

NEPAD – New Partnership for Africa's Development

SRES - IPCC Special Report on Emission Scenarios

UN - United Nations

UNU-EHS - United Nations University - Institute for Environment and Human Security

WHO -World Health Organisation

WWF - World Wildlife Fund

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CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

Climate change is a very current and contentious issue that has received a lot of attention during the past two decades because of its global influence and impact. Climate change affects the entire globe and the impact is mostly continental and regional and is not limited along state borders. Whether a person or group believe in the existence of global warming or not, the scientific evidence leaves no doubt that the climate is changing (Mazo, 2010: 9).

Climate change influence the environment people live in and have a direct impact on all aspects of their daily lives. Mazo also indicates that since the end of the last Ice Age, climate and culture have been closely related. Since the very beginning of human civilisation climate change has been a key factor in the rise and fall of societies and states. It has been a driver of instability, conflict and collapse, but also of expansion and reorganisation (Mazo, 2010: 12).

Human security is broadly defined by the United Nations (UN) as "freedom from want and freedom from fear" (HSI, 2012). Climate change has a direct impact on the environment of populations and it therefore also has a direct influence on human security on different levels and scales of impact. Because, the phenomena of climate change and its influence on human security has a larger regional impact, it also has the potential to place increased pressure on state borders and therefore has the potential to influence and pose additional risks to state border integrity and safeguarding.

1.2 BACKGROUND

Although climate change has a global impact, the African continent is likely to be more severely affected than other regions of the globe. According to predictions by the Intergovernmental Panel on Climate Change (IPCC), in Africa, warming is very likely to be larger than the global annual mean warming throughout the continent and in all seasons, with drier subtropical regions warming more than the moister tropics. Annual rainfall is likely to decrease in much of Mediterranean Africa and the northern

Sahara, with a greater likelihood of decreasing rainfall as the Mediterranean coast is approached. Rainfall in Southern Africa is likely to decrease in much of the winter rainfall region and western margins. There is likely to be an increase in annual mean rainfall in East Africa. It is unclear how rainfall in the Sahel, the Guinean Coast and the southern Sahara will evolve (Brown & Crawford, 2009: 850).

The World Wildlife Fund (WWF) also indicated that the historical climate record for Africa shows warming of approximately 0.7°C over most of the continent during the twentieth century, a decrease in rainfall over large portions of the Sahel and an increase in rainfall in east central Africa. Over the next century, this warming trend and changes in precipitation patterns are expected to continue and be accompanied by a rise in sea level and increased frequency of extreme weather events (WWF, 2008: 1).

The IPCC also indicated that climate change will disproportionately affect the most vulnerable populations in the developing world. Rising temperatures, increasingly severe floods and droughts, and sea-level rise threaten economies that are reliant on agriculture, in countries whose governments lack adaptive capacity, and in areas where populations have little access to healthcare and education (Sachin, Williams & Yang, 2011: 1).

According to Kofi Annan, human security, in its broadest sense, embraces far more than the absence of violent conflict and is an essential part of national security of states. It is also highlighted by Sadako Ogata, former United Nations High Commissioner for Refugees, that an essential element of human security is the possibility for all citizens to live in peace and security within their own borders. According to the UN's definition, human security constitutes of seven dimensions namely economic, food, health, environmental, personal, political, and community security (HSI, 2012). Today the threats to human security are varied but for the purpose of this research the focus will be narrowed down to one category of threats, namely, those related to climate change in the context of the above-mentioned dimensions.

In Southern Africa the majority of the climate change-related threats are already manifesting and as a developing region poverty levels are still very high that makes it difficult for individual households to cope with unpredictable weather patterns, reduced harvests and natural disasters. Due to the high levels of poverty, government revenue is also reduced which in turn hampers them to render assistance to citizens affected by climate change (Barnett & Adger, 2007: 646).

According to Zachary, in Africa most borders between states were created by colonial powers a century and a half ago and are today one of the continent's major barriers to building strong, competent states. The result has been conflict, which often looks ethnic, but is really all about territorial control. Borders in Africa do not come close to following tribal lines, splitting some groups up and artificially joining others together (Zachary, 2010: 1). The increased risks related to climate change influencing human security have the potential to pose additional and new challenges to border integrity and safeguarding.

For the purpose of this research the focus will be on South Africa and its direct neighbouring states. The geographical research area consists therefore of South Africa, Namibia, Botswana, Zimbabwe, Mozambique, Lesotho and Swaziland. Further in the document when referred to Southern Africa, it will mean abovementioned geographical area, South Africa and its direct neighbouring states, unless clearly defined otherwise. Also, for the purpose of this research "borders" will include land, air and sea borders of South Africa and its direct neighbouring states as officially demarcated and internationally accepted. However, it is important to take note that climate change-related human security threats in other regions of Africa still has the potential to have an influence on the border integrity and safeguarding of this limited geographical area.

1.3 PROBLEM STATEMENT

Global trends regarding human security threats related to climate change and the possible influence on national border integrity and safeguarding, have been identified but it is still mostly unknown how these trends will influence and manifest in Southern Africa. The possible influence of these phenomena on national border integrity and

safeguarding was not yet adequately and holistically researched within the Southern African context.

Due to the vast spheres affected by climate change and human security threats, most research have taken place in separate spheres and rarely was an integrated holistic approach followed that addressed the possible influences specifically on national border integrity within the Southern African region. Climate change places stress on all aspects of human and state security. As climate change affect vast areas across national borders, human security threats can occur that can affect an entire region and therefore will have definite implications for national border integrity and safeguarding.

It is important to research the possible influence of climate change-related human security threats on national border integrity and safeguarding as it can cause insecurity and instability within states as well as between states. Entire regions could be affected by trans-border human security threats.

Understanding this risk holistically can inform state policy and legislation as well as assist regional understanding and co-operation that can lead to pre-emptive action. Southern Africa is vulnerable to the influence of climate change-related human security threats due to physical geographical factors as well as the demographics of the states within the region.

Border integrity and safeguarding are two critical aspects that contribute to safety and security within a state and are therefore crucial to the stability of states within Southern Africa.

1.4 PURPOSE STATEMENT

The purpose of this research is to explore the influence of climate change-related human security threats on border integrity and safeguarding for South Africa and its immediate neighbouring states. Once the possible influence has been established, it could be utilised to act pre-emptively by informing policy and legislation to avoid a negative impact by focusing mitigation actions in various spheres of responsibility on possible "hot spot" or problem areas to the benefit of South Africa and the region.

1.5 RESEARCH QUESTIONS

To execute this research, one main research question will be addressed. How could/would climate change-related human security threats manifest and influence national border integrity and safeguarding in Southern Africa?

In order to answer this question it will be essential to define and clarify climate change and the anticipated influence and trends in Southern Africa. This will be followed by defining and clarifying the nature and understanding of human security threats and specifically those only associated with climate change. The linkage between climate change and human security threats will be explored followed by defining the views and understanding of border integrity and border safeguarding. The current status, trends, views and approach of border integrity and safeguarding of Southern African states will briefly be summarised. After all the above-mentioned facts were gathered and summarised it will be possible to explore the possible influence of climate change-related human security threats on border integrity and safeguarding in Southern Africa in order to answer the research question.

1.6 DRAFT OUTLINE OF CHAPTERS

The research conducted will be presented in six short chapters. In Chapter 1, the topic is introduced, as well as the background surrounding climate change, human security and border safeguarding and integrity is discussed. This is then followed by the problem statement, purpose statement and research question. The significance of the research is then briefly discussed.

In Chapter 2, titled Literature Review, the key definitions, terms and concepts of climate change, human security threats and climate change-related human security threats are introduced and discussed. The concepts and understanding of state borders, border integrity and border safeguarding are also introduced and defined. The concepts and definitions are followed by the literature review.

Chapter 3 deals with Research Methodology and the research approach and design, data collection, data analysis, validity and reliability, limitations and ethical considerations are discussed.

Chapter 4 addresses trends in climate change and human security threats in Southern Africa (data presentation). Discussions in this chapter look at climate change trends predicted for Southern Africa and the predicted climate change-related human security threats are identified. The current status and approach to border integrity and safeguarding of Southern African states are also discussed in this chapter.

The influence of climate change-related human security threats on Southern African border integrity and safeguarding (data analysis) is discussed in detail in Chapter 5.

In Chapter 6 conclusions regarding the climate-change related human security threats to border integrity and safeguarding for South Africa are summarised. This is followed by recommendations regarding how to possibly address these threats.

Further relevant background information needed to support the arguments, is summarised in an appendix. In Appendix A the basic indicators for Southern African States are summarised in Table A.1 and a summary of Border Information is found in Table A.2.

1.7 SIGNIFICANCE OF THE RESEARCH

As was previously mentioned that due to the vast spheres affected by climate change and human security threats, most research have taken place in separate spheres and rarely was an integrated holistic approach followed that addressed the possible influences, specifically on national border integrity within the Southern African region.

Climate change places stress on all aspects of human and state security. As climate change affects vast areas across national borders, human security threats can occur that can affect an entire region and therefore will have definite implications for national border integrity and safeguarding.

It is important to research the possible influence of climate change-related human security threats on national border integrity and safeguarding as it can cause insecurity and instability within states as well as between states. Entire regions could

be affected by trans-border insecurity. Understanding this risk holistically can inform state policy and legislation as well as assist regional understanding and co-operation that can lead to pre-emptive action to prevent regional conflict and instability that could further hamper human prosperity and development in the region. Southern Africa is vulnerable to the influence of climate change-related human security threats due to physical geographical factors as well as the demographics of the states within the region.

Border integrity and safeguarding are two critical aspects that contribute to safety and security within a state and are therefore crucial to the stability of states within Southern Africa. This is a very complex issue that must be holistically researched in detail to help ensure the future prosperity and security of states in Southern Africa.

1.8 CONCLUSION

In the following chapters the future impact of climate change on human security within the Southern African region will be explored and the possible impact on border safeguarding and integrity for South Africa will be identified according to the identified research methods stipulated for this paper.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

While conducting this research a large number of papers, books and other pieces of information were consulted and a similar theme in definitions and issues were observed as most arguments were based on the same scientific resources and baselines. In order to facilitate the understanding of key issues in this paper the most important definitions, terms and concepts will be highlighted.

2.2 DEFINITION OF TERMS AND CONCEPTS

The word and concept of "climate change" is often very abstract and difficult to understand if you do not come from a specific scientific grouping and their school of thought. We see today that increasingly, the phrase “climate change”, is used to refer to changes in global and regional climate in response to specific human influences (Davis, 2011: 8). Climate change also has a strong association with prediction and projection and creating possible future scenarios as to what could be expected, based on sound scientific analysis of past patterns and events. This is absolutely essential due to the uncertainty and difficulty in accurately predicting exactly what is going to happen in the future within a system with such a large number of changing interrelated variables.

Predictions are an attempt to forecast the future state of the climate over relatively short timescales. The most well-known example is that of weather predictions, although other examples include climate predictions over seasonal or inter-annual timescales. An important feature of all predictions is that they are verifiable; because of their shorter duration, performance of the forecast can always be compared against what actually happened (Davis, 2011: 29).

A *projection* is a statement of a possible (hopefully likely) future state of the climate system dependent on the evolution of a set of key factors over time (e.g. emissions scenarios). Given the long-term nature of climate projections, they are generally not verifiable in the short term (Davis, 2011: 29).

A *scenario* is a coherent, internally consistent and plausible description of a possible future state of the world. It is not a forecast, rather, each scenario is one alternative of how the future can unfold. A set of scenarios is often adopted to reflect the possible range of future conditions, which can be based on changes in the climate system, socio-economic circumstances or other potential future changes. The IPCC published its Special Report on Emissions Scenarios (SRES) which describes a range of possible scenarios based around four 'storylines': A1, B1, A2 and B2. These storylines assume different paths of development for the world, greater weight being given to environmental (B family) or economic (A family) considerations, and more global (A1, B1) or regional (A2, B2) development. Each of these scenarios has an associated emissions pathway for the period 2000 to 2100. These emission pathways describe the amount of greenhouse gases (and other atmospheric gases) emitted through human activity in the future. GCMs can then use these future emissions (which define changes in the concentration of these gases in the atmosphere) to model the future climate (Davis, 2011: 29).

2.2.1 CLIMATE CHANGE

Within the concept of "climate change" there is a variety of terminology to address the various aspects of this field. We refer to climate change when we are describing alterations to prevailing climatic conditions which persist for long periods of time (decades to millennia). These may be caused by natural variability (Davis, 2011: 7). It is also important to distinguish between the following general terminologies in order to attach the correct scientific meaning that will facilitate the correct understanding of the rest of the chapters in this paper.

Weather describes the set of meteorological phenomena we experience on a daily basis. Weather conditions might be sunny and hot, or cloudy and rainy. We expect changes in weather to occur from day to day (Davis, 2011: 8).

By *climate* we mean the average of individual weather states, taken over sufficiently long periods of time. While weather impacts our daily lives, climate influences our decisions about where to live, and where and how to grow food. In this way, it directly influences how societies and economies develop and flourish. Changes in

climate are associated with more fundamental changes to the global climate system, involving interactions and feedbacks between the atmosphere, the oceans, land and ice surfaces and all living things (the biosphere) (Davis, 2011: 8).

Climate variability refers to variations in climate on all spatial and temporal scales beyond that of individual weather events. This variability may be caused by natural internal processes within the climate system (so-called *internal variability*). Variations may also be caused by *external* influences which may be due to naturally-occurring phenomena (such as periodic changes in the earth's orbit around the sun) or anthropogenic causes (IPCC, 2007). One of the most important (and widely known) examples of natural climate variability is the El Niño-Southern Oscillation (ENSO) (Davis, 2011: 16).

Climate change refers to a change in the average weather experienced in a particular region or location. The change may occur over periods ranging from decades to millennia. It may affect one or more seasons (e.g. summer, winter or the whole year) and involve changes in one or more aspects of the weather, e.g. rainfall, temperature or winds. Its causes may be natural (e.g. due to periodic changes in the earth's orbit, volcanoes and solar variability) or attributable to human (anthropogenic) activities, e.g. increasing emissions of greenhouse gases such as CO2, land use changes and/or emissions of aerosols. In contemporary society the term 'climate change' often refers to changes due to anthropogenic causes. When changes in climate occur, they directly impact livelihoods, food security and potentially how societies, economies and political systems function (Davis, 2011: 16).

Global warming refers only to the overall warming of the Earth, based on average increases in temperature over the entire land and ocean surface. It is important to note that climate change is more than simply an increase in global temperatures; it encompasses changes in regional climate characteristics, including temperature, humidity, rainfall, wind, and severe weather events, which have economic and social dimensions (Davis, 2011; 16). Further, throughout this paper, the terminology used will refer to the abovementioned explanations of the various climate change-related concepts.

2.2.2 HUMAN SECURITY THREATS

'Security' in a general sense is the condition of being protected from or not exposed to danger. It has historically been concerned with safety and certainty from contingency and was thus defined as ''the assurance people have that they will continue to enjoy those things that are most important to their survival and well-being (Barnett, 2003: 7). The impact of climate change has the potential to impact on every facet of daily human existence threatening the wellbeing of communities and even populations within entire regions.

2.2.3 CLIMATE CHANGE-RELATED HUMAN SECURITY THREATS

In order to fully understand the impact of climate change-related human security threats on communities and populations, the following concepts and terminology will be highlighted:

Hazard exposure refers to the physical parameters (e.g. rainfall or temperature) of climate change. A hazard exposure can be incremental temperature or precipitation change, which unfolds gradually over a longtime or it can refer to weather-related events, such as droughts, floods and heat waves (Davis, 2011: 51).

Sensitivity, or *biophysical vulnerability*, refers to the extent to which any unit of analysis (ranging, for example, from one tree to a whole forest) reacts to hazard exposure (Davis, 2011: 51).

Adaptive capacity, or its opposite, *social vulnerability*, refers to the varying social characteristics of people (at various units of analysis, from individual to community to country) that determine how hazard exposure is experienced. Adaptive capacity/social vulnerability can reflect the status of poverty, health, knowledge/education, and governance (at collective levels). A high adaptive capacity is equivalent to a low social vulnerability, and a low adaptive capacity is equivalent to a high social vulnerability (Davis, 2011: 51).

Risk is the result of the relationship between hazard exposure, sensitivity (biophysical vulnerability) and adaptive capacity (or social vulnerability), and refers to the likelihood of an adverse impact from climate change (Davis, 2011: 51).

Mitigation refers to the measures taken to reduce the emission of greenhouse gases and to enhance sinks of greenhouse gases, such as growing trees which absorb carbon dioxide from the atmosphere (Davis, 2011: 66).

Adaptation is a means of responding to the impacts of climate change. It aims to reduce the impacts as well as to take advantage of new opportunities or to cope with the consequences of new conditions. The capacity to adapt is dependent on a region's socio-economic and environmental situation, as well as the availability of information and technology. At the individual level, a person's characteristics (e.g. their age, gender, education level, etc.) will influence their ability to adapt successfully to changes in climate conditions (Davis, 2011: 66).

There are two main types of adaptation:

• *Anticipatory adaptation* is adaptation that takes place before impacts of climate change are observed. Also referred to as proactive adaptation.

• *Reactive adaptation* is adaptation that takes place after impacts of climate change have been observed (Davis, 2011: 66).

Disaster risk reduction includes all forms of activities to avoid (prevention) or to limit (mitigation and preparedness) the adverse effects of hazards. Strategies that are effective and/or suitable across sectors need to be prioritised and these are termed *multi-sectoral approaches*. This would involve simultaneously addressing a range of objectives, which include climate change adaptation, carbon sequestration and greenhouse gas emissions mitigation, biodiversity conservation and sustainable livelihoods. Many existing strategies and policies may be merely supported or amended to improve adaptive capacity in the face of climate change implications for key sectors (Davis, 2011: 66). The abovementioned explanations of terminology and concepts will be applicable throughout the entire document.

2.2.4 STATE BORDERS, BORDER INTEGRITY AND BORDER SAFEGUARDING

In this paper state borders will refer to the physical boundaries between Southern African states as globally recognised and it will also include land, air and sea boundaries. The detail, history and background of these borders are further discussed in Chapter 4.

Border integrity entails that the recognised state border is respected by citizens from that state as well as other states and crossing it by humans or goods is done within the ambit of that state's legislation regarding emigration, immigration, customs and trade. Border safeguarding entails the execution of the state's border safeguarding legislation by a number of state departments along the entire borderline and all official ports of entry to ensure that border integrity is maintained and that external threats to the state are effectively addressed.

2.3 LITERATURE REVIEW

As previously mentioned, since 2005 up to date (2013) several global conferences and workshops regarding climate change and future trends have taken place and as a result several international organisations, academic institutions and individuals have published reports and research addressing climate change and the link with human security threats. The majority of these reports and research have been obtained and were collated in order to serve as the basis of the analysis that took place during this research. However, very few documents address the specific situation related to Southern Africa and the influence on border safeguarding and integrity.

All documents sourced to date agree that the climate change predictions as outlined by the IPCC, as previously mentioned, is the baseline for departure. All documents also either acknowledge the link between human security and climate change or address the link between human wellbeing and the environment they live in. Most documents also look at the entire Africa as a region or a wider Southern African approach. For example, Desanker list the possible impacts on humans, animals and plants but in a holistic African context (Desanker, 2002). Also, Kinuthia look at the climate impact on a wider Southern African region. The paper listed the predicted

impact on agriculture, irrigation and livestock production, which mostly falls within the food security category (Kinuthia, 1997).

According to Barnett & Adger, climate change is increasingly been called a ‘security’ problem. The link is that climate change increasingly undermines human security in the present day, and will increasingly do so in the future, by reducing access to, and the quality of, natural resources that are important to sustain livelihoods. Climate change is also likely to undermine the capacity of states to provide the opportunities and services that help people to sustain their livelihoods (Barnett & Adger, 2007: 639).

The determinants of human security are as temporally as they are spatially complex and past processes, such as colonisation and war, shape present insecurities, and ongoing processes, such as climate change and trade liberalisation, shape future insecurities. The extent to which system-wide impacts transpire will be determined in part by the degree to which any given national economy is dependent on climate sensitive natural resources, and the robustness and resilience of social institutions to manage change. In both these indirect ways, but also through direct processes, such as territorial losses through rising sea levels, climate change may be a national security issue. The risk to national security may be both a cause and a consequence of human insecurity (Barnett & Adger, 2007: 642).

Various reports and research already obtained agree with the above-mentioned arguments highlighted, while others add a few new dimensions as well. Most documents highlight food insecurity, migration, urbanisation, increased poverty and trans-border spread of diseases as the major threats to human security due to climate change. As new reports and research becomes available it will be obtained and utilised during this research process. However, it is clear from this preliminary literary review that no other researcher has yet addressed the research question posed in Southern Africa through holistic exploration and analysis that could be determined. Most documents address one specific aspect alone for example regional water resources and food security (Shah, Williams & Yang, 2011) or migration (McMichael, Barnett & McMichael, 2012).

Although the trans-boundary nature of human security threats related to climate change are acknowledged, the specific impact on Southern African border integrity and security is not directly addressed in any document obtained to date. Also, the specific impact on national and regional policy was not explored.

2.4 CONCLUSION

All the key concepts regarding climate change, human security and border safe guarding and integrity have now been clarified and will be applicable throughout the rest of the paper. As can be seen from the literature review there are still gaps in addressing this topic and the research done in this paper will attempt to address some of these gaps. The research methodology to be followed will be addressed in the next chapter.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION

The approach and research methodology to be followed during the research process and compilation of this paper will now be discussed. This chapter will explain the technical detail of the methods utilised to conduct this research.

3.2 RESEARCH APPROACH AND DESIGN

The relationship between climate change-related human security threats and border integrity and safeguarding is very complex and related to several academic disciplines. In order to answer the research question, a holistic descriptive research approach will have to be followed.

Descriptive research is the exploration of the existing, specific phenomena and is used to obtain information concerning the current status of the phenomena to describe "what exists" with respect to variables or conditions in a situation. It is also research that provides an accurate portrayal of characteristics of a particular individual, situation, or group. These studies are a means of discovering new meaning, describing what exists, determining the frequency with which something occurs, and categorising information. Descriptive research can be either quantitative or qualitative or a combination of both (Okstate, 2012).

Mainly a qualitative and not a quantitative approach will be followed during compiling this research paper. According to Leedy & Ormrod, quantitative research is used to answer questions about relationships among measured variables with the purpose of explaining, predicting and controlling phenomena (Leedy & Ormrod, 2005: 94). Qualitative research is research generated outside the framework of a quantitative approach. Collected data is not subjected to formulaic analysis for the purpose of generating projections (Investorwords, 2010). Qualitative researchers study phenomena in their natural settings, attempting to make sense of, or to interpret it in terms of the meanings people bring to them. Qualitative research is intended to penetrate to the deeper significance that the subject of the research ascribes to the topic being researched. It involves an interpretive, naturalistic approach to its subject

matter and gives priority to what the data contribute to important research questions or existing information (Encyclopedia, 2010).

As can be seen from previous discussions, in this paper, science and security will have to be blended in order to reach a conclusion that will address the research question. Firstly, the scientific basis of the paper will be established and then the security impact from the scientific findings will be discussed. Finally, the recommendations will be done upon the findings of these two chapters.

In Chapter 4, the scientific detail regarding the predicted climate change scenarios for Southern Africa will be summarised and discussed. Predicted climate change-related human security threats will be highlighted and the current status and approach to border integrity and safeguarding of Southern African states will be determined.

In Chapter 5, the predicted possible influence and trends of climate change-related human security threats on Southern African border integrity and safeguarding will be discussed in the context of the specific issues highlighted in Chapter 4.

In Chapter 6 the findings of Chapter 4 and 5 will inform the recommendations and conclusions reached in order to address the research questions. Due to the restrictions of the length of this paper only the major key issues will be discussed in detail while other less prominent issues will only be mentioned.

3.3 DATA COLLECTION AND ANALYSIS

Over a period of 18 months all relevant papers books and other pieces of information were collected, collated and then studied for relevance. Mostly research papers from reputable organisations and individuals were utilised. To establish a scientific baseline, the findings and predictions by the IPCC will be used as benchmark.

As mentioned, a descriptive research approach will be followed with the added comparative analysis of trends identified related to climate change and human security. Comparative analysis is the item by item comparison of two or more comparable alternatives, processes, products, qualifications, sets of data, systems,

etc (Business Dictionary, 2010) and this approach will be followed to compare the various trends and predictions related to aspects of climate change and human security holistically as listed by the various scientific communities. For example, all trends regarding rainfall, temperature and food production will be analysed separately as well as integrated in context of the region. Where information is available, the manifestation of these phenomena will be analysed and compared with the identified trends and predictions. Only trends and predictions as well as information from reputable, globally accepted and peer reviewed scientific communities will be utilised.

For the purpose of this research the main focus will be on comparative analysis of the various sources of information from academic resources including books, scientific reports and journal articles on the relevant topics. Where possible, maps will be used of identified trends and predictions to facilitate further analysis and interpretation. No questionnaires will be utilised. All data and information obtained will be collated systematically and the process will be documented in detail throughout the entire research process.

When conclusions are reached during the analysis process, the possible impact on border integrity and safeguarding in Southern Africa will be analysed in depth and documented. Recommendations to mitigate the possible risks will be listed. Once the comprehensive analysis of all the information was completed, the findings will also be discussed with relevant experts in order to explore the possible implications for national and regional policies to further inform the recommendations.

3.4 VALIDITY AND RELIABILITY

As only information from reputable peer reviewed sources is used, it can be accepted and expected that a high level of validity and reliability can be reached. The prediction of future climate change scenarios is a very abstract science that has to function in systems with high levels of variability, however, the most reliable sources were used and the IPCC, which is the globally accepted authority on this subject, was used as benchmark for all information.

During the conduct of the three interviews reputable experts will be chosen. Throughout the conduct of the research as wide a variety of reputable views will be included to ensure validity and reliability.

3.5 LIMITATIONS

As this research will follow a descriptive approach, very few limitations are expected. The majority of reports, journal papers, research papers and books are readily available. However, specific information and research regarding the Southern African situation specifically is limited as most documents address the entire African continent with limited detail reference regarding the Southern African situation.

3.6 ETHICAL CONSIDERATIONS

During this research no personal or private information regarding individuals will be utilised therefore there will be no or very few ethical considerations or issues to take into account. While conducting the research bias will be avoided and all possible schools of thought, approaches and viewpoints will be included and analysed.

3.7 CONCLUSION

The research methodology to be followed in this paper have now been discussed and clarified and in the next chapters the scientific prediction of climate change for the Southern African region, the security impact on border safeguarding and integrity and the recommendations will be addressed as indicated.

CHAPTER 4: TRENDS IN CLIMATE CHANGE AND HUMAN SECURITY THREATS IN SOUTHERN AFRICA

4.1 INTRODUCTION

As previously mentioned, it is anticipated that Africa will be negatively affected by climate change that will have an impact on all facets of human security. According to the latest report from the World Bank, human health in Sub-Saharan Africa will be affected by high temperatures and reduced availability of water, especially as a result of alterations occurring in patterns of disease transmission. Some areas in Sub-Saharan Africa may face a 50 percent increase in the probability for malaria transmission as a result of new species of mosquitoes becoming established. The impacts on agriculture and ecosystems would further compound the direct impacts on human health by increasing the rates of malnutrition and reduced incomes, ultimately producing negative repercussions for economic growth. These conditions are expected to increase the scale of population displacement and the likelihood of conflict as resources become scarcer (World Bank, 2012: 62).

The World Bank report also indicates that Africa is considered particularly vulnerable to increasing threats affecting human security. Long-term shifts in the climate seem likely to catalyse conflict by creating or exacerbating food, water and energy scarcities, triggering population movements, and placing larger groups of people in competition for more and more limited resources. Increased climate variability, including the greater frequency of extreme weather events, will also complicate access to resources, thereby exacerbating conditions that are conducive to promoting conflict (World Bank, 2012: 62). The potential for climate change to act as a threat multiplier, potentially making such existing challenges as water scarcity and food insecurity more complex and irresolvable, is cause for particular concern (World Bank, 2012: 62).

Globally sea level rise of between 0.2m and 0.6m can be expected by 2100 (Brown & Crawford, 2009: 11). While the number of major natural disasters in the world increased from 100 to more than 400 per year from 1975 to 2005, it is Africa that has experienced the fastest rate of increase in the incidence of natural disasters over the

last three decades, and a threefold increase in such disasters has been experienced in the last decade alone (ACCES, 2011: 37).

Understanding how global climate change may affect regions and individual countries is, however, still a matter of research, and is inherently associated with greater uncertainty (Davis, 2011: 14). We will now explore the predicted impact of climate change in Southern Africa specifically by looking at the current climate, the predicted changes and trends that are already manifesting. The predictions from various models were taken into account and summarised for the purpose of this paper.

4.2 CLIMATE CHANGE TRENDS PREDICTED FOR SOUTHERN AFRICA

In order to best try and understand how the Southern African regional climate may change in future, is to examine what it is like now and how it has changed in the past. While it is certainly possible that climate may change in ways we have not yet observed, reconstructions of past climatic fluctuations and evidence of more recent changes, based on available observational records, provide a good first indication of the direction and magnitude of possible future changes. This is particularly true of observational records which cover the most recent past, as we know already that we have begun to observe the pattern of a human influence on global climate records over the last century (Davis, 2011: 16).

Detecting and attributing regional climate trends is considerably more difficult than doing so for global climate. This is because of a number of factors, predominantly among them the lack of an accurate, long-term, well-maintained and dense network of observational stations to detect regional climate signals. The important influence of local features of the landscape like mountains and water bodies, for example, on regional climate variability, also makes attributing observed regional climate trends to a human cause more difficult. Despite these difficulties, the observational record for Southern Africa was analysed for evidence of climate trends over the last century. These trends provide the context for projections of future regional climate change (Davis, 2011: 16).

Davies (2011) indicates that the current climate of Southern Africa is strongly determined by the position of the subcontinent in relation to the major circulation patterns of the southern hemisphere, the complex regional topography and the surrounding ocean currents. The Southern African region is located between the equator and the mid-latitudes and has the warm Indian Ocean on the east coast and the cold Atlantic Ocean on the west coast. The relief ranges from sea-level to a plateau at about 1 250m and extends to mountains exceeding 3 000m in height. The combination of these factors leads to different climate types and regimes across the region namely a coastal desert from about 32 degrees south to the border of Namibia with Angola, a temperate climate over the interior central plateau, a subtropical climate over the low-lying coastal regions of the southeast, and a Mediterranean climate in the southern part of South Africa (Davis, 2011: 8).

Rainfall currently varies considerably across Africa, both spatially and temporally (Brown & Crawford, 2009: 9). In recent decades, the continent's sub-tropical zones have become more arid, particularly the Saharan and Mediterranean regions and Southern Africa (Brown & Crawford, 2009: 9).

Southern Africa is described as a predominantly semi-arid region with high intra-seasonal and inter-annual rainfall variability, with extreme events such as droughts and floods occurring frequently (Davis, 2011: 8). The amount and seasonal distribution of rainfall are the most important factors to consider when looking at rainfall across Southern Africa (Davis, 2011: 8). There is a high degree of spatial variation in rainfall across the region. The average rainfall for the region is just less than 1 000mm per year. Rainfall tends to decrease to the north-east and to the south-west of the equator, with some arid areas receiving less than 100mm per year. The majority of the region receives between 500mm and 1 500mm per year, with the more semi-arid regions of the south receiving between 250 mm and 500mm per year (Davis, 2011: 8).

Rainfall over most of Southern Africa is predominantly seasonal, except for the south coast, the arid south-west and the moist tropics. The majority of the rainfall occurs in the summer half of the year from October to March (Davis, 2011: 8). The rainy season reaches a peak between December and February when most of Southern

Africa receives 80 percent of its annual rainfall, with some parts receiving as much as 90 percent. Tropical cyclones occasionally make landfall at the Mozambican and South African coastlines, bringing significant rainfall and associated flooding to Mozambique, the northern parts of South Africa and Zimbabwe. The south-west coast of South Africa is sufficiently far south to be influenced by mid-latitude cyclones (disturbances associated with the belt of westerly winds in the southern ocean) in the winter months, during which most of the annual rainfall occurs (Davis, 2011: 8).

Over the next 50 to 80 years more frequent and intense storms are projected in the Southern Indian Ocean. It is anticipated that a 2 to 4°C increase in sea surface temperature could most probably lead to a 10 to 20 percent increase in cyclone activity along the eastern coast of Southern Africa (Brown & Crawford, 2009: 10).

Southern African inter-annual rainfall variability is known to be linked to the El Niño-Southern Oscillation (ENSO) phenomenon. The influence of El Niño is strongest in the south-eastern region of Southern Africa and reaches a maximum in late summer January to March. Other important determinants of rainfall patterns in Southern Africa include the Inter-Tropical Convergence Zone (ITCZ) and the Botswana Upper High Influence (anticyclone centred over Botswana) (Davis, 2011: 8). The ITCZ is a region characterised by high convective activity resulting in high rainfall in several countries within the sub-region in the summer months when its position shifts into the southern hemisphere. The ITCZ phenomenon is suppressed by the Botswana Upper High Influence (BUHI) which occurs from time to time and contributes to the aridity of Botswana and Namibia. A persistent BUHI can result in drought in the region (Davis, 2011: 9).

In Southern Africa, there has been an increase in inter-annual variability of rainfall over the past 40 years, with more intense and widespread droughts. Floods and droughts in Southern Africa are gradually increasing in number and frequency as well (ACCES, 2011: 20-21). Heavy rainfall events have increased for many of the countries in the region including Namibia and Mozambique, along with changes in seasonality and weather extremes (Adano & Daudi, 2012: 6). It is also predicted that winter rains will decrease, by up to 40 percent in the extreme west (Brown &

Crawford, 2009: 9). It is further anticipated that Southern Africa could experience a drying, especially in the south (ACCES, 2011: 38).

Droughts have affected Southern Africa particularly since the end of the 1960s and drought-period models indicate increasing probabilities of dry spells or dry years in especially over western South Africa and over eastern Southern Africa, including Mozambique. In Southern Africa, droughts have been linked to ENSO in recent decades. (ACCES, 2011: 38).

Changes in rainfall are typically harder to detect due to the fact that rainfall varies so much from place to place and from year to year across Southern Africa. Existing evidence for rainfall trends suggests moderate decreases in annual rainfall over parts of Southern Africa. There is also evidence from other studies which shows that inter-annual rainfall variability over Southern Africa has increased since the late 1960s and that droughts have become more intense and widespread in the region. The pattern of changes demonstrates that year-to-year rainfall variability is high across the region, and has been a persistent feature of the region's climate for many years. These alternating patterns of above-normal/below-normal rainfall periods clearly illustrate the rainfall cycles prevalent in Southern Africa where extreme wet and dry years have been recorded, which resulted in floods and droughts. In 1999 to 2000, for example, tropical cyclone Eline caused widespread flooding in southern and central Mozambique, south-eastern Zimbabwe and parts of South Africa and Botswana. In 1982 to 1983 (El Niño year), 1986 to 87 and 1991 to 92 serious droughts were experienced that caused a decrease in crop and stock production in many parts of the region (Davis, 2011: 18).

Where records covered a sufficient time period, there have been detectable increases in the number of heavy rainfall events and over Southern Africa regional studies have shown that the length of the dry season and the average rainfall intensity has increased. Furthermore, a study considering changes in extreme rainfall events over South Africa found that 70 percent of the country has experienced a significant increase in the intensity of extreme rainfall events between 1931 to 1960 and 1961 to 1990. Regional differences between the north-eastern and central parts of South Africa were also noticed (Davis, 2011: 18).

Patterns of average moisture content over Southern Africa show a distinct west-to-east gradient across the subcontinent with the humidity being the lowest over the western interior and highest over the east due to the source of moisture from the Indian Ocean. Humidity also displays distinct diurnal and seasonal variations, with humidity reaching a minimum in winter and maximum in summer. This means that the east-west gradient is more pronounced in summer compared to winter (Davis, 2011: 11).

It is widely recognised that there has been a detectable rise in global temperature during the last 100 years, and that this rise cannot be explained unless human activities are accounted for (Davis, 2011: 14). In Africa warmer temperatures are projected to increase both the frequency and intensity of extreme weather events for the continent resulting in more heavy rain storms, flooding, forest fires and El Niño events. It is anticipated that an increasing share of annual rains will be falling during intense precipitation events and that periods of drought could be longer and more frequent (Brown & Crawford, 2009: 10).

In 2010, global average temperature was 0.53°C above the 1961 to 1990 average. Along with 1998, 2010 is widely recognised as the warmest year on record. In fact, the World Meteorological Organisation has confirmed that the ten warmest years on record have all occurred since 1998. The regional distribution of temperature increases is not uniform, however, and some regions have experienced greater change than others, especially the interior of continental regions such as Southern Africa. The rate of global average temperature increases has also increased during the latter half of the 20th century, suggesting that increases in global average surface temperature are accelerating (Davis, 2011: 14).

Increasing emissions of atmospheric greenhouse gases, primarily through the burning of fossil fuels, are enhancing the natural greenhouse effect, resulting in climate changes which are manifested at both global and regional scales. Atmospheric carbon dioxide (CO_2) concentrations are increasing. However, concentrations fluctuate every year based on the annual cycle of uptake and release of CO_2 in the vast forests which cover much of the landmasses of the northern hemisphere (Davis, 2011: 14).

Computer models of the earth's climate system are unable to simulate the warming observed over recent decades unless they include the effects of anthropogenic emissions of greenhouse gases. Simulations of the earth's climate which include only natural forcing (e.g. solar variability due to, internal and orbital variations, volcanic activity, etc.) show a cooling of the earth after 1960, which is at odds with the observed warming. This has led the IPCC to conclude recently that most of the warming, on a global scale, of the last 50 years is attributable to human activities (Davis, 2011: 14).

Southern Africa has a warm climate and much of the region experiences an average annual temperature above 17°C. The month-to-month variation in temperature tends to be gradual. Across the region, mean annual minimum temperature ranges from 3 to 25°C and mean annual maximum temperature ranges from 15 to 36°C. The lowest temperatures occur along the escarpment. Frost is common in winter on the interior plateau and at higher altitudes, for example the Drakensberg Mountains of South Africa. The highest maximum temperatures are observed in the Kalahari and in the lowlands of north-eastern South Africa, Zimbabwe and Mozambique (Davis, 2011: 12).

The greatest diurnal temperature range (difference between the daily maximum and minimum temperature) is observed over the central plateau regions and the highland areas, where the lowest and highest day temperatures can differ by up to 19°C. The coastal regions experience a much smaller diurnal temperature range (Davis, 2011: 12).

Temperatures along the coast are influenced by the temperature of the adjacent oceans and the nature of the Benguela and Agulhas currents. The eastern coastline is warmed by the Agulhas current which flows southwards from the equator, whereas the western coastline is cooled by the Benguela current which flows northwards from Antarctica (Davis, 2011: 12).

Mean temperature is greatly influenced by extremes in maximum and minimum temperature and is consequently a good indicator of seasonal changes in temperature across the region. For most of the region, summer is experienced from

December to February, autumn from March to May, winter from June to August, and spring from September to November. In summer the temperatures are highest over the desert regions of Namibia and Botswana and exceed 27°C. Cooler conditions are experienced over the interior plateau regions and to the south-west, where temperatures may be below 22°C due to the cloud cover associated with the summer rains. In winter the temperature regimes display a latitudinal gradient where temperature decreases southwards. The coldest temperatures are experienced over South Africa, including Lesotho, extending to the Southern parts of Namibia where temperatures average less than 15°C (Davis, 2011: 12).

Brown & Crawford (2009) indicate that temperatures in Southern Africa would increase by 3.7°C in the summer and 4°C in the winter. Under a high warming scenario, temperature increases are expected to be more dramatic and according to one model, temperatures could increase by up to 7°C for Southern Africa in September to November by the end of the century (Brown & Crawford, 2009: 9).

There is strong evidence, based on analysis of minimum and maximum temperature trends that the region is getting warmer. After the mid-1970s the average temperatures observed are approximately 0.8°C above the 1961 to 1990 average and these differences also started to increase in more recent years, suggesting that the rate of increase in minimum and maximum temperatures is increasing. This is consistent with detected increases in global annual surface air temperatures over Southern Africa since 1900 (Davis, 2011: 17).

Trend analysis of temperatures across Southern Africa reveals that annual minimum and maximum temperatures have increased at an average rate of 0.057°C per decade and 0.046°C per decade, respectively between 1901 and 2009. Further analysis reveals that the periods of most rapid warming occur post 1970, a period for which the rate of increase in both average annual minimum and maximum temperatures is statistically significant at the 95 percent confidence level (Davis, 2011: 17).

After 1976, minimum temperatures began increasing by 0.27°C per decade and maximum temperatures by 0.25°C per decade. This demonstrates again that

temperatures have begun to rise more steeply during the latter years of the 20th century and the first decade of the 21st century. Projections of temperature change show that temperatures are expected to continue to increase and so too is the rate of increase (Davis, 2011: 18).

Analysis of extreme temperature trends also reveals evidence of change. The lowest recorded annual minimum temperature has increased gradually at an average rate of 0.162°C between 1901 and 2009. The highest recorded annual maximum temperature has increased more gradually at an average rate of 0.075°C between 1901 and 2009. The higher rate of increase in minimum temperatures has been observed previously and suggests a general trend toward less severe very cold events. After 1995, the highest observed maximum temperatures begin to increase at a rate of 0.85°C, suggesting that the frequency of hot years is increasing (Davis, 2011: 18).

Botswana

Botswana has a semi-arid climate, characterised by warm winters, hot summers, low rainfall, and high evapotranspiration. The country is prone to frequent droughts, lately occurring every two years rather than once every four years, as in the previous decade (Zhou et al, 2012: 1).

It is anticipated that there will be minimal change in annual precipitation in the central, northern, eastern, and western parts of the country between 2000 and 2050. It is also indicated that there would be a reduction in precipitation of between 100 and 50mm in the southern and south-eastern regions. However, there is a predicted increase in precipitation in the south-western parts of the north region. In the worst case a decrease in annual precipitation across Botswana of between 50 and 200mm could occur (Zhou et al, 2012: 1).

An overall increase in the annual maximum temperature ranging from 1.5^{o}C to 2.5^{o}C is expected. It is predicted that the east will have smaller temperature increases than the southwest and in the worst case temperature increases of greater than 3°C for 95 percent of the country would occur (Zhou et al, 2012: 1).

Lesotho

Lesotho lies on the plateau of the Southern African subcontinent. Variations in topography and micro-climate shape the country's ecological zones namely the lowlands, the foothills, the highlands, and the Senqu River Valley. Annual precipitation is highly variable, both temporally and spatially, ranging from 500mm to 760mm. Temperatures also are highly variable, ranging from –10°C to 30°C (Gwimbi et al, 2012: 1).

It is in general predicted that Lesotho will become warmer and that precipitation will diminish by 2050. A significant decrease in rainfall (between 50mm and 100mm annually) is predicted in the lowlands, foothills and southern Senqu Valley, with little change in the mountains and northern Senqu Valley (plus or minus 50mm). In the worst case a severe reductions in rainfall (between 100 and 200mm) for the whole country is predicted (Gwimbi et al, 2012: 1).

It is projected from 2000 to 2050 the average daily maximum temperature for the warmest month of the year will change with increases of between 1.0°C and 2.0°C throughout the country, with the lower increases in the mountain zone (Gwimbi et al, 2012: 1).

Significant changes in precipitation and temperature could have severe impacts on people's livelihoods and especially on agriculture, particularly in the lowlands, foothills and Senqu Valley, the most densely populated and cultivated regions of the country. In these zones, increasing temperatures and decreasing precipitation could lead to a substantial decrease in harvests (Gwimbi et al, 2012: 1).

Mozambique

Mozambique's diverse climate is influenced by monsoons from the Indian Ocean and the hot current of the Mozambique Canal. The country's location makes it particularly vulnerable to climatic hazards such as drought, floods, and recurring tropical cyclones during the rainy season from October to April (Maure et al, 2012: 1).

Very little change in rainfall across the country is anticipated with a slight reduction in the eastern part of Inhambane province and an increase in part of Tete province. Similarly little change is expected over most of the coastal area and the southern part of the country, but in the northern and north-western parts, away from the coast, an increase in rainfall is predicted that could be exceeding 200mm in some places (Maure et al, 2012: 1).

However, ACCES (2011) predicts that Mozambique is likely to become significantly drier over the coming decades. It was already seen that the annual average precipitation has decreased slowly over the past decades and it is likely to decrease further. Yet, at the same time, the number of heavy-rain events has increased, as did the risk of flash floods. While actual average annual rainfall may only change slightly, the distribution over the year will change, and possibly quite dramatically (ACCES, 2011: 14-15). Droughts in Mozambique occur primarily in the southern and central regions with a frequency of 7 in 10 and 4 in 10 years, respectively (ACCES, 2011: 39-40). Floods occur every 2 to 3 years along major river basins, low coastal plains and areas with drainage problems (ACCES, 2011: 39-40).

Mozambique is also at an increasing risk from storm surges (flood of water caused by wind and low pressure) due to climate change and it is estimated that 41 percent of the country's coastal area and 52 percent of coastal GDP is vulnerable (ACCES, 2011: 39-40).

In general higher temperatures are anticipated, though the degree of change differs from region to region. The least change would be in the 1 to 1.5°C range for most of the country, though changes in parts of the south could be as high as 2°C. In the worst case slightly hotter temperatures are expected with increases of 2°C to 2.5°C, especially in the north-eastern part of the country (Maure et al, 2012: 1).

South Africa

The climate of South Africa is unique, with a steep rainfall gradient from west to east, as well as three different rainfall regimes with some parts prone to drought. The anticipated changes in rainfall are regionally complex, especially in areas of strong topographical variation. Increased annual rainfall along the east coast during

summer is expected while the west coast will receive less precipitation and the southwest is projected to grow drier in both summer and winter (Johnston et al, 2012: 1).

While the west-east pattern of precipitation response seems consistent, there is considerable uncertainty in the magnitude of the response. It is predicted that the annual rainfall will decrease by about 100mm in much of the Eastern Cape, Northern Cape, Free State and North West provinces, while there will be no change elsewhere. In the worst case annual rainfall will decline by about 100mm across the entire country (Johnston et al, 2012: 1).

It is predicted that temperatures will increase by less than 2ºC across the country for the average daily maximum during the warmest month in the best case scenario. Temperatures in the worst case could increase by 2 to 3ºC, with the greatest increase occurring in the country's interior (Johnston et al, 2012: 1).

Swaziland

Swaziland's climate is moderate, near-temperate, subtropical, and semiarid. The climate is localized, varying over short distances with changes in altitude (Manyatsi et al, 2012: 1).

It is predicted that there will be no significant change in rainfall between 2000 and 2050 in the northeast (mainly the highveld) and an annual increase of 50 to 100mm in the central and eastern part of the country (middleveld, lowveld, and Lubombo plateau). In the worst case there could be a decrease of 50 to100mm in annual precipitation over much of the country (Manyatsi et al, 2012: 1).

A temperature increase of 1 to 1.5ºC across the country is predicted for the average daily maximum during the warmest month. Less rainfall and warmer temperatures will likely mean an increase in shrubs and herbaceous cover and a reduction in tall tree cover. In the worst-case scenario, temperatures might increase by 2 to 2.5ºC and precipitation might decrease by 200 mm (Manyatsi et al, 2012: 1).

Zimbabwe

Zimbabwe has a subtropical climate with a summer season extending from October to April. Rainfall is erratic and unevenly distributed, resulting in crop failures that occur three out of every five years. Semi-arid conditions cover 75 percent of Zimbabwe (Mugabe et al, 2012: 1).

It is predicted that annual precipitation will increase in the extreme northern region, with little change in the rest of the country. In the worst case it is predicted that rainfall would decrease by 100 to 200mm over most of the country (Mugabe et al, 2012: 1). Drought is expected to be the biggest problem facing Zimbabwe (ACCES, 2011: 20-21). It has already been noticed that the amount of precipitation Zimbabwe receives is deviating from the mean more frequently (ACCES, 2011: 20-21).

An overall increase in the annual maximum temperature is predicted with increases of 1.5 to 2ºC for all but the northernmost regions of the country. In the worst case increases of 2.5 to 3ºC for the majority of the country and 3 to 3.5ºC for the western region could occur. Such high changes, coupled with predicted decreases in rainfall, could adversely affect some crops (Mugabe et al, 2012: 1). The country is experiencing more hot days and fewer cold days and it has been noticed that average temperatures have increased by about 2ºC in the last 30 years (ACCES, 2011: 20-21).

Namibia

Although no country specific analysis could be obtained for Namibia, it could be assumed that the regional predicted trends would also be applicable in Namibia. As was previously mentioned, it is predicted that the western regions of Southern Africa would become hotter and dryer. All regions in Southern Africa will also be exposed to sudden erratic weather events. Namibia is consisting of mainly desert areas with a hot, dry climate. There are limited natural freshwater resources and rainfall is already sparse and erratic The country already experience prolonged periods of drought and desertification is a current environmental concern. On the other hand, the Okavango Delta in the north-east of Namibia is prone to yearly flooding in late summer. Any changes in rainfall patterns,

increased temperatures and erratic weather events will have a severe negative impact on Namibia due to the already vulnerable environmental status of the country (see Appendix A Table A.1).

4.3 PREDICTED CLIMATE CHANGE-RELATED HUMAN SECURITY THREATS

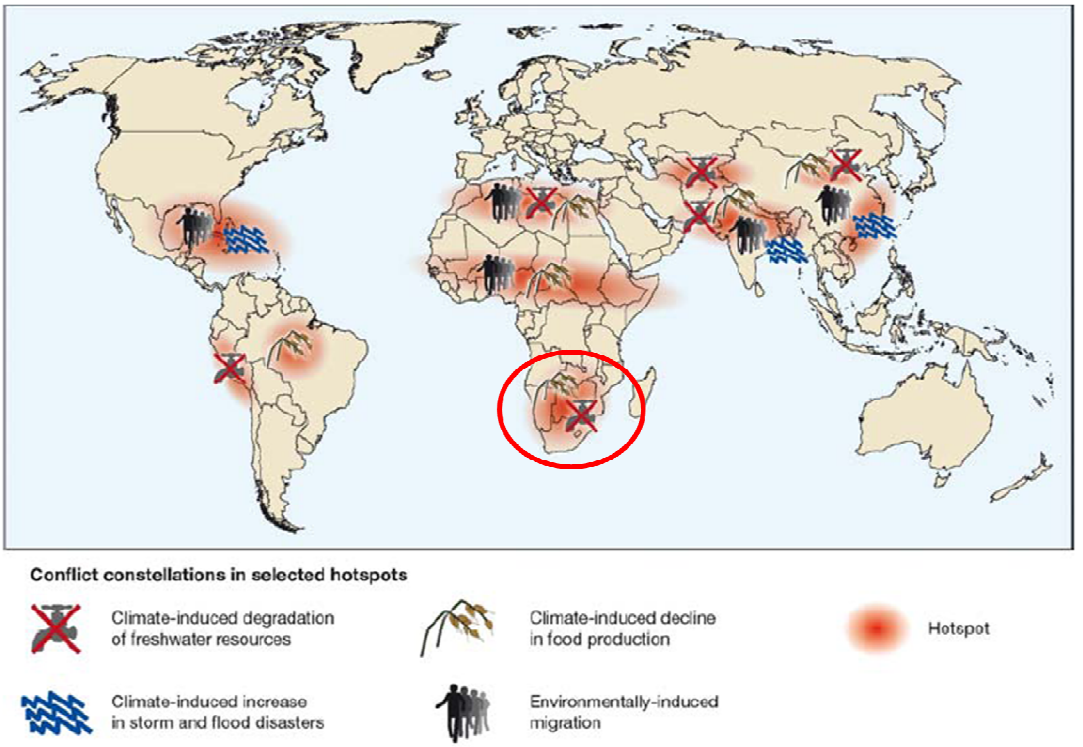
As previously mentioned in Chapter 1, according to the UN's definition, human security constitutes of seven dimensions namely economic, food, health, environmental, personal, political, and community security (HSI, 2012). Climate change predicted for Southern Africa will have a definite direct and indirect impact on all of these dimensions.

As summarised by Davies (2011), Southern Africa is likely to be significantly impacted by future climate change with the latest climate change projections for the region indicating that both temperature and evapotranspiration are likely to increase into the 21st century. The entire region is considered a climate change "hotspot" (see Figure 4.1). Climate change is likely to alter the magnitude, timing, and distribution of storms that produce flood events as well as the frequency and intensity of drought events (Davis, 2011: 4).

From all the sources considered a number of key themes emerged regarding the main expected impacts of climate change in Southern Africa and these will now be discussed: (also see Figure 4.2)

• **Increases in drought, flood, windstorms and other extreme climate phenomena**, which will reduce freshwater availability, threaten food security and human health, diminish industrial production and weaken the physical infrastructure base for socio-economic activity, resulting in reduced development (NEPAD, 2008: 3). Already in all Southern African states drought is mentioned as a recurring natural hazard (see Appendix A Table A.1). Furthermore, extreme weather events like cyclones resulting in flooding is also a recurring natural hazard in Mozambique and it has also affected South Africa and Zimbabwe in the past (see Appendix A Table A.1). All Southern African states are also periodically and seasonally affected by flooding during the rainy season especially areas adjacent to main river systems like the Zambezi river system (see Appendix A Table A.1).

Figure 4.1: Conflict and Migration Induced by Environmental Stressors.



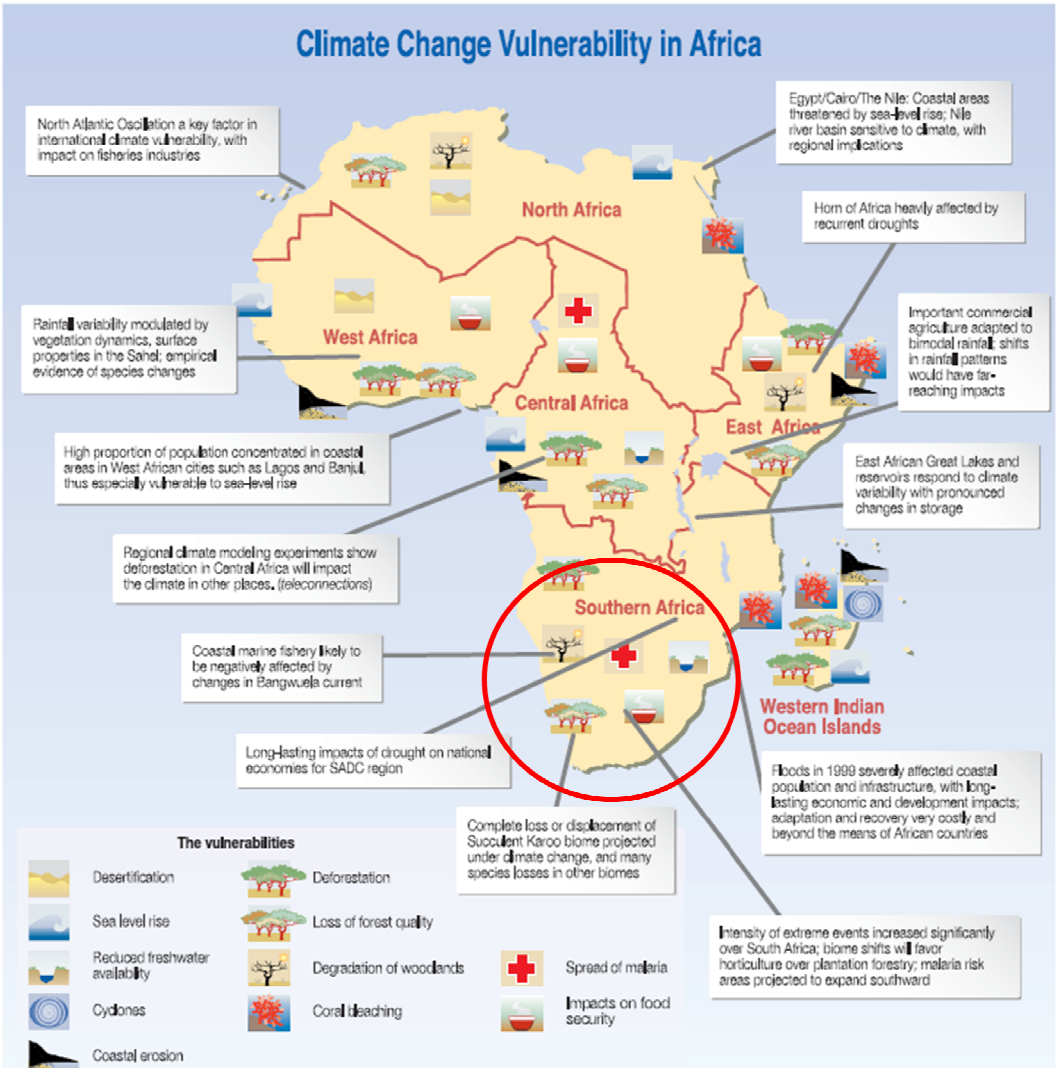
Source: German Advisory Council on Global Change WBGU (2007): Climate Change as a Security Risk)

• **Changes in rainfall**. More intense land use will result in increased deforestation, loss of forest quality, and woodland degradation across the continent that will worsen desertification, particularly in Southern Africa. This will exert greater pressure on already strained coping strategies and will most likely result in increased poverty (NEPAD, 2008: 3). Of the 19 countries in the world currently classified as water-stressed, most are in Africa and this number is likely to increase, not only due to climate change, but also to non-climatic stresses such as increased demand due to population growth, degradation of watersheds caused by changes in land use, and siltation of river basins. A reduction in precipitation projected especially for Southern Africa, if accompanied by high inter-annual variability, could be detrimental to the hydrological balance of Africa, disrupting socio-economic activities that depend on water (NEPAD, 2008: 7).

Overgrazing, soil erosion and soil degradation are already current environmental issues in Southern African states, especially in Botswana, Lesotho Swaziland Namibia, Zimbabwe and some areas of South Africa (see Appendix A Table A.1).

Desertification is also already listed as a current environmental issue in Botswana, Lesotho, Mozambique, Namibia and South Africa (see Appendix A Table A.1). It can

Figure 4.2: Climate Change Vulnerability in Africa



Source: Climate Change and Security in Africa Oli Brown and Alec Crawford, March 2009, A Study for the Nordic-African Foreign Ministers Meeting.

therefore be anticipated that changes in rainfall, especially a reduction in rainfall, will have a profound impact on all Southern African states resulting in increased food insecurity, poverty and reduced development and economic growth.

It is projected that by 2020, between 75 and 250 million people in Africa will be exposed to increased water stress due to climate change. The variability of climates may render the management of water resources more difficult both within and

between countries, resulting in conflicts. A drop in water levels in dams and rivers could adversely affect the quality of water by increasing the concentration of sewage waste and industrial effluents, thereby contributing to outbreaks of water borne diseases such as cholera. Currently most of the urban populations within the region have access to potable water and sanitation services, however, this number is reduced in the rural areas (see Appendix A Table A.1). The indicators include increased water borne diseases, reduced water quality and quantity for domestic and industrial use, competition and water use conflicts as well as high water pricing (NEPAD, 2008: 7). Water (including coastal waters) and environmental pollution is already a current environmental issue in Mozambique, South Africa and Zimbabwe. Air pollution is also a current environmental concern in South Africa. (see Appendix A Table A.1).

• **Sea level rise leading to coastal erosion and flooding**, particularly in eastern Africa, and bleaching of coral reefs along the Indian Ocean coastal zone. With more than one-quarter of the population living within 100 km of the coast and most cities concentrated along the coastline, the vulnerability to marine-induced disaster from tidal waves and storm surges will increase. For example, projections show that the combined effects of ice melting and sea water expansion from ocean warming are projected to cause the global mean sea level to rise by between 0.1 and 0.9 metres between 1990 and 2100 (NEPAD, 2008: 3). Mozambique is particularly vulnerable to this phenomenon as the majority of the state's population lives in coastal areas. Major coastal cities in South Africa and Namibia could also be negatively affected as well as major port infrastructure will be at risk (see Appendix A Table A.1).

African coastal zones are already under stress from population pressure and conflicting uses adversely affected by sea-level rise associated with climate change. The coastal nation of Angola, have low-lying lagoon coasts that are susceptible to erosion, particularly areas with rapidly expanding cities on the coastal belt. The west coast of southern Africa often is buffeted by storm surges and extreme storm events, which contribute to both erosion and flooding. Meanwhile, sea-level rise and climatic variation may reduce the buffer effect of coral and patch reefs along the East African coast, increasing the potential for erosion (NEPAD, 2008: 8).

• **A decrease in river basin run-off and water availability for agriculture and hydropower** generation due to changes in rainfall and river sensitivity to climate variation will likely result in increased cross-boundary tensions. This will result in more conflicts, intensification of existing conflicts, or reduced ability to resolve them (NEPAD, 2008: 3). Limited fresh water resources are already a current environmental issue in Botswana, Lesotho, Namibia, South Africa and Swaziland (see Appendix A Table A.1). Any level of warming will result in increased water stress, especially by impacting on water supply. As a result, reduced recharge of dams and ground water supply will contribute to the drying of soils, causing wind erosion, dust problems, and unaffordable high water prices for the poor (NEPAD, 2008: 4).

• **Loss of biodiversity**. Biodiversity is the basis of Africa's wealth. It provides consumptive resources as food, fiber, fuel, shelter, medicine, and wildlife trade; and non-consumptive functions such as stabilizing the environment and other ecosystem services. Losses in biodiversity are associated with erosion, floods, sea level rise, and the spread of invasive alien species. For example, the coral reefs in the Indian Ocean experienced massive bleaching in 1998, with over 50 percent mortality in some regions. The damage to coral reef systems has far reaching implications for fisheries, food security, tourism and overall marine biodiversity. Loss or alteration of terrestrial habitats by climate change will impact on the species concentrated in the savannas and tropical forests. Already, projections of changes in climate in the twenty-first century could alter the range of antelope species; of which 90 percent are concentrated in Africa (NEPAD, 2008: 4).

Climate change is also expected to have significant impacts on animals and bird species that migrate seasonally and or annually within and outside Africa. If climatic conditions of specific habitats at either end of these migratory routes change beyond the tolerance of the species involved, the species will be forced to migrate to suitable habitats or face extinction. Even where migratory species have some capacity to alter their destinations, with intense changes in land use the probability of finding sufficient suitable habitat is limited (NEPAD, 2008: 4).

The resilience of many ecosystems is likely to be exceeded this century by an unprecedented combination of climate change associated disturbances (e.g. flooding, drought, wildfire, insects, and ocean acidification) and other global change drivers such as human encroachment via urbanisation, changes in land use, pollution, and overexploitation of resources. Where changes in the environment are gradual, ecosystems often re-stabilise. However, when the changes are rapid, it becomes very difficult for the ecosystems to deal with, especially those that are already highly distressed, leading to their collapse. Ecosystem collapse not only brings hardship to people who depend on them, but also create a window for invasive species, new pests and diseases. For example, the WHO has identified 30 new diseases in the past 20 years, nearly all arising from distressed ecosystems (NEPAD, 2008: 6).

In addition, an increase in mean ambient temperatures beyond 1°C has a significant influence on forest and range-land cover; species distribution, composition and migration patterns and biome distribution. In the dry-lands, desert species are already near their tolerance limits, and some may not be able to adapt further under higher temperatures, hence the risk of extinction. Also, arid and semi-arid sub-regions and the grasslands of Southern Africa are currently under threat from land degradation and desertification due to overgrazing and the creation of small cities or towns. Impact indicators include loss of biodiversity, including extinction and threatening of species, changes in vegetation composition and structure, rapid deterioration in land cover and depletion of water quality and quantity through the destruction of catchments and underground aquifers (NEPAD, 2008: 6).

• **Reduced agricultural production**: Increased temperatures and evaporation coupled with decreased water availability will reduce agricultural production. Approximately 70 percent of the African population lives by farming, and 40 percent of all exports are agricultural products. Furthermore, one-third of the income in Africa is generated by agriculture, with crop production and livestock husbandry accounting for half or more of household income. The poorest members of society are those most dependent on agriculture for their livelihoods. As most agricultural production on the continent is rain-fed, it is highly vulnerable to changes in climate variability, seasonal shifts, and precipitation patterns (NEPAD, 2008: 4). Currently in Southern

Africa less than 11 percent of the surface area of states is arable land and less than one percent is used for permanent crop production (see Appendix A Table A.1). Also, less than three percent of the surface area of states is irrigated to facilitate crop production (see Appendix A Table A.1) and therefore the majority areas used for crop production are dependent on natural rainfall. Agriculture in Southern African states contributes less than 30 percent to the GDP of the state. However, up to 86 percent of the labour force of states works in the agricultural sector. In Lesotho and Namibia up to two thirds of the population are engaged in subsistence farming (see Appendix A Table A.1).

Despite the critical role this sector plays in national economies, it is one of the most vulnerable sectors to climate change. Declines in agricultural production have resulted from unpredictable rainfall, reduced soil productivity through erosion, and increased evapotranspiration, significantly affecting food security. It is projected that by 2020, in some countries, yields from rain-fed agriculture could be reduced by up to 50 percent and that agricultural production will be severely compromised in many African countries, further compounding food insecurity and malnutrition (NEPAD, 2008: 7). Climate change and desertification can cause declines in the potential productivity of land and alter fundamental socio-economic conditions, rendering people chronically vulnerable to food insecurity. It is estimated that a doubling of CO_2 emissions in this century may lead to tens of millions more at risk of food insecurity in Africa by 2080. The major impacts of climate change on food security include changes in precipitation and insulation, changes in the length of growing seasons and changes in carbon uptake. Declines in agricultural yields, decline in the quality of pasture and livestock production, and reduced vegetation cover place local people at risk of famine (NEPAD, 2008: 7).

• **Increased health problems:** Africa is increasingly vulnerable to vector-borne diseases and reduced nutritional status. Increased temperatures would lead to increased precipitation thereby increasing the prevalence of malaria, yellow fever, dengue fever, onchocerciasis (river blindness) and trypanosomiasis (sleeping sickness). Increased morbidity and mortality in sub-regions where vector-borne and respiratory diseases increase following climatic changes would have far-reaching economic consequences in terms of increased health care costs. The indicators

include weather related mortality, infectious diseases, reduced air quality and a rise in respiratory illness, human disease prevalence, high infant mortality rates, and increased health care costs (NEPAD, 2008: 8). Heat waves will have serious health consequences for people who work outdoors. Changes in rainfall will also influence disease vectors for malaria and will increase susceptibility to water borne diseases such as cholera. Small changes in temperature and precipitation can boost the population of malaria-carrying mosquitoes. Increased flooding will also enhance breeding grounds for the malaria carriers in formerly arid areas. These problems will be exacerbated by the inability of many communities to cope with an increased prevalence of the disease, thus increasing health care costs (NEPAD, 2008: 4). Currently the life expectancy in all Southern African states is below 55 years and this is mostly related to the high HIV prevalence rate in the region (see Appendix A Table A.1). The large number of people living with HIV in the Southern African states is especially vulnerable to changes in food security, climate and disease prevalence (see Appendix A Table A.1). Furthermore, there is already a vast number of infectious and vector borne diseases present in Southern African states that would further increase as a result of climate change (see Appendix A Table A.1).

• **Increased migration:** Climate change impacts such as flooding, drought and desertification are displacing large populations and forcing people to leave their homes and land in search of better livelihoods or to evade disasters. Pastoral communities have used mobility to take advantage of annual and seasonal rainfall variations. They cannot simply move their axis of migration when wetter zones are already densely occupied and permanent water points fail. The problem of droughts appears to be most severe in sub-Saharan Africa (NEPAD, 2008: 5). The result has been widespread loss of human life and livestock, and substantial changes to social systems. It is estimated that about 60 million people will eventually move from the desertified areas of sub-Saharan Africa towards northern Africa and Europe by the year 2020 (NEPAD, 2008: 6).

The figures for the net migration rate in Southern African states seems surprising however, when analysed in context it makes sense. The net migration rate is the difference between the number of persons entering and leaving a country during the year per 1 000 persons (based on midyear population). An excess of

persons entering the country is referred to as net immigration (e.g. 3.56 migrants/1 000 population) and an excess of persons leaving the country as net emigration (e.g. -9.26 migrants/1,000 population). The net migration rate indicates the contribution of migration to the overall level of population change. The net migration rate does not distinguish between economic migrants, refugees, and other types of migrants nor does it distinguish between lawful migrants and undocumented migrants (CIA, 2012a).

Botswana, Namibia, Swaziland and Zimbabwe has net immigration rates and Lesotho, Mozambique, South Africa has net emigration rates. This is indicative of the large scale circular migration, of mostly economic migrants, taking place between states. Zimbabwe's high immigration rate is indicative of the large number of people working in neighbouring states entering and leaving multiple times throughout the year. The immigration rate is also influenced by the number of deportations from neighbouring countries as these are documented while the exit from the state was mostly undocumented and illegal. South Africa's net emigration rate is a reflection of the large number of people entering the country in search of economic opportunities and then leaving to visit their homes multiple times a year. Similarly, as in the case of Zimbabwe, the high number of deportations taking place also affects these figures for the same reason. However, these figures could be seen as biased as it does not truly reflect the magnitude of illegal migration that goes undetected and is therefore not reflected in numbers at any stage. This is on the other hand still a significant indication of current migration patterns in the region (see Appendix A Table A.1).

• **Infrastructure:** Infrastructure such as human settlement, industry, electricity and transportation are all affected by an increase in extreme weather events associated with climate change. Risks include flooding and landslides due to intense rainfall; strong winds, droughts and sea level rise. Urban areas will face increasing population pressure, as individuals living in marginal areas may be forced to migrate to cities, where infrastructure is already approaching its limits, especially for housing. Currently only in South Africa and Botswana more than 60 percent of the population lives in urban areas and for the other states this figure is below 40 percent. The rate of urbanisation is currently still below four percent in all states (see Appendix A Table

A.1). However, this is anticipated to change as the impact of climate change becomes more severe in rural areas.

Moreover, climate change could further deplete biomass energy resources as the demand for energy and building materials grows. The combination of urban population pressure and decreasing water supply in catchment areas will reduce stream flow, which in turn limits hydropower production and the industrial productivity that depends on energy. Management of pollution, sanitation, waste disposal, water supply and public health, and the provision of adequate infrastructure in urban areas, will become more difficult and costly within a changing climate. The indicators include power rationing and black outs, the emergence of slums and shantis in urban areas, and collapsed bridges (NEPAD, 2008: 8).

4.4 THE CURRENT STATUS AND APPROACH TO BORDER INTEGRITY AND SAFEGUARDING OF SOUTHERN AFRICAN STATES

Modern African states were created by outsiders and held in place first by colonialism and then, during the Cold War, by superpower rivalry and this is also true for Southern African States (Cilliers, 2009: 11). Most African boundaries were established during the late 1800s, when Great Britain, France, Belgium, and Germany scrambled to secure their claims to the African continent (Herbst, 1989: 673). The boundaries in Africa are often characterized as artificial and arbitrary on the basis of the fact that they do not respond to what people believe to be rational demographic, ethnographic, and topographic boundaries, however, borders are always artificial because states are not natural creations (Herbst, 1989: 692).

Initially the borders were drawn without respect for social and linguistic groupings and because the colonial and postcolonial political authorities charged with maintaining the borders have been weak or absent. Further, two international organizations that seem completely unrelated, the Berlin Congo Conference of 1885 (composed of representatives from the major Western nations of the time) and the Organization of African Unity (composed of representatives from each majority-ruled country on the continent), have been instrumental in establishing the decision-making rules that created the boundaries and promoted their stability (Herbst, 1989: 673). However, the borders demarcated by 1904 firmly established the outline of the

boundary system that is used in Africa today (Herbst, 1989: 674) as well as in Southern Africa.

Because of the artificiality of these boundaries, each independent African state is made up of a whole host of different ethno-cultural groups and nations having different historical traditions and cultures and speaking different languages (Herbst, 1989: 675). It is unlikely that the political geography of Africa or the nature of national loyalties will change to such a degree that African leaders will feel compelled to make significant boundary changes (Herbst, 1989: 691) and this also holds true for Southern Africa.

After independence all the Southern African states retained their borders as demarcated during the colonial period and their borders are now addressed in their constitutions as part of maintaining the sovereignty of the states. All states also have policy and legislation regarding border safeguarding and control, immigration and international trade and tourism. There are also regional agreements regarding cooperation wrt trade, tourism, resources, transnational crime etc. However, the implementation and execution is not always done effectively in all states and the border safeguarding environment is often plagued by corruption and other criminal activities.

The detail regarding the physical borders of Southern African states are summarised in Table A.2 in Appendix A. From this information it is clear that all the states have vast land borders with several neighbouring states and in the case of South Africa, Namibia and Mozambique it includes vast coastlines and territorial waters as well. These vast land and sea borders with the accompanying airspace are very difficult to effectively control for all states as they lack resources and capacity. The naval capacities of South Africa, Namibia and Mozambique are too small to adequately patrol and control all maritime borders effectively. Most official ports of entry including border posts, international airports and ports are mostly relatively effectively controlled although plagued by corruption. However, the vast land borders between official border posts are difficult to patrol and to control effectively and this also holds true for the vast airspace along state borders.

Although there have not been any serious conflict between South Africa and its neighbouring states there are however a few border disputes and issues that affect border integrity and safeguarding in the region. These issues have the potential to become major issues and disputes in the future due to the impact of climate change on human security in the region.

During 2006, the Swazi King's advocates resorted to the ICJ to claim parts of Mpumalanga and KwaZulu-Natal from South Africa. There is also a managed dispute between South Africa and Namibia over the location of the boundary in the Orange River. Both governments have not signed or ratified the text of the 1994 Surveyor's General agreement placing the boundary in the middle of the Orange River (CIA, 2012d,e,f). There were concerns from international experts and local populations over the Okavango Delta ecology in Botswana and human displacement that forced Namibia to abandon plans to construct a hydroelectric dam on Popa Falls along the Angola-Namibia border (CIA, 2012a,d).

Southern African states especially Mozambique, South Africa and Zimbabwe are transit points and destinations for illicit drugs from South Asia and South America. Illicit drugs are also illegally imported from India through various east African countries and then distributed or transited through Southern African states (CIA, 2012c,e,g).

Zimbabwe is a source, transit, and destination country for men, women, and children trafficked for the purposes of forced labor and sexual exploitation. Some victims of forced prostitution are subsequently transported across the border to South Africa where they suffer continued exploitation. Zimbabwean men, women, and children are subjected to forced labor in agriculture and domestic service in rural areas, as well as domestic servitude and sex trafficking in cities and towns. Children are also utilized in the commission of illegal activities, including gambling and drug smuggling (CIA, 2012g). Southern Africa, especially South Africa, is increasingly becoming an attractive venue for money launderers given the increasing level of organized criminal and narcotics activity in the region and the size of the South African economy (CIA, 2012e).

All Southern African states are host to refugees that were displaced due to conflict on the African continent. The numbers vary between the states and South Africa is the preferred destination for refugees and asylum seekers in the region (CIA, 2012e).

In order to address some of these threats to border integrity and safe guarding different measures have been implemented by different states. Botswana built electric fences and South Africa has placed military personnel along the border to stem the flow of Zimbabweans fleeing to find work and escape political persecution. South Africa has also placed military units to assist police operations along the border of Lesotho, Zimbabwe, and Mozambique to control smuggling, poaching and illegal migration (CIA, 2012a,e).

4.5 CONCLUSION

Form the scientific analysis and predictions it is clear that Southern Africa will experience a wide variety of negative impacts related to climate change. Increases in erratic weather events, higher temperatures and lower and erratic rainfall will negatively affect the entire spectrum of human security of the region.

Already Southern Africa has experienced an increase in inter-annual variability of rainfall over the past 40 years, with more intense and widespread droughts. Floods and droughts in Southern Africa are gradually increasing in number and frequency as well (ACCES, 2011: 20-21). Heavy rainfall events have increased for many of the countries in the region including Namibia and Mozambique, along with changes in seasonality and weather extremes (Adano & Daudi, 2012: 6). It is also predicted that winter rains will decrease, by up to 40 percent in the extreme west (Brown & Crawford, 2009: 9). It is further anticipated that Southern Africa could experience a drying, especially in the south (ACCES, 2011: 38). It can therefore be anticipated that changes in rainfall, especially a reduction in rainfall, will have a profound impact on all Southern African states resulting in increased food insecurity, poverty and reduced development and economic growth.

This predicted negative impact of climate change on human security has the potential to affect the border safeguarding and integrity of all Southern African states.

In the next chapter this anticipated impact on border safeguarding and integrity will be discussed.

CHAPTER 5: THE INFLUENCE OF CLIMATE CHANGE-RELATED HUMAN SECURITY THREATS ON SOUTHERN AFRICAN BORDER INTEGRITY AND SAFEGUARDING

5.1 INTRODUCTION

In a globalized world almost all problems cross borders and environmental issues have long been recognized as among the most international and the most transnational of all (Parsons, 2009: 5). This also holds very true for the Southern African region and what happens wrt the environment in one state does have a direct or indirect impact on its neighbours. Climate change acts as a "threat multiplier" by exacerbating existing vulnerabilities, and must be analysed in relation to the adaptive capacity of those affected (individuals, communities and states), taking account of the wider political, socio-economic and demographic context (ACCES, 2011: 9).

As can be seen from the findings of the previous chapters, climate change has a very complex predicted impact on all the dimensions of human security and a few major key issues in this regard came to light. These issues include urbanisation, migration, environmental degradation and biodiversity loss, water scarcity, spread of diseases, slow onset climate change, economic decline and poverty, criminality and conflict. The potential impact of these issues on Southern African border integrity and safe guarding will now be discussed in the context of the current and predicted threats experienced in the border integrity and safeguarding domain.

5.2 THE INFLUENCE OF PREDICTED CLIMATE CHANGE-RELATED HUMAN SECURITY THREATS ON SOUTHERN AFRICAN BORDER INTEGRITY AND SAFEGUARDING

Urbanisation

As it becomes increasingly impossible to make a living in rural areas, especially from subsistence farming, members from families or entire families would be compelled to move to urban areas in order to look for work and economic opportunities to earn a living. Firstly people will move within states to urban areas but could also directly move across borders to urban areas in neighbouring states, or if unsuccessful in the first instance, later move across state borders.

According to Cilliers (2009) an increased number of Africans are moving to urban areas at a rate of three percent per annum. Although they are currently still dominantly rural, 50 percent of Africans will live in urban areas before 2030. In effect, Africa's urban population will double by 2030 - from a current 373.4 million to 759.4 million. This is more than all the current city dwellers in the West. By 2050 there will be more than 1.2 billion African city dwellers (Cilliers, 2009: 7).

While urbanisation is set to become a major coping mechanism for the impact of environmental stress, urban poverty in Africa is severe, with 66 percent of those in urban areas living in informal settlements and slums. Yet it is not the largest cities that are absorbing new arrivals from rural areas, but the intermediate cities and towns with fewer than 500 000 inhabitants (Cilliers, 2009: 7).

South African cities like Johannesburg, Durban and Cape Town are particularly attractive due to the perceived abundance of available jobs in these centres. Only in South Africa and Botswana more than 60 percent of the population currently lives in urban areas for the other states this figure is below 40 percent. The rate of urbanisation is currently still below four percent in all states (see Appendix A Table A.1). However, the infrastructure restrictions in South African cities can already not absorb the current inflow of migrants.

Urban centres in Southern Africa lack the infrastructure and capacity to deal with an influx of mostly unskilled and poorly educated people. Unmanaged urbanization involving the growth of slums is a major vulnerability for numerous African countries (ACCES, 2011: 31). The economies cannot absorb this oversupply of unskilled labour and as a result poverty levels remain high and people are forced to live in informal settlements or shanty towns on the edges of the cities. This situation makes these people vulnerable to exploitation by criminal syndicates and some also engage in criminal activities out of their own choice.

The poor living conditions in these urban slums or shanty towns also increase the risk of disease outbreaks that spread rapidly and are difficult to bring under control. Other social problems like alcohol abuse, prostitution etc are also rife in these areas further increasing the vulnerability of these marginalised populations. Increased

pollution due to a lack of water and sanitation infrastructure will also contribute to increased environmental degradation that will further exacerbate the situation.

In an urban environment competition for resources and opportunities are concentrated because of the high population density, especially in slums and shanty towns that could lead to large scale conflict and xenophobia especially where different nationalities, religious and ethnic groups live in close proximity to each other. This conflict and xenophobia has the potential to spill over to other urban areas and across state borders. Currently every state in Southern Africa consists of multiple ethnic and religious groups with multiple languages (see Appendix A Table A.1) and additional strain and competition for resources could easily result in conflict between these groups.

Cities are also negatively affected by climate change and in the event of natural disasters and extreme weather events like flooding, cyclones or drought, cannot cope with the large number of affected people and this increases the risk of mass mortality, disease outbreaks and mass migration to safer areas or areas where humanitarian assistance is available. Few governments in Southern Africa have the capacity to deal with urban disasters that affect a vast number of people and the majority of states mostly depend on international humanitarian assistance from aid organisations and NGOs. The GDP in Southern African states is indicative of developing nations (see Appendix A Table A.1) and therefore these states cannot handle major disasters on their own due to a lack of capacity.

Large scale destruction of urban infrastructure and industries due to extreme weather events are difficult to rehabilitate and replace resulting in loss of employment and revenue for these states. Most governments in Southern Africa lack the capital and capacity to replace and repair damage of this nature rapidly. Zimbabwe has the highest population growth rate in the region while all the other states have a population growth rate of less than 2.5 percent (see Appendix A Table A.1). However, the economies of most Southern African states cannot adequately provide for the current population growth rates with the result that a vast section of the population in the region remains poverty stricken and vulnerable.

Although urbanisation has a limited direct affect on border integrity and safeguarding the indirect effects of urbanisation impact directly on border integrity and safeguarding. As urbanisation accelerates due to climate change it can be anticipated that the impact will accelerate proportionally and affect border safeguarding and integrity.

Migration

Metha (2013) from the IOM highlights that migration is the single most important consequence of the climate change-induced impact on human security and also has the anticipated most profound impact on border integrity and safeguarding of states. Mixed migration flows are set to increase proportionally to the increasing impact of climate change on human security. As previously mention migration normally starts with the movement of people from rural areas to urban areas within a state but it can also mean the move from a rural or urban area in one state to a mostly urban destination in another state. Movement could be to neighbouring states, states on the same continent or even destinations on other continents.

Migration especially across borders does not always have a negative influence on human security as is the case of skilled labour migration. These skilled individuals contribute to the economy and capacity of their host destination. At the same time remittances send home to family members in their country of origin also assist in alleviating poverty. However, skills gaps are left in the areas of origin especially if they have scarce skills that are not easily replaced. These skills gaps in the area of origin can have a negative impact on economic growth and capacity in that specific area.

Unfortunately the positive impact of skilled labour migration is mostly cancelled by the higher numbers of unskilled labour migration, especially if it is across borders. Unskilled labourers are more likely to cross borders illegally and find it difficult to find employment at their destination, often resulting in them resorting to being involved in criminal activities or being recruited into criminal syndicates.

Human smugglers assist migrants without the financial means and documents wanting to cross borders and are operating in well organised groups and syndicates

along borders. Human smuggling on its own is a criminal activity and also co-insides with human rights abuses and other criminal acts that are committed in the border environment.

Human trafficking is a form of migration taking place within states and across state borders. Human traffickers recruit people under false pretences and promises of legitimate job opportunities like waiters in restaurants or domestic workers at the destination and then often sell them into prostitution or domestic servitude. Victims of human trafficking often cross borders illegally without appropriate documentation. Human traffickers normally work in syndicates with far reaching networks that can involve several states and even states on other continents. Metha (2013) also warns that with increased migration the risk for exploitation by human smugglers and human traffickers increase as well.

Forced migration normally takes place after a sudden extreme weather event such as a major flood or cyclone or conflict. If the only safe area is across a state border then migration will take place in that direction. Normally these type of migrants are called environmental refugees when they cross state borders.

The negative impact of migration does not only affect the border safeguarding environment but national security within a state. The result of migration is often that people of different nationalities, religious and ethnic groups are living in very close proximity to each other and compete for scarce resources and opportunities with each other and with the poverty stricken members of the local population. This can result in conflict that can escalate into xenophobia with a definite impact on national security of the host nation. Unemployment rates are currently quite high in Southern African states resulting in large numbers of the populations living below the poverty line (see Appendix A Table A.1).

In the region South Africa is often the destination of choice for migrants due to the perception that there are a lot of job opportunities, especially in large urban centres. South Africa is also a transit state for migrants wanting to reach other continents such as America and Europe.

It is important to note that illegal migration into South Africa affects terrestrial, air and sea borders. Different routes and methods of transport and movement are used by the migrants and syndicates very quickly adapt their modus operandi if law enforcement becomes problematic to their activities.

Environmental Degradation and Biodiversity Loss

Environmental degradation and biodiversity loss have a definite impact especially on the rural population and can increase poverty levels and make subsistence farming difficult for sustained food security. This can lead to an increase in poverty that would result in the migration of these populations to areas where they perceive better opportunities to be available.

Environmental degradation and biodiversity loss can also affect the distribution and range of endemic diseases and disease vectors that can have a negative impact on human health, livestock and crop production. This can also on a national level have a negative impact on agricultural production that will have a negative impact on the national economy and food security of a state. This in turn will increase national poverty levels and in the absence of adequate social programs and capacity lead to migration across borders, criminal activities as well as conflict and insecurity.

In areas close to national parks, marine conservation areas and trans-frontier parks it can be anticipated that all forms of poaching and illegal harvesting of natural resources will increase and that trans-border activities of this nature will increase in these areas. Poaching, including marine poaching and unsustainable hunting and utilisation of natural resources, are already a current environmental issue especially in Mozambique, Namibia, South Africa, Swaziland and Zimbabwe (see Appendix A Table A.1 and Box 5.1).

It can also result in conflict when people in an area are forced to compete for diminishing scarce resources. This competition and conflict can be across borders or spark migration across borders.

Water Scarcity

Water scarcity is anticipated to have an influence on the region. A lack of water will have a direct negative impact on agricultural production and food security. It will also have a negative impact on industrial development and production especially where hydro-electricity generation is concerned. It will therefore cause economic decline and contribute to poverty which in turn will contribute to migration and other negative coping mechanisms. It could also lead to conflict and border conflict where a water source forms a border between states or communities now competing for maximum access to the same limited resource. Water scarcity will also contribute to disease outbreaks that could spread across borders.

Spread of Diseases

As it was previously mentioned, as the environment is altered and temperatures become warmer, both diseases and disease vectors could spread to areas that were previously unaffected. The range and distribution of endemic diseases is anticipated to change dramatically affecting larger numbers of people. With the movement of people across borders by various transport methods, the risk of cross border spread of diseases and vectors, remains a daily hazard and is set to increase in the future. There is also the risk of the introduction of diseases and disease vectors from other continents through the legal and illegal movement of humans, animals, plants and contaminated products.

Slow Onset Climate Change

Slow onset climate change goes mostly unnoticed and unidentified but has a profound long term impact. Especially rural subsistence farmers are severely affected. The environment changes slowly year on year and crop yields and livestock production becomes less every year, increasing poverty year on year. In the end affected populations start competing for diminishing resources that could spark conflict and it also result in an increased number of people migrating in search of economic opportunities. Populations affected by slow onset climate change experience a downward spiral into poverty that is difficult to avoid or break free from.

Gradual environmental change includes processes such as desertification, reduction of soil fertility, coastal erosion, and sea-level rise (ACCES, 2011: 28-29). Overall, a much larger number of people are expected to migrate due to gradual deterioration of environmental conditions rather than natural disasters, even if, in most cases, their fate does not catch the headlines. In many parts of the world, environmental degradation and natural disasters combined can have devastating effects, as seen in Eastern Africa where heavy rain that often follows drought seasons can lead to flash floods. Populations exposed to such cumulative vulnerabilities are particularly at risk (ACCES, 2011: 28-29).

Economic Decline and Poverty

The effects of climate change affect all dimensions of human security that results in national economic decline and poverty in states. More pressure is placed on governments to address the socioeconomic impact on the poorest portion of the population but developing nations like Southern African states find it difficult to mitigate the impact successfully. Often the socioeconomic impact is not recognised as climate change-induced and programmes does not address the causes and the origin of the causes successfully resulting in temporary inadequate relief for affected populations.

Criminality

In an environment of increasing levels of poverty, high levels of criminality and increased criminal activities often occur, as people become desperate to earn a living and to survive when job opportunities are scarce or pay very poorly. Criminal syndicates often also target poverty stricken communities for exploitation and recruitment. Most criminal syndicate activities are stretching across borders and have the potential to increase in the future and the types of criminal activities will also become more varied and diverse as syndicates expand their activities utilising established routes to increase their businesses.

Conflict

As previously mentioned on several occasions in this chapter, when there is an increase in competition for scarce resources or opportunities there is always the risk of conflict. Conflict can occur within affected communities that could lead to widespread insecurity within a state. The citizens of a state could also become disillusioned by the assistance rendered by their government and turn to revolt against their government. Conflict and insecurity can spark population displacement and migration that could spill across national borders.

The infertile, inhospitable climates created by climate change may prove fertile and hospitable to extremist ideology; inviting to transnational crime; and insuperable to their impoverished, weakened, and disenfranchised inhabitants (Parsons, 2009: 30). Climate change and other environmental phenomena have not yet caused major wars, but low-level regional conflict is an increasing possibility (Parsons, 2009: 31). Furthermore, climate change, by redrawing the maps of water availability, food security, disease prevalence and coastal boundaries, could increase forced migration, raise tensions and trigger new conflicts (Brown & Crawford, 2009: ii).

Although very few border disputes have occurred in Southern Africa to date and did not lead to conflict, it could in future become more intense and could become more difficult to resolve, especially if claims are laid to scarce resources in border areas.

5.3 THE CURRENT AND PREDICTED THREATS THAT COULD MANIFEST IN THE BORDER SAFEGUARDING ENVIRONMENT

The possible influence of climate change-related human security threats on Southern African border integrity and safeguarding was discussed above and it is important to compare it with the current threat patterns that occur along South Africa's borders. In Box 5.1 some of the most prominent crime areas in the border safeguarding environment have been summarised (Grundling, 2013). These crime areas are all not necessarily related to climate change-related human security threats, but have the potential to be amplified and escalated by the impact of climate change. Earlier in this Chapter and in Chapter 4, trans-boundary and trans-national criminal activities that can be amplified by the vulnerabilities caused by climate change were

highlighted and as can be seen in Box 5.1, some of these activities like drug smuggling, environmental crime, animal and stock theft, wood theft, trafficking in human beings and animal poaching, are currently already taking place along South Africa's borders. It can be anticipated that these criminal activities will increase and expand as the impact of climate change on the region becomes more profound in the future.

BOX 5.1: Current Identified Crime Areas In The South African Safeguarding Environment

The following crime areas have been identified in the current border safeguarding environment by the SANDF. Only those that occur most often are listed:

- Corruption
- Crimes against children
- Cybercrime
- Drugs
- Environmental crime
- Financial crime
- Firearms
- Fugitive investigations
- Animal and Stock theft
- Wood theft
- Maritime piracy
- Organized crime
- Pharmaceutical crime
- Terrorism
- Trafficking in human beings
- Trafficking in illicit goods
- Vehicle crime
- Works of art
- Animal poaching
- Etc

Source: Interview with Col A. Grundling (SANDF Joint Operations Division) February 2013

In Box 5.2 the trend analysis of threats manifesting in the border safeguarding environment of South Africa is listed. This analysis was done since 2003 and these trends are predicted to continue to manifest and some aspects will be amplified and escalated by the impact of climate change in the future. These current threat trends are not only related to climate change-related human security threats.

In Box 5.3 the possible impact of the threat trends on the internal security and socio-economic environment are summarised. As can be seen from Boxes 5.1 and 5.2,

migration and related activities are already a concern and as previously predicted could increase in the future. Environmental crime that includes poaching in all forms already occur across the South African border and it is anticipated that it would increase significantly in the future as wildlife resources in neighbouring countries become over exploited and even extinct.

BOX 5.2: Current Threat Trends In The South African Border Integrity And Safeguarding Environment

- **Cross border human population migration (mixed migration flow)**:
  Due to:
  - Socioeconomic factors
  - Food insecurity
  - Disasters (natural and manmade)
  - Insecurity / instability
  - Humans security threats
  - Demographic changes (youth bulge)

  Manifesting as:
  - Undocumented migrants
  - Stowaways (all forms of cross border transport)
  - Illegal and legal immigration
  - Legal / illegal migrant workers
  - Human trafficking/ smuggling

- **Cross border animal migration**:
  - Natural and forced migration of wildlife
  - Illegal cross border grazing of livestock
  - Stock theft
  - Illegal trade in wildlife
  - Trends amplified by extreme weather events and insecurity / instability

- **Cross border spread of animal, plant and human diseases due to cross border movement:**
  - Infectious and communicable human diseases
  - Zoonotic diseases
  - Animal diseases of economic importance
  - Crop (plant) diseases of economic importance
  - Cross border spread of disease vectors and plant and animal pests

- **Spread of global diseases through modern transport methods and the global legal and illegal trade in animals, plants and related products**.

- **The impact of climate change:**
  - Increase in extreme weather events / natural disasters
  - Increase in levels of malnutrition
  - Increase in food insecurity
  - Increase in disease outbreaks
  - Increase in population migration
  - Changes in the occurrence and distribution of diseases and disease vectors
  - Increased threats to human security

BOX 5.2: Current Threat Trends In The South African Border Integrity And Safeguarding Environment (continuing)

- **Cross border movement of hazardous cargo by all transport methods:**
  - Possible accidents / incidents
  - Environmental contamination

- **Illegal trade in fake and contraband medication (animal and human consumption):**
  - Increase in drug resistant diseases
  - Increased disease mortality rates
  - Increased rate in the spread of diseases

- **Transnational Criminal Activities:**
  - Can be related to international syndicates or individual localised groupings.
  - Smuggling:
    - Small arms and munitions
    - Explosives
    - Mining products (minerals, precious metals, diamonds, copper cable, non-ferrous metals, etc)
    - Illicit Drugs
    - Humans and human organs and body parts
    - Wildlife and wildlife products
    - Other commodities eg cigarettes, food and agricultural products

- **Trafficking**:
  - Humans
  - Other commodities

- **Other Criminal Activities**:
  Cyber Attacks
  Corruption at ports of entry
  Criminal Warfare
  Environmental crimes
  Vehicle theft
  Terrorism
  - Safe zones
  - Transit
  - Acts of terrorism

- **Maritime criminal activities:**
  - Piracy
  - Marine poaching
  - Marine resource plundering
  - Illegal fishing
  - Smuggling/ trafficking
  - Illegal transit / shipping traffic
  - Shipping accidents / pollution
  - Unlicensed/ unregistered vessels

BOX 5.2: Current Threat Trends In The South African Border Integrity And Safeguarding Environment (continuing)

- **Air space related criminal activities**:
  - Illegal entry into RSA
  - Poaching
  - Illegal landing at unauthorised / private landing strips
  - Smuggling/ trafficking
  - Illegal transit / air traffic
  - Accidents / pollution
  - Unlicensed/ unregistered aircraft

Source: Author's own analysis done since 2003 as Military Intelligence Officer in the SANDF.

BOX 5.3: Potential Impact Of Current Threats Trends On South African Border Integrity And Safeguarding

- Clustering of cross border migrants in areas where resources are available or supplied
- Insecurity and xenophobia due to the competition for resources
- Increase in criminal activities
- Increase in urban slums with health and humanitarian implications as well as security implications
- Increase in the number of street and vulnerable children within South Africa
- Disease outbreaks affecting humans, animal and crops
- Increase in the distribution patterns of diseases and disease vectors
- Introduction of global diseases eg H1N1 pandemic influenza
- Environmental contamination to the detriment of human and animal health and wellbeing.

Source: Author's own analysis done since 2003 as Military Intelligence Officer in the SANDF.

Furthermore, theft of livestock, animals and wood already occur in the border environment and as biodiversity loss due to climate change increases, it can be expected that these kinds of theft will also increase. However, these resources are directly related to the livelihoods of communities and could spark cross border conflict during events of theft.

All criminal activities currently occurring in the border safeguarding environment can be anticipated to increase as the impact of climate change negatively affect human security of populations within Southern Africa, as increased levels of poverty and

limited economic opportunities would make people vulnerable to exploitation of criminals or cause them to choose criminal activities in order to earn a living. Although most activities affect the border safeguarding environment it also has the potential to affect internal stability and security through all the impacts as previously mentioned.

5.4 CONCLUSION

As can be seen from the above discussions, border safeguarding and integrity in South Africa can be affected by a number of climate change-related human security threats, of which migration with its related impacts is anticipated to have the most profound effect. Throughout history, migration has been used as a coping strategy in the face of environmental change (ACCES, 2011: 28) and environmentally induced migration has the potential to become a phenomenon of a scale and scope not experienced in human memory. Its effects on the global economy, international development, and national budgets could have significant implications for almost all dimensions of human security, in addition to political and state security (UNU-EHS, 2008: 5).

Furthermore, food and water shortages, health crises, population displacement (rural-to-urban and across borders), resource and territorial conflict, damage to infrastructure, and greater poverty (real and comparative) are likely to erode confidence in governments too weak or too poor to ameliorate these conditions (Parsons, 2009: 29). The high cost of migration and the lack of education/information/networks concerning the possibilities for international migration explains why most analysts predict that the majority of environmental migration will be internal or to bordering countries (ACCES, 2011: 28).

As can be seen from these discussions, Southern African states are faced with overwhelming climate change-related human security threats and needs to take pre-emptive action in order to try and adapt to and mitigate these threats. Recommendations to this effect will be discussed in the next chapter.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

In the previous chapters the predictions and possible impact of climate change on human security and the border integrity of South Africa was discussed. The most profound issues that will have an impact on South African border integrity and safeguarding include urbanisation, migration, environmental degradation and biodiversity loss, water scarcity, spread of diseases, economic decline and poverty, criminality and conflict. Migration can be singularly highlighted, as it has the potential to amplify and exacerbate all of the abovementioned issues.

States have national security strategies and policies in order to guide policy and legislation to adequately protect the state from threats and to determine national security priorities. Border safeguarding is an important aspect of state security and strategy, policy and legislation, informed by the national security strategy and policy, constantly has to evolve and adapt to changes in the threat pattern affecting states.

The recommended approach and interaction between science, security strategy and policy, to ensure effective border safeguarding and integrity within an environment of climate change and related threats to human security, will now be discussed.

6.2. CONCLUSION

The border safeguarding environment of any state is very complex and faced with multiple external and international threats. Climate change-related human security threats will further amplify and complicate these threats as the impact of climate change becomes more pronounced in the Southern African region. In order for South Africa to successfully address these threats in the border safeguarding environment it is important that a sound National Security Strategy and Policy provide focus and priorities for all government departments involved.

Border safeguarding is an interdepartmental and multinational issue that needs to be addressed in these spheres to ensure cooperation and integration to ensure effective execution of policy and legislation. Climate change is a very dynamic ever changing phenomenon full of uncertainty and it is important that all policy and legislation also

be very flexible and evolves with the changes to stay effective and to have a degree of pre-emptive action.

Climate change impacts on entire regions and should be addressed in this context as no state alone will be able to effectively deal with climate change-related human security threats in total isolation. Furthermore, in this constantly changing and uncertain environment, continuous integrated multidisciplinary research will be essential to support pre-emptive action and government direction to secure the sovereignty of the state through effective border safeguarding.

6.3. RECOMMENDATIONS

Since the late 1970s climate change as a security threat slowly emerged but little attention was given to this issue in contrast to other security threats emanating from the "Cold War" era. However, as the profound impact started to manifest in all spheres of state security, it became clear that this matter should be adequately addressed. At the same time human security became an important issue and started to be included in national security strategies and policies. The impact of climate change cuts across all spheres and all departments of governments and governance and should therefore be addressed in a co-ordinated way within states and regions in order to ensure the best adaptation and mitigation for the future.

In Box 6.1, five policy recommendations by the UNU-EHS are summarised and these are important aspects that should be taken into account when national security strategy and policies are formulated.

BOX 6.1: UNU-EHS Policy Recommendations

In order to address the impact of climate change on all dimensions of a state and a region the UNU-EHS (2008) has five policy recommendations. These five recommendations are as follows:

- **Building a strong scientific basis**. As the window for identifying appropriate adaptation pathways for climate change narrows, it is imperative to address how changing environmental conditions affects individuals and group decisions to migrate. Robust definitions are needed for environmentally induced migrants and people displaced by environmental push factors. These definitions can facilitate identification, measurement, characterization, and appropriate policy responses. A new level of policy and scientific attention to this issue is required to identify the policy alternatives which smooth the way forward and avoid tensions or even conflict over natural and social resources.

BOX 6.1: UNU-EHS Policy Recommendations (continuing)

- **Increasing awareness**. Knowledge about environmental degradation and climate change can arm governments, migrants, and potential migrants against losses in human security. At the national level, countries must understand how environmental processes and environmental quality affect living standards of their populations. As some environments become inhospitable to people, people will be pushed to move elsewhere where their locally specific knowledge may no longer apply to the places where they migrate. Displaced people may not always receive the support they need in places of destination. For those displaced to locations where adequate infrastructure is not available and where they are directly dependent on the environment for survival, there can be an over-exploitation of natural resources leading to a lack of potable water, soil degradation, cutting of trees and clearing of land, but also to pollution and potential epidemics. Under such circumstances, a range of maladaptive activities can drive migrants to further stress ecosystems, and may unleash a number of secondary environmental catastrophes. Awareness can help avoid maladaptation.
- **Improving legal frameworks**. At the regional level, multilateral dialogue may be necessary about how to address, coordinate, and ease environmental pressures as well as migration that results in part because of climate change. Policy and legal frameworks need to address environmentally induced migration. Frameworks must be established for dealing with individuals and groups induced to migrate because of environmental change. There is still active debate about including 'environmentally induced migrants' within international treaties or developing a new international convention that would recognize individuals or communities whose displacement is mainly by environmental factors.
- **Adequate humanitarian response**. Gradual and sudden environmental changes will result in substantial human movements and displacements, and these situations will require sufficient and timely humanitarian efforts to avoid escalating crises. It is essential to enable organizations such as the UNHCR, the IFRCRC, and the IOM to effectively fulfill their mandates in helping different parts of the population of people on the move. Natural disasters may displace larger numbers of people for relatively short periods of time, while the steady and continuous impact of climatic drivers are likely to permanently displace many more people in a less visible way. In the face of environmental stressors, people in Egypt Mozambique and the Mekong Delta have already adapted by migration and will do so in the future.
- **Strengthening institutions and policies**. Institutions in both source and receiving countries should work together to ensure safe, non-criminal, and orderly migration relations. The magnitude of future environmentally induced migration depends in part on longer term environmental and development policies. Scenarios might estimate a large range: from a very large amount of environmentally induced migrants if both environmental and development policies fail massively, such as a failure to meet the Millennium Development Goals and a simultaneous failure to reduce greenhouse gas emissions contributing to climate change—to a small number of environmentally induced migrants if favourable intervening variables such as improved risk management ameliorate the necessity of moving. The time to address the effects of dangerous environmental change including climate change is now. Action must be concerted and swift: Policy makers, the scientific community, civil society and other actors must seek solutions for those people who are currently migrating and who may be induced to migrate in order to seek safe and sustainable existences. Human security requires freedom from fear, freedom from want, and freedom from hazard impact. Most importantly, achieving human security in the face of environmental change requires urgent policy attention and action *today*.

Source: (UNU-EHS, 2008: 7-8)

Sound science should be used as baseline for creating future climate change scenarios that could be expected to manifest in the region and the impact on human security should also be adequately researched in order to provide direction and prioritisation during the determination and adjustment of national security strategy.

Knowledge should be shared between the various expert disciplines to increase awareness and improve the effectiveness and appropriateness of strategies and policies being created to best address the predicted human security threats due to climate change. Strategy and policy should be informed by science and a multi-disciplinary approach should be followed. By following this approach policies and institutions could be strengthened to better address the predicted future challenges.

Predicted climate change scenarios would assist with pre-emptive policy formulation and adaptation direction as well as contingency planning for all possible events and occurrences in the future. Contingencies can then address all aspects ranging from slow onset climate change impacts to sudden large scale disasters with mass migration and displacement.

Establishing legal national and regional frameworks addressing the human security threats related to climate change is essential to manage these threats within the Southern African region. South Africa should also play a strong role, nationally and internationally, especially in Africa and the SADC region, regarding the mitigation of climate change and should also build partnerships with neighbouring states in order to collectively assist each other in order for the region to adapt effectively to climate change. Grundling (2013) also indicated that an ideal opportunity for South Africa would be to play an active role in SADC's border management committee and use this platform to address climate change-related human security threats in the region.

SADC also made provision in its Strategic Indicative Plan for the Organ (SIPO) for disaster risk reduction/management, however, this is an under-developed instrument that might become much more important in future. As was previously mentioned, Southern African states could experience an increase in extreme weather events and erratic weather that implies an increase in natural disasters, which necessitates the need for a co-ordinated disaster risk reduction and mitigation system. South

Africa should also become actively involved in this instrument as it can play a crucial role in the future to improve resilience wrt natural disasters in the region (SADC, 2010: 59).

Closely related to the establishment of legal national and regional frameworks is the establishment of adequate humanitarian response contingencies with links to the regional and international humanitarian community. None of the Southern African states included in this research are financially and economically strong enough to absorb the additional financial burden of mitigating these human security threats and adapting to climate change in general at the same time. A lack of adequate humanitarian assistance could have far-reaching effects as it places additional strain on already strained natural resources and could lead to localised insecurity and mass migration to other areas increasing again the strain in these areas.

Brown & Crawford (2009) also highlight that it is non-climate factors such as poverty, governance, conflict management and regional diplomacy that will largely determine whether and how climate change moves from being a development challenge to presenting a security threat (Brown & Crawford, 2009; 2). It is therefore important that the correct approach is followed with legislation and policy to ensure that the threats to border safeguarding and security are effectively addressed to reduce the risks to internal security and stability

From the discussions in the previous chapters it became clear that also within the South African context environmentally induced migration is an issue of increasing policy relevance, because of inherent uncertainties and the potential magnitude and scope of this phenomenon (UNU-EHS, 2008: 5). Climate-related stressors combined with ecosystem change, such as sea level rise and rapid-onset events such as flooding, have the potential to drive migration or prompt national governments to plan for the relocation and resettlement of affected populations (UNU-EHS, 2008: 5).

Adaptation policies and programs, if implemented effectively and at multiple scales, could help avert the impacts of climate change becoming triggers for conflict. It is also crucial that adaptation must take into account existing social, political and economic tensions within the region and internally within South Africa and avoid

exacerbating them. The often thin line between security and insecurity and between stability and instability, will be determined by three broad factors:

• the extent and speed of climate change (structural conditions);

• the ability of countries and communities to adapt to those changes (institutional capacity); and

• how individuals, communities and governments react to the challenges that arise (responsiveness) (Brown & Crawford, 2009: 2).

All Southern African states are party to and signatories of most of the major international environmental agreements including those related to climate change, but the actual implementation and monitoring thereof remains limited due to a lack of capacity and resources (see Appendix A Table A.1).

Hoste (2009) also indicated that repeatedly in the international arena the need for a multifaceted and multilayered approach to climate change have been highlighted. Although this approach is not easily translated to policy, that is exactly what will be needed namely, a case by case evaluation of the underlying political, economic and social contexts to determine in what way climate change is exacerbating existing problems and how they can be remediated (Hoste, 2009: 4).

In order to ensure human security, peace and stability, not only are pro-growth policies needed, but also redistributive policies anchored on positive relationships between human and regime security, or a positive alignment between political incentives and good economics (Sharamo & Ayangafac, 2011: 4).

South Africa's border safeguarding strategy, policy and legislation should be directed by the National Security Strategy and policy. Two key pieces of policy and legislation needed in this environment is foreign policy and legislation as well as migration policy and legislation. As was previously mentioned, migration across national borders and its associated risks have the most potential risks to influence South African border safeguarding and integrity in the future and should be adequately addressed, especially through foreign and migration policy and legislation. These

policies and legislation will then in turn inform border safeguarding policy and legislation and direct all the government departments involved with this tasking.

Furthermore, according to analysts, climate change, by redrawing the maps of water availability, food security, disease prevalence and coastal boundaries, could ultimately increase forced migration, raise tensions and trigger new conflicts. This resulted in a new foreign policy priority and a perceptible shift in the way that a growing number of decision-makers in the North and the South are talking about the subject (Brown & Crawford, 2009: 1). It is therefore essential that climate change become a core foreign policy priority for South Africa as well. It will be important for South African foreign policy to address these issues. South Africa should have an active pre-emptive approach to ensure regional co-operation and mitigation to assist with a regional approach to address the human security threats related to climate change.

Because climate change and the impact thereof has a global origin and a regional impact it is clear that the challenge of climate change is one that is beyond the capacity of any one country to tackle. Ultimately, its shared developmental and security implications will be best resolved through cooperation at a myriad of levels including cooperation to develop comprehensive international strategies to manage migration, to share the most innovative approaches for adaptation, to administer shared resources and to cope with insecurity (Brown & Crawford, 2009: iii).

Throughout the world immigration and migration policies require rethinking. Closing out immigrants may be of marginal effectiveness and, particularly for developed countries, morally difficult to sustain since it is their emissions that will have caused the problem. A potentially more effective and respectable policy option would be controlled acceptance and resettlement of immigrants and promotion of racial tolerance domestically (Barnett, 2003: 12).

Existing patterns of 'environmental refugees' may also be indicative of the places from where climate migrants might emerge as these represent movements from areas already under environmental stress, and therefore susceptible to further stress due to climate change. For countries already dealing with large influxes of migrants

like South Africa, and for those likely to receive increasing numbers of migrants (like South Africa) as a consequence of climate change, forward looking assessments and forward planning for climate immigrants should be a policy priority (Barnett, 2003: 12). Carefully timed acceptance of immigrants from climate sensitive areas from an early stage can ease adaptation for immigrants and host communities alike (Barnett, 2003: 12).

Currently there is no obligation under international law for states to shelter those who are displaced across borders by disasters or processes linked to climate change (Bradley & McAdam, 2012: 4). However, this aspect should be addressed in policy and legislation in the future to ensure an orderly response, should such an event occur that affects South Africa's border integrity.

Metha (2013) also highlighted the importance of applicable migration legislation in order to address this phenomenon within the ambit of the law. Especially legislation addressing crimes associated with migration, for example human trafficking, is essential in order to successfully address this threat and punishment must be in line with the seriousness of this crime. It is also important that South Africa becomes a signatory to international treaties in this regard as well as have ties with international bodies addressing these threats as they can provide assistance and expertise to address these threats in the South African context. International NGOs can also assist states with limited resources with funding to assist victims of human trafficking and repatriate them to their countries of origin and assist with the legal prosecution of perpetrators.

South Africa also would have to seriously rethink its immigration and migration policy and legislation, hand in hand with a changed foreign policy approach. Security can also serve as an integrative concept which links local (human security), national (national security) and global (international security) levels of environmental change and response. It also integrates mitigation and adaptation as both are essential to security from climate risks (Barnett, 2003: 14-15).

As previously mentioned, none of the Southern African states addressed in this research has the capacity to continue to absorb large numbers of migrants,

especially unskilled migrants, due to already existing natural resource stress and high levels of poverty. South Africa is no exception and already has reached a saturation point for unskilled migrants. The economy and infrastructure are already strained and local governments and government departments find it difficult to render adequate services especially in remote rural areas. Service delivery protests already has become a daily occurrence and xenophobic sentiments are becoming more pronounced where poverty stricken citizens perceive foreigners as competing with them for resources and employment opportunities. These occurrences could increase internal insecurity to the detriment of economic growth within South Africa.

South Africa would have to move towards a tougher immigration policy and legislation to reduce the number of people flowing into the country and increasing the strain on infrastructure and resources that could incite spiralling and escalating incidents of xenophobia in the future, especially when the impact of climate change becomes harsher locally as well. Unfortunately natural resources, especially water and arable land, limit the number of people that could be adequately sustained within a region. Technological advances can temporarily bring relief but not significantly increase the number of people that can be sustained indefinitely.

However, hand in hand with a tougher immigration policy will have to be foreign policy that focuses on regional methods and co-operation to address the climate change-related threats within neighbouring states to prevent these populations from migrating across borders. Assisting affected populations to mitigate the effects of climate change in order to sustain their livelihoods would reduce the number of people forced to migrate in order to survive. Foreign policy should also have an international focus in order to obtain access to new technology development and to foster global co-operation networks to assist regional mitigation and adaptation programmes.

In the South African border safeguarding context more that 17 government departments are involved with various roles and shared and unique responsibilities. Each department has its own governing legislation and related policies. However, in the absence of clear national security policy and strategy these various policies and legislation are not fully co-ordinated and human security threats related to climate

change are not adequately addressed. Climate change is mostly addressed in environmental policies and legislation with little reference to the security impact as a result in other spheres.

Conçalves (2013) indicated that border safeguarding should be informed by pro-active national security policy development. There is fragmentation between the official ports of entry and the actual borderline and therefore border safeguarding objectives and end states should be informed by cross departmental strategy to increase cohesion and co-operation. Unfortunately such a streamlined strategy does not exist yet.

Conçalves (2013) also highlights the need for foresight by using climate change scenarios on a national level to determine risks and anticipated threats and to develop reactions and contingencies to solve these problems. Integrated risk analysis including legal aspects and an understanding of international trends in border safeguarding will also be essential in this process. All risk categories are to be analysed and risk relationships determined including the co-occurrence and risk chains.

There is also an overlap between departmental roles and legislation. Some of this legislation is also fairly old and difficult to read and interpret for example the stock theft act. This make stakeholder management very difficult and these pieces of legislation should be reviewed and updated to be applicable to the current situation.

Data and information should be shared across departments in order to facilitate integrated analysis to support decision making and to inform policy changes when and where needed. The security risks within the South African border safeguarding environment is very complex and require a "whole of government" approach with increased international co-operation.

Grundling (2013) also emphasised the "whole of government" approach to border safeguarding as the only option to fully address the threats to South Africa's border safeguarding and integrity. Activities should be integrated to achieve shared goals. Government already has a cluster approach, however, the Border Management Agency is not fully functional yet and the National Integrated Border Management

Strategy is not fully implemented yet as well. Integrated planning should take place and follow a "top down" approach in order to effectively use resources and multiply capabilities.

Grundling (2013) has indicated that the National Planning Commission's National Development Plan 2030 has an integrated approach to safety and a holistic view of safety and security, however, in other areas this approach is still lacking. Also, this approach has not fully filtered through to all state departments. He also highlighted that South Africa's national Security Strategy/Policy is still in draft format and has not been completed and promulgated yet.

The SANDF plays the lead role along the physical borders and national waters of South Africa between ports of entry and doctrine and policy needs to be informed by the National Security Strategy. Also all responsible Government Departments at the ports of entry need to align legislation and policy according to the National Security Strategy. Furthermore, all these departments should co-ordinate and co-operate to ensure effective border safeguarding with effective boundary management and separation of responsibilities to ensure all aspects are covered without duplication.

The effects of climate change on human security and the impact on border safeguarding is not a static situation and policy and legislation should be reviewed and adapted regularly to stay in line with the changing and unpredictable situation as best as possible.

Parsons (2009) summarised five policy recommendations for the United States Defence environment and these also holds true within the South African context for the SANDF, as one of the role players tasked with ensuring border safeguarding and integrity. South Africa should also fully incorporate the security implications of climate change into national security and national defence strategies in order to inform policy legislation and SANDF doctrine regarding national defence and border safeguarding.

During border safeguarding tasks the SANDF is also exposed to the impact of climate change and could be exposed to sudden natural disasters as well as increasing climate variability. It would therefore also be essential for the SANDF to

adapt doctrine and equipment in order to deal with the challenges of a changing environment in order to still be effective in executing its tasks regarding border safeguarding. The constantly changing threat pattern must also be taken into account in order to act pre-emptively to protect the South African national borders from these threats.

Creating sound policies and legislation to deal with climate change-related human security threats impacting on border safeguarding and security is essential but emphasis must also be placed on implementing and executing these policies and legislation effectively. These policies and legislation must also be understandable and practical to inform actions on the actual borderline and official ports of entry to ensure success. There should also be a formal system of monitoring and evaluation to ensure that execution takes place effectively and that adjustments to changes in the threat pattern are done continuously. This system should also ensure that all departmental tasks are adequately funded by following the correct budgeting and expenditure processes.

APPENDIX A

Table A.1: Southern African States: Basic Indicators

	Botswana	Lesotho	Mozambique	Namibia	South Arica	Swaziland	Zimbabwe
Independence	30 September 1966 (from the UK)	4 October 1966 (from the UK)	25 June 1975 (from Portugal)	21 March 1990 (from South African mandate)	31 May 1910 (Union of South Africa formed from four British colonies: Cape Colony, Natal, Transvaal, and Orange Free State); 31 May 1961 (republic declared); 27 April 1994 (majority rule)	6 September 1968 (from the UK)	18 April 1980 (from the UK)
Climate	semiarid; warm winters and hot summers	temperate; cool to cold, dry winters; hot, wet summers	tropical to subtropical	desert; hot, dry; rainfall sparse and erratic	mostly semiarid; subtropical along east coast; sunny days, cool nights	varies from tropical to near temperate	tropical; moderated by altitude; rainy season (November to March)
Terrain	predominantly flat to gently rolling tableland; Kalahari Desert in southwest	mostly highland with plateaus, hills, and mountains	mostly coastal lowlands, uplands in center, high plateaus in northwest, mountains in west	mostly high plateau; Namib Desert along coast; Kalahari Desert in east	vast interior plateau rimmed by rugged hills and narrow coastal plain	mostly mountains and hills; some moderately sloping plains	mostly high plateau with higher central plateau (high veld); mountains in east

	Botswana	Lesotho	Mozambique	Namibia	South Arica	Swaziland	Zimbabwe
Natural Resources	diamonds, copper, nickel, salt, soda ash, potash, coal, iron ore, silver	water, agricultural and grazing land, diamonds, sand, clay, building stone	coal, titanium, natural gas, hydropower, tantalum, graphite	diamonds, copper, uranium, gold, silver, lead, tin, lithium, cadmium, tungsten, zinc, salt, hydropower, fish ***note:*** suspected deposits of oil, coal, and iron ore	gold, chromium, antimony, coal, iron ore, manganese, nickel, phosphates, tin, rare earth elements, uranium, gem diamonds, platinum, copper, vanadium, salt, natural gas	asbestos, coal, clay, cassiterite, hydropower, forests, small gold and diamond deposits, quarry stone, and talc	coal, chromium ore, asbestos, gold, nickel, copper, iron ore, vanadium, lithium, tin, platinum group metals
Land Use	arable land: 0.65% permanent crops: 0.01% other: 99.34% (2005)	arable land: 10.87% permanent crops: 0.13% other: 89% (2005)	arable land: 6.51% permanent crops: 0.25% other: 93.24% (2011)	arable land: 0.97% permanent crops: 0.01% other: 99.02% (2011)	arable land: 9.87% permanent crops: 0.34% other: 89.79% (2011)	arable land: 10.08% permanent crops: 0.86% other: 89.06% (2011)	arable land: 10.49% permanent crops: 0.31% other: 89.2% (2011)
Irrigated Land	20 sq km (2008)	30 sq km (2008)	1,181 sq km (2003)	75.73 sq km (2003)	16,700 sq km (2012)	498.5 sq km (2003)	1,735 sq km (2003)
Total renewable water resources	14.7 cu km (2001)	5.2 cu km (1987)	217.1 cu km (2011)	17.72 cu km (2011)	51.4 cu km (2011)	4.51 cu km (2011)	20 cu km (2011)

	Botswana	Lesotho	Mozambique	Namibia	South Arica	Swaziland	Zimbabwe
Natural hazards	periodic droughts; seasonal August winds blow from the west, carrying sand and dust across the country, which can obscure visibility	periodic droughts	severe droughts; devastating cyclones and floods in central and southern provinces	prolonged periods of drought	prolonged droughts volcanism: the volcano forming Marion Island in the Prince Edward Islands, which last erupted in 2004, is South Africa's only active volcano	drought	recurring droughts; floods and severe storms are rare
Environment - current issues	overgrazing; desertification; limited freshwater resources	population pressure forcing settlement in marginal areas results in overgrazing, severe soil erosion,and soil exhaustion; desertification; Highlands Water Project controls, stores, and redirects water to South Africa	a long civil war and recurrent drought in the hinterlands have resulted in increased migration of the population to urban and coastal areas with adverse environmental consequences; desertification; pollution of surface and coastal waters; elephant poaching for ivory is a problem	limited natural freshwater resources; desertification; wildlife poaching; land degradation has led to few conservation areas	lack of important arterial rivers or lakes requires extensive water conservation and control measures; growth in water usage outpacing supply; pollution of rivers from agricultural runoff and urban discharge; air pollution resulting in acid rain; soil erosion; desertification	limited supplies of potable water; wildlife populations being depleted because of excessive hunting; overgrazing; soil degradation; soil erosion	deforestation; soil erosion; land degradation; air and water pollution; the black rhinoceros herd - once the largest concentration of the species in the world - has been significantly reduced by poaching; poor mining practices have led to toxic waste and heavy metal pollution

	Botswana	Lesotho	Mozambique	Namibia	South Arica	Swaziland	Zimbabwe
Environment - international agreements	party to: Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Ozone Layer Protection, Wetlandssigned, but not ratified: none of the selected agreements	party to: Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification,Endangered Species, Hazardous Wastes, Law of the Sea, Marine Life Conservation, Ozone Layer Protection, Wetlands signed, but not ratified: none of the selected agreements	party to: Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Ozone Layer Protection, Ship Pollution, Wetlands signed, but not ratified: none of the selected agreements	party to: Antarctic-Marine Living Resources, Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Ozone Layer Protection, Wetlands signed, but not ratified: none of the selected agreements	party to: Antarctic-Environmental Protocol, Antarctic-Marine Living Resources, Antarctic Seals, Antarctic Treaty, Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Marine Dumping, Marine Life Conservation, Ozone Layer Protection, Ship Pollution, Wetlands, Whaling signed, but not ratified: none of the selected agreements	party to: Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Hazardous Wastes, Ozone Layer Protection signed, but not ratified: Law of the Sea	party to: Biodiversity, Climate Change, Desertification, Endangered Species, Law of the Sea, Ozone Layer Protection signed, but not ratified: none of the selected agreements
Population:	2,127,825 (July 2013 est.)	1,936,181 (July 2013 est.)	24,096,669 (July 2013 est.)	2,182,852 (July 2013 est.)	48,601,098 (July 2013 est.)	1,403,362 (July 2013 est.)	13,182,908 (July 2013 est.)
Population growth rate	1.35% (2013 est.)	0.34% (2013 est.)	2.44% (2013 est.)	0.75% (2013 est.)	-0.45% (2013 est.)	1.17% (2013 est.)	4.38% (2013 est.)
Net migration rate	4.68 migrant(s)/1,000 population	-7.89 migrant(s)/1,000 population (2013 est.)	-2.07 migrant(s)/1,000 population (2013 est.)	0.1 migrant(s)/1,000 population (2013 est.)	-6.24 migrant(s)/1,000 population	0 migrant(s)/1,000 population (2013 est.)	22.76 migrant(s)/1,000 population

	Botswana	Lesotho	Mozambique	Namibia	South Arica	Swaziland	Zimbabwe
Urbanization	urban population: 61.7% of total population (2011)rate of urbanization: 2.07% annual rate of change (2010-15 est.)	urban population: 27.6% of total population (2011) rate of urbanization: 3.57% annual rate of change (2010-15 est.)	urban population: 31.2% of total population (2011) rate of urbanization: 3.05% annual rate of change (2010-15 est.)	urban population: 38.4% of total population (2011) rate of urbanization: 3.14% annual rate of change (2010-15 est.)	urban population: 62% of total population (2011) rate of urbanization: 1.21% annual rate of change (2010-15 est.)	urban population: 21.2% of total population (2011) rate of urbanization: 1.19% annual rate of change (2010-15 est	urban population: 38.6% of total population (2011) rate of urbanization: 3.4% annual rate of change (2010-15 est.)
Life expectancy at birth (total population)	54.47 years	52.3 years	52.29 years	52.03 years	49.48 years	50.01 years	53.86 years
HIV/AIDS - adult prevalence rate	24.8% (2009 est.)	23.6% (2009 est.)	11.5% (2009 est.)	13.1% (2009 est.)	17.8% (2009 est.)	25.9% (2009 est.)	14.3% (2009 est.)
HIV/AIDS - people living with HIV/AIDS	320,000 (2009 est.)	290,000 (2009 est.)	1.4 million (2009 est.)	180,000 (2009 est.)	5.6 million (2009 est.)	180,000 (2009 est.)	1.2 million (2009 est.)

	Botswana	Lesotho	Mozambique	Namibia	South Arica	Swaziland	Zimbabwe
Major infectious diseases	degree of risk: high food or waterborne diseases: bacterial diarrhea, hepatitis A, and typhoid fever vectorborne disease: malaria (2009)	degree of risk: very high food or waterborne diseases: bacterial and protozoal diarrhea, hepatitis A, and typhoid fev	degree of risk: very high food or waterborne diseases: bacterial and protozoal diarrhea, hepatitis A, and typhoid fever vectorborne diseases: malaria and dengue fever water contact disease: schistosomiasis animal contact disease: rabies (2013)	degree of risk: high food or waterborne diseases: bacterial diarrhea, hepatitis A, and typhoid fever vectorborne disease: malaria water contact disease: schistosomiasis (2013)	degree of risk: intermediate food or waterborne diseases: bacterial diarrhea, hepatitis A, and typhoid fever water contact disease: schistosomiasis (2013)	degree of risk: intermediate food or waterborne diseases: bacterial diarrhea, hepatitis A, and typhoid fever vectorborne disease: malaria water contact disease: schistosomiasis (2013)	degree of risk: very high food or waterborne diseases: bacterial and protozoal diarrhea, hepatitis A, and typhoid fever vectorborne diseases: malaria and dengue fever water contact disease: schistosomiasis animal contact disease: rabies (2013)

	Botswana	Lesotho	Mozambique	Namibia	South Arica	Swaziland	Zimbabwe
Drinking water source	improved: urban: 99% of population rural: 92% of population total: 96% of population unimproved: urban: 1% of population rural: 8% of population total: 4% of population (2010 est.)	improved: urban: 91% of population rural: 73% of population total: 78% of population unimproved: urban: 9% of population rural: 27% of population total: 22% of population (2010 est.)	improved: urban: 77% of population rural: 29% of population total: 47% of population unimproved: urban: 23% of population rural: 71% of population total: 53% of population (2010 est.)	improved: urban: 99% of population rural: 90% of population total: 93% of population unimproved: urban: 1% of population rural: 10% of population total: 7% of population (2010 est.)	improved: urban: 99% of population rural: 79% of population total: 91% of population unimproved: urban: 1% of population rural: 21% of population total: 9% of population (2010 est.)	improved: urban: 91% of population rural: 65% of population total: 71% of population unimproved: urban: 9% of population rural: 35% of population total: 29% of population (2010 est.)	improved: urban: 98% of population rural: 69% of population total: 80% of population unimproved: urban: 2% of population rural: 31% of population total: 20% of population (2010 est.)

	Botswana	Lesotho	Mozambique	Namibia	South Arica	Swaziland	Zimbabwe
Sanitation facility access	improved: urban: 75% of population rural: 41% of population total: 62% of population unimproved: urban: 25% of population rural: 59% of population total: 38% of population (2010 est.)	improved: urban: 32% of population rural: 24% of population total: 26% of population unimproved: urban: 68% of population rural: 76% of population total: 74% of population (2010 est.)	improved: urban: 38% of population rural: 5% of population total: 18% of population unimproved: urban: 62% of population rural: 95% of population total: 82% of population (2010 est.)	improved: urban: 57% of population rural: 17% of population total: 32% of population unimproved: urban: 43% of population rural: 83% of population total: 68% of population (2010 est.)	improved: urban: 86% of population rural: 67% of population total: 79% of population unimproved: urban: 14% of population rural: 33% of population total: 21% of population (2010 est.)	improved: urban: 64% of population rural: 55% of population total: 57% of population unimproved: urban: 36% of population rural: 45% of population total: 43% of population (2010 est.)	improved: urban: 52% of population rural: 32% of population total: 40% of population unimproved: urban: 48% of population rural: 68% of population total: 60% of population (2010 est.)

	Botswana	Lesotho	Mozambique	Namibia	South Arica	Swaziland	Zimbabwe
Ethnic groups	Tswana (or Setswana) 79%, Kalanga 11%, Basarwa 3%, other, including Kgalagadi and white 7%	Sotho 99.7%, Europeans, Asians, and other 0.3%,	African 99.66% (Makhuwa, Tsonga, Lomwe, Sena, and others), Europeans 0.06%, Euro-Africans 0.2%, Indians 0.08%	black 87.5%, white 6%, mixed 6.5% ***note:*** about 50% of the population belong to the Ovambo tribe and 9% to the Kavangos tribe; other ethnic groups include Herero 7%, Damara 7%, Nama 5%, Caprivian 4%, Bushmen 3%, Baster 2%, Tswana 0.5%	black African 79%, white 9.6%, colored 8.9%, Indian/Asian 2.5% (2001 census)	African 97%, European 3%	African 98% (Shona 82%, Ndebele 14%, other 2%), mixed and Asian 1%, white less than 1%
Religions	Christian 71.6%, Badimo 6%, other 1.4%, unspecified 0.4%, none 20.6% (2001 census)	Christian 80%, indigenous beliefs 20%	Catholic 28.4%, Protestant 27.7% (Zionist Christian 15.5%, Evangelical Pentecostal 10.9%, Anglican 1.3%), Muslim 17.9%, other 7.2%, none 18.7% (1997 census)	Christian 80% to 90% (at least 50% Lutheran), indigenous beliefs 10% to 20%	Protestant 36.6% (Zionist Christian 11.1%, Pentecostal/Charismatic 8.2%, Methodist 6.8%, Dutch Reformed 6.7%, Anglican 3.8%), Catholic 7.1%, Muslim 1.5%, other Christian 36%, other 2.3%, unspecified 1.4%, none 15.1% (2001 census)	Zionist 40% (a blend of Christianity and indigenous ancestral worship), Roman Catholic 20%, Muslim 10%, other (includes Anglican, Baha'i, Methodist, Mormon, Jewish) 30%	syncretic (part Christian, part indigenous beliefs) 50%, Christian 25%, indigenous beliefs 24%, Muslim and other 1%

	Botswana	Lesotho	Mozambique	Namibia	South Arica	Swaziland	Zimbabwe
Languages	Setswana 78.2%, Kalanga 7.9%, Sekgalagadi 2.8%, English (official) 2.1%, other 8.6%, unspecified 0.4% (2001 census)	Sesotho (official) (southern Sotho), English (official), Zulu, Xhosa	Emakhuwa 25.3%, Portuguese (official) 10.7%, Xichangana 10.3%, Cisena 7.5%, Elomwe 7%, Echuwabo 5.1%, other Mozambican languages 30.1%, other 4% (1997 census)	English (official) 7%, Afrikaans (common language of most of the population and about 60% of the white population), German 32%, indigenous languages (includes Oshivambo, Herero, Nama) 1%	IsiZulu (official) 23.82%, IsiXhosa (official) 17.64%, Afrikaans (official) 13.35%, Sepedi (offcial) 9.39%, English (official) 8.2%, Setswana (official) 8.2%, Sesotho (official) 7.93%, Xitsonga (official) 4.44%, siSwati (official) 2.66%, Tshivenda (official) 2.28%, isiNdebele (official) 1.59%, other 0.5% (2001 census)	English (official, used for government business), siSwati (official)	English (official), Shona, Sindebele (the language of the Ndebele, sometimes called Ndebele), numerous but minor tribal dialects
Literacy Total Population (age 15 and over can read and write)	84.5%	89.6%	56.1%	88.8%	86.4%	81.6%	90.7%
Government type	parliamentary republic	parliamentary constitutional monarchy	republic	republic	republic	monarchy	parliamentary democracy

	Botswana	Lesotho	Mozambique	Namibia	South Arica	Swaziland	Zimbabwe
Constitution	March 1965; effective 30 September 1966	2 April 1993	30 November 1990	ratified 9 February 1990, effective 12 March 1990	10 December 1996; note - certified by the Constitutional Court 4 December 1996; was signed by then President MANDELA 10 December 1996; and entered into effect 4 February 1997	signed by the King July 2005; went into effect 8 February 2006	21 December 1979
Legal system	mixed legal system of civil law influenced by the Roman-Dutch model and also customary and common law	mixed legal system of English common law and Roman-Dutch law; judicial review of legislative acts in High Court and Court of Appeal	mixed legal system of Portuguese civil law, Islamic law, and customary law	mixed legal system of uncodified civil law based on Roman-Dutch law and customary law	mixed legal system of Roman-Dutch civil law, English common law, and customary law	mixed legal system of civil, common, and customary law	mixed legal system of English common law, Roman-Dutch civil law, and customary law
GDP	$32.06 billion (2012 est.)	$4.131 billion (2012 est.)	$26.69 billion (2012 est.)	$17.03 billion (2012 est.)	$592 billion (2012 est.)	$6.345 billion (2012 est.)	$7.366 billion (2012 est.)
GDP - composition by sector	agriculture: 2.1% industry: 45% services: 52.9% (2011 est.)	agriculture: 6.4% industry: 34.6% services: 59% (2012 est.)	agriculture: 29.5% industry: 23.9% services: 46.5% (2012 est.)	agriculture: 7.4% industry: 31.3% services: 61.3% (2012 est.)	agriculture: 2.6% industry: 29.3% services: 68.1% (2012 est.)	agriculture: 7.8% industry: 45.1% services: 47.2% (2012 est.)	agriculture: 20.3% industry: 25.1% services: 54.6% (2012 est.)

	Botswana	Lesotho	Mozambique	Namibia	South Arica	Swaziland	Zimbabwe
Labor Force-by occupation	agriculture: unknown industry: unknown services: unknown	agriculture: 86% industry and services: 14% *note:* most of resident population engaged in subsistence agriculture; roughly 35% of the active male wage earners work in South Africa (2002 est.)	agriculture: 81% industry: 6% services: 13% (1997 est.)	agriculture: 16.3% industry: 22.4% services: 61.3% *note:* about half of Namibia's people are unemployed while about two-thirds live in rural areas; roughly two-thirds of rural dwellers rely on subsistence agriculture (2008 est.)	agriculture: 9% industry: 26% services: 65% (2007 est.)	agriculture: 70% industry: unknown services: unknown	agriculture: 66% industry: 10% services: 24% (1996)
Unemployment rate	17.8% (2009 est.)	25% (2008 est.)	17% (2007 est.)	51.2% (2008 est.)	22.7% (2012 est.)	40% (2006 est.)	95% (2009 est.)
Population below poverty line	30.3% (2003)	49% (1999)	52% (2009 est.)	55.8% ***note:*** the UNDP's 2005 Human Development Report indicated that 34.9% of the population live on $1 per day and 55.8% live on $2 per day (2005 est.)	31.3% (2009 est.)	69% (2006)	68% (2004)

	Botswana	Lesotho	Mozambique	Namibia	South Arica	Swaziland	Zimbabwe
Agriculture - products	livestock, sorghum, maize, millet, beans, sunflowers, groundnuts	corn, wheat, pulses, sorghum, barley; livestock	cotton, cashew nuts, sugarcane, tea, cassava (tapioca), corn, coconuts, sisal, citrus and tropical fruits, potatoes, sunflowers; beef, poultry	millet, sorghum, peanuts, grapes; livestock; fish	corn, wheat, sugarcane, fruits, vegetables; beef, poultry, mutton, wool, dairy products	sugarcane, cotton, corn, tobacco, rice, citrus, pineapples, sorghum, peanuts; cattle, goats, sheep	corn, cotton, tobacco, wheat, coffee, sugarcane, peanuts; sheep, goats, pigs
Industries	diamonds, copper, nickel, salt, soda ash, potash, coal, iron ore, silver; livestock processing; textiles	food, beverages, textiles, apparel assembly, handicrafts, construction, tourism	aluminum, petroleum products, chemicals (fertilizer, soap, paints), textiles, cement, glass, asbestos, tobacco, food, beverages	meatpacking, fish processing, dairy products, pasta and beverages; mining (diamonds, lead, zinc, tin, silver, tungsten, uranium, copper)	mining (world's largest producer of platinum, gold, chromium), automobile assembly, metalworking, machinery, textiles, iron and steel, chemicals, fertilizer, foodstuffs, commercial ship repair	coal, wood pulp, sugar, soft drink concentrates, textiles and apparel	mining (coal, gold, platinum, copper, nickel, tin, diamonds, clay, numerous metallic and nonmetallic ores), steel; wood products, cement, chemicals, fertilizer, clothing and footwear, foodstuffs, beverages
Exports - commodities	diamonds, copper, nickel, soda ash, meat, textiles	manufactures 75% (clothing, footwear, road vehicles), wool and mohair, food and live animals	aluminum, prawns, cashews, cotton, sugar, citrus, timber; bulk electricity	diamonds, copper, gold, zinc, lead, uranium; cattle, processed fish, karakul skins	gold, diamonds, platinum, other metals and minerals, machinery and equipment	soft drink concentrates, sugar, wood pulp, cotton yarn, refrigerators, citrus and canned fruit	platinum, cotton, tobacco, gold, ferroalloys, textiles/clothing

	Botswana	Lesotho	Mozambique	Namibia	South Arica	Swaziland	Zimbabwe
Imports - commodities	foodstuffs, machinery, electrical goods, transport equipment, textiles, fuel and petroleum products, wood and paper products, metal and metal products	food; building materials, vehicles, machinery, medicines, petroleum products	machinery and equipment, vehicles, fuel, chemicals, metal products, foodstuffs, textiles	foodstuffs; petroleum products and fuel, machinery and equipment, chemicals	machinery and equipment, chemicals, petroleum products, scientific instruments, foodstuffs	motor vehicles, machinery, transport equipment, foodstuffs, petroleum products, chemicals	machinery and transport equipment, other manufactures, chemicals, fuels, food products

Source: CIA World Fact Book (https://www.cia.gov/library/publications/the-world-factbook/geos/countrytemplates accessed 7/09/2012)

Table A.2: Summary: Border Information

		Botswana	Lesotho	Mozambique	Namibia	South Africa	Swaziland	Zimbabwe
Land Boundaries		4,013 km	909 km	4,571 km	3,936 km	4,862 km	535 km	3,066 km
Area	**Total**	581,730 sq km	30,355 sq km	799,380 sq km	824,292 sq km	1,219,090 sq km	17,364 sq km	390,757 sq km
	Land	566,730 sq km	30,355 sq km	786,380 sq km	823,290 sq km	1,214,470 sq km	17,204 sq km	386,847 sq km
	Water	15,000 sq km	0 sq km	13,000 sq km	1,002 sq km	4,620 sq km	160 sq km	3,910 sq km
Border Countries		Namibia 1,360 km, South Africa 1,840 km, Zimbabwe 813 km	South Africa 909 km	Malawi 1,569 km, South Africa 491 km, Swaziland 105 km, Tanzania 756 km, Zambia 419 km, Zimbabwe 1,231 km	Angola 1,376 km, Botswana 1,360 km, South Africa 967 km, Zambia 233 km	Botswana 1,840 km, Lesotho 909 km, Mozambique 491 km, Namibia 967 km, Swaziland 430 km, Zimbabwe 225 km	Mozambique 105 km, South Africa 430 km	Botswana 813 km, Mozambique 1,231 km, South Africa 225 km, Zambia 797 km
Coastline		0 km (landlocked)	0 km (landlocked)	2,470 km	1,572 km	2,798 km	0 km (landlocked)	0 km (landlocked)

		Botswana	Lesotho	Mozambique	Namibia	South Africa	Swaziland	Zimbabwe
Maritime Claims		none (landlocked)	none (landlocked)	territorial sea: 12 nm exclusive economic zone: 200 nm	territorial sea: 12 nm contiguous zone: 24 nm exclusive economic zone: 200 nm	territorial sea: 12 nm contiguous zone: 24 nm exclusive economic zone: 200 nm continental shelf: 200 nm or to edge of the continental margin (includes Prince Edward Islands (Marion Island and Prince Edward Island)	none (landlocked)	0 km (landlocked)

Source: CIA World Fact Book (https://www.cia.gov/library/publications/the-world-factbook/geos/countrytemplates accessed 7/09/2012)

APPENDIX B

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