

**PERCEPTIONS OF CLIMATE CHANGE AND ITS IMPACTS ON SUBSISTENCE
FARMING: A CASE OF MUTOKO COMMUNITY IN ZIMBABWE**

By

TAYENGWA DYKE

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SUPERVISOR: Prof. SA Rankoana

Co-Supervisor: Dr. TS Nyawasha

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DECLARATION

I, **TAYENGWA DYKE** hereby declare that this dissertation;

(a) Represents my work;

(b) Has not previously been submitted for a degree at this or any other university;
and

(c) Does not incorporate any published work or material from another dissertation

Signed.....

Date.....

DEDICATION

I want to humbly dedicate this study to the providential **Almighty God** for giving me life of which without that, nothing was to be accomplished. This work is dedicated to my parents **Edward** and **Francesca Tayengwa**. Their love and support kept me going throughout the years of my academic and social life. The study is also dedicated to my brothers **Dragon, James and Dominic** who have been true anchors in times of predicaments, I salute you all. Thank you.

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ABSTRACT

The study explored Mutoko community members' perceptions of climate change and its impact on subsistence farming. Mutoko is a rural community situated in the eastern part of Zimbabwe. Focus group discussions were conducted to explore perceptions of climate change and its impacts on subsistence farming. The study findings show that the primary source of food is subsistence farming. The main crop grown in Mutoko is maize, followed by ground nuts (peanuts), and indigenous vegetables. Maize, ground nuts, sunflowers (for seed), sorghum and millet are grown for household consumption. The study reports community members' perceptions and views of changes in the local natural environment. The changes are increased temperature and scarcity of rain. Observable impacts of these changes are decreased crop yields in times of drought. The findings are supported by observation that Zimbabwe lies in a semi-arid region with limited and unreliable rainfall patterns and temperature variations. Rainfall exhibits considerable spatial and temporal variability.

Generally, the impact of climate change on subsistence farming was the major concern among the participants. Though the study was not aimed at documenting adaptation measures taken to lessen the negative impacts of increased temperature and rainfall scarcity on crop production, the study shows that adaptive measures have been developed and used to adapt and cope with climate change. Community members are adapting to the impacts of increased temperature and scarcity of rain through their culturally informed mechanisms. The mechanisms include change of crops, use of manure to improve soil structure and mulching. It is concluded that the impact of climate change on subsistence farming is real and is negatively affecting food security in the study area. Farmers gave different views on the following; knowledge about climate variations, changes in environmental conditions, changes in temperature patterns and changes in rainfall patterns.

LIST OF ACRONYMS

IPCC	Intergovernmental Panel on Climate Change
FCCC	Framework Convention on Climate Change
FAO	Food Agriculture Organization
SSA	Sub-Saharan Africa
FAO	Food and Agriculture Organization
UNECA	United Nations Economic Commission for Africa
UNFCCC	United Nations Framework Convention on Climate change
GoZ	Government of Zimbabwe
MDC	Mutoko District Council
MDZ	Metrological Department of Zimbabwe
ZMLRD	Zimbabwe Ministry of lands and Rural Development
AREX	Agriculture and Rural Extension

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The study explored Mutoko community members' perceptions on climate change and its impact on subsistence farming. Mutoko is a rural community situated in the eastern part of Zimbabwe. The primary occupation of the economy is agriculture, with the majority being subsistence farmers. The primary crop grown in this community is maize, followed by ground nuts (peanuts), and table vegetables such as tomatoes and cucumbers. However, maize, ground nuts, sunflowers (for seed), sorghum and millet are also grown commercially. The study findings shows that community members are aware of changes in the local natural environment. The changes are increased or high temperatures and scarcity of rain. Observable impacts of these are decreased crop yields in times of drought. The study findings are supported by observation that Zimbabwe lies in a semi-arid region with limited and unreliable rainfall patterns and temperature variations. Rainfall exhibits considerable spatial and temporal variability characterised by shifts in the onset of rains, increases in the frequency and intensity of heavy rainfall events, increases in the proportion of low rainfall years, decreases in low intensity rainfall events, and increases in the frequency and intensity of mid-season dry-spells (Unganai, 2009). Extreme weather events, namely tropical cyclones and drought have increased in frequency and intensity (Mutasa, 2008).

Moreover, according to the Zimbabwe Meteorological Service, daily minimum temperatures have risen by approximately 2.6°C over the last century while daily maximum temperatures have risen by 2°C during the same period. Climate records for Zimbabwe demonstrate that the country is already beginning to experience the effects of climate change, notably rainfall variability and extreme temperature increases (Saarinen et al., 2012). These conditions are expected to render land increasingly marginal for agriculture, which poses a major threat to the economy and

the livelihoods of the poor due to heavy dependence on rain-fed agriculture and climate sensitive resources.

While several studies have been carried out on the impact of climate change on local livelihoods, there is very little literature to understand the impact of climate change on the subsistence farming of rural communities in Zimbabwe. Existing studies on climate change in Africa cannot be generalised to include the Zimbabwean scenario due to several reasons (Nath & Behera, 2011). Firstly, subsistence farming differs according to regions because they are ecologically dependent. Saarinen et al. (2012) argues that naturally, some farming activities are more sensitive to climate change than others. Regional ecological variations mean that the livelihood strategies and the impact of climate change on those strategies will differ. Secondly regional climatic variations also mean that the impact would be experienced differently in different regions. For example, it has been suggested that while sub-Saharan countries will bear the brunt of climate change, Arctic regions stand to gain positively from climate change with the warming of temperatures enabling longer periods for growing crops (Nath & Behera, 2011). This argument shows the need for local studies on the impact of climate change on communal farming as a subsistence means. The study examined Mutoko rural community experiences of climate change and how climate variations impact on the community's livelihood patterns focusing more on its subsistence farming.

There is a world-wide consensus that climate change is real, rapidly advancing and threatening humanity. Social scientists presented evidence and tested models to substantiate awareness of the reality of climate change (Bhusal, 2009; Chaudhary & Aryal, 2009). Climate change manifests as rising temperature trends and erratic rainfall patterns (Smith & Reynolds, 2005; Broham, Caesar & Alexander, 2006). Nhemachena, Mano, Mudombi and Muwanigwa (2014) attest that the main climate variables embrace rainfall and temperature. For Bhusal (2009) local communities are not aware of climate change instead they understand change in rainfall and temperature patterns. Haque Yamamoto, Malik and Sauerborn (2012) add that the main indicators of climate change are change in rainfall patterns and high and low temperatures. In the Sahelian region of West Africa for example, farmers point to shrinking water bodies, disappearing plants and crops, and changing settlement

patterns as evidence of reduced rainfall over the last three decades of the twentieth century (Roncoli , 2006; West, Roncoli, & Ouattara, 2007).

The Intergovernmental Panel on Climate Change (IPCC)'s Fourth Assessment Report indicates that increases in temperature patterns and erratic rainfall in the African Continent can impact agriculture by reducing crop yields by almost half by 2020 (IPCC, 2007). This will have adverse impacts on the already vulnerable and poor communities that rely on climate-sensitive livelihood sources like agriculture and exploitation of biodiversity. Changes in temperature and seasonality have direct, immediate effects on flora and fauna as well as on human activities and health (Bhusal, 2009).

Climate change models for Southern Africa indicate that the region will face increased challenges due to projected changes in climate (Hulme et al., 2005). The IPCC (2007), Taros, Lewiston and Usman (2005), Tadross et al. (2009) predict rainfall reductions and increased variability for most parts of Southern Africa. Southern Africa has recently been experiencing recurrent droughts (including mid-season droughts) (Moyo et al., 2012), and these experiences together with other extreme climatic events are expected to increase (Twomlow, Steyn & Du Preez, 2006).

The causes of changing climate conditions, its effects on natural resources, human health and the mechanism of adaptation to changing living conditions are extensively explored (Yohe & Tol, 2002; Adger & Vincent, 2004; Brenkert & Malone, 2005; Brooks & Adger, 2005). Little was researched about the perceptions and impacts of climate change on livelihood patterns in the rural communities. The present study explored the local community's perceptions of climate change and its impact on their subsistence farming.

1.2 Problem statement

Meteorological records demonstrate that Zimbabwe is already experiencing climate variations. The country is experiencing more hot days and fewer cold days. Precipitation is varying more frequently. These variations pose significant threats to sustainable development and poverty reduction. The IPCC (2007) projections for

sub-Saharan Africa such as increased water stress, decreased yields from rain-fed agriculture and increased food insecurity are already being felt by the rural communities in Zimbabwe (Moyo, 2011; Brown et al., 2012; United Nations, 2013).

The IPCC (2007; 2012) and UNFCCC (2009) confirm that there is remarkable increase in warm days, erratic rainfalls patterns and ecological variability, as well as decrease in water levels and depletion of biodiversity. The effects of these conditions are already being experienced in various regions of the world and are predicted to increase due to human factors such as pollution from factories and mines as well as natural factors such as excessive heat and natural disasters (Dowing, 1992; Bhursal, 2009).

The study is motivated by literature about climate variations and hazards on the livelihood of rural communities in the African continent. Chambers and Conway (2009) show that the livelihoods of the African citizens are likely to be impacted negatively by higher temperature, rising sea levels, changing rainfall patterns and increased climate variability. Moyo (2011) and Brown et al. (2012) attest that climate hazards are being felt by rural communities that depend on rain-fed agriculture for their livelihoods.

Given what the records are saying and the problems people are experiencing in Zimbabwe, what is puzzling is that in the context of Zimbabwe, there is limited knowledge on how climate change impacts on individual households and also how these households adapt to changes in climatic conditions. This study attempts to fill that gap by examining local experiences or perceptions on climate change and how these experiences inform the adaptive capacities of local communities in Zimbabwe.

1.3 Purpose of the study

The present study explored Mutoko community members' perceptions on climate change and its impact on the subsistence farming. The study was conducted with the objective of investigating Mutoko community members' understanding of climate

change and examining community members' knowledge of the impact of climate change on subsistence economy farming.

1.4 Operational definitions

1.4.1 Climate change

Climate change in this study refers to variations in temperature and rainfall patterns defined by Bhusal (2009) and Kruger and Sekele (2012).

1.4.2 Climate change impacts

Impacts of climate change refer to the effects of variations of temperature and rainfall patterns as defined in the IPCC Report (2007).

1.4.3 Livelihood

According to Blaikie (2004:11) a person's livelihood refers to their "means of securing the basic necessities -food, water, shelter and clothing- of life". Livelihood is defined as a set of activities, involving securing water, food, fodder, medicine, shelter, clothing and the capacity to acquire above necessities working either individually or as a group by using endowments (both human and material) for meeting the requirements of the self and his/her household on a sustainable basis with dignity (Ibid). For the purpose of the study, livelihood patterns are restricted to the subsistence farming in Mutoko community.

1.4.4 Subsistence Farming

Subsistence farming refers to an economic system wholly reliant on the self-provisioning of the community. Wealth in a subsistence economy is measured in terms of natural resources. A subsistence economy relies on hunting and cultivation for food and surrounding trees for building shelter depending on the natural environment's renewal and reproduction for survival (Online business dictionary). Growing of crops and rearing of animals predominantly for consumption by family rather than for the wider economy is the basis for subsistence farming (Moyo, 2004). This means that subsistence farming is not for commercial purposes hence production is at a small scale because it is only meant for the family. Subsistence farming can also be defined as a form of farming in which nearly all of the crops or livestock raised are used to maintain the farmer and the farmer's family, living little, if

any, surplus for sale or trade (Kerdachi, 2006). Pre-industrial agricultural peoples throughout the world have traditionally practiced subsistence farming (Ibid).

1.5 Motivation of the study

The effects of climate change and its high cost-effectiveness in the face of persistent poverty in a rural community have been proved beyond dispute. This is very important given the limited success of existing adaptation strategies in the face of the still growing climate change impacts (Moyo, 2004). Therefore any intervention and this include empirical research is unlikely to be adopted unless it is known and acceptable by those being targeted. Because of this, it is essential to explore not only people's perceptions but rather, the factors underlying their perceptions and knowledge among the targeted population.

1.6 Significance of the study

The study will make a contribution to existing knowledge about the extent of climate change and its impact on the subsistence economies of rural communities in Zimbabwe. The researcher has a strong belief that a lot of fallacies are being broadcasted concerning Zimbabwe; therefore the study will unmask some clouded misconceptions about climate change and its impacts scenario for Zimbabwe. The study results will be of importance in addressing the current socio-economic burden through the development of adaptation policies to assist rural communities vulnerable to climate hazards (Moyo, 2004). More importantly, the results could be used to make recommendations and guidelines for the adoption of indigenous practices and values to mitigate the factors responsible for climate change, and adapt to climate variations to sustain the rural community's subsistence economy.

The key concern of this study is on how rural livelihoods can be sustainable, especially given the growing evidence of climate change and its potential overall negative impacts. There is clearly a need to learn to manage vulnerable communities. There is a need to be able to understand and/or manage climate change related hazards, natural resilience and acquired resilience. Such

understanding helps to open up opportunities for improving people's overall vulnerability since it forces people to examine the multi-dimensional nature of global climate change and its local level impacts.

1.7 Chapter outline

Chapter 1; introduces the study with an overview of the thesis that includes the introduction and background; research problem; aim and objectives of the study, significance of research; operational definitions of the key concepts.

Chapter 2; presents literature review on global climate change; climate change in Africa; climate change in sub-Sahara; impacts of climate on subsistence economy; climate change in Zimbabwe; impact of climate change on subsistence economy: agriculture; water; health; infrastructure and energy; gender; human settlement; recommendations on the impacts of climate change on subsistence economy; theoretical framework (Afrocentric Approach) and the summary of the chapter.

Chapter 3; describes the methodological steps used in this research. This entails that this chapter encompasses the methodology, research design, population and sample, sampling procedure, sample size, methods of data collection and analysis and ethical consideration ethical considerations.

Chapter 4; presents analysis of the study results. The chapter presents analyses of qualitative data collected through focus groups .The chapter is divided into two (2) sections. The first section presents data about the first objective on participants' knowledge about climate variations in the form of increased temperature and erratic rainfall patterns. The second section presents analyses of data that respond to the second objective on participants' knowledge of the impact of variations in temperature and rainfall patterns on the community's subsistence economy.

Chapter 5; gives the summary and study concluding remarks.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The primary focus of this chapter is a review of literature on perceptions on climate change and its impacts on subsistence farming. In this review, I offer some insights on the way climate change has affected the different regions of the world. In the context of Zimbabwe, I revisit existing literature on the subject of climate change. Such literature provides a picture on the nature and extent of the problem of climate change. This chapter begins by examining the notion of 'climate change' and how it is defined in literature. The chapter concludes by looking at how climate change has been experienced within Zimbabwean communities and how such experiences compare to other regions within Africa and the world at large.

2.2 Climate change

Climate change refers to a change in the state of the climate that can be identified by changes in the mean temperature and rainfall variations that persist for an extended period, typically decades or longer (IPCC, 2007). Climate change may be due to natural processes or forces such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in-land use. The Framework Convention on Climate Change (UNFCCC, 2009), in its Article 1 defines climate change as a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

2.2.1 Sociology and Climate Change: What are the issues at stake?

Sociological research on global climate change has its roots in environmental sociology; a specialty field that developed in reaction to increased social awareness

of environmental problems. Environmental sociologists examine and theorises the complex and multifaceted relationship between human beings and their natural environments. To respond to climate change, sociologists need to know more about the final binding decisions taken by authorities or the ecological effects of individual perceptions, views and social behaviour. They are much involved into probing more deeply, into the social demands, their representation, decisions and behavioural practices. There lies the distinct contribution of sociology to the study of these social processes particularly the study of climate change. Because of its relational orientation, sociology is well prepared to study the networks and flows of interaction among social actors, sectors and institutions (structural analysis) and social categories of meaning (discourse analysis) as constituent inter-actor processes that construct macro-outcomes which link up with the study of climate hazards and its impact on the environment (Dunlap 2007).

There is widespread scientific consensus that global climate change is occurring. Climate change looms as the global environmental justice issue of the twenty-first century. Climate change poses special environmental justice challenges for communities that are already overburdened with pollution, poverty, and environmentally-related illnesses. The world's poorest countries of the global south and most vulnerable peoples, particularly in rural communities will suffer the earliest and most damaging setbacks, even though they have contributed least to the problem of global warming. Sociologists are concerned about why do social systems tend to exceed their ecological carrying capacities.

The most recent report of the Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2007: Impacts, Adaptation and Vulnerability*, identified key vulnerabilities associated with climate sensitive systems, including food supply, infrastructure, health, water resources, coastal systems, ecosystems, global biogeochemical cycles, ice sheets, and modes of oceanic and atmospheric circulation. The IPCC also predicts the impacts of future changes in climate are expected to fall disproportionately on the poor, and communities in low-lying coastal and arid areas, with many who are highly dependent on farming, fishing or forestry seeing their livelihoods severely curtailed or destroyed. Scientists predict droughts,

wildfires, and dust transported between continents to cause locally severe economic damage and substantial social and cultural disruption and possible political conflict including North-South conflict. Climate change around the world is creating a new category of people known as 'environmental refugees'.

The number of people forced to flee their homes because of extreme weather events is increasing globally. Over 2 billion people worldwide were affected by disasters in the last decade. In 2001, more than 170 million people were affected by disasters, 97 percent of which were climate-related (Nagel et al 2008). There are more environmental refugees (25 million) than political refugees (22 million). By 2010, the number of environmental refugees is expected to grow to 50 million and could reach as high as 150 million by 2050. Most of these refugees are uprooted by gradual environmental shifts such as desertification, diminishing water supplies, and rising sea levels. Climate change costs. In the 1990s, disasters such as hurricanes, floods, and fires caused billions dollars in economic losses worldwide, an amount greater than during the previous four decades (Climate Alliance 2012).

Changing climates will negatively impact food production making drought prone regions especially vulnerable to food shortages and food riots. It will also harm fish and many types of ecosystems and threaten human health with a broad set of problems, including water shortages, increased injuries and deaths from severe weather such as hurricanes, heat stress, cold stress (hypothermia), as well as increasing death rates and cardiovascular and respiratory disease related to aeroallergens and worsening air pollution caused by the higher concentration of ground-level ozone (smog) that accompanies higher temperatures (Dunlap and Marshall 2007). Ground level ozone sends an estimated 53,000 persons to the hospital, 159,000 to the emergency room and triggers 6,200,000 asthma attacks each summer in the eastern half of the United States. Air pollution causes an estimated 50,000 to 120,000 premature deaths in the U.S. each year. Approximately 600,000 deaths occurred world-wide as a result of weather-related natural disasters in the 1990s; and some 95 percent of these were in poor countries (Nagel et al 2008).

There is evidence that climate change has already affected human health. The World Health Organization (WHO 2004) estimates that the global burden of climate change exceeds 150,000 deaths per year. Many diseases are highly sensitive to changing temperatures and precipitation, including vector-borne diseases such as malaria, cholera, diarrhoea, dengue fever, Rift Valley fever, plague, and emerging infectious diseases such as Hantavirus, Ebola haemorrhagic fever, and West Nile virus. Variable precipitation can compromise the supply of freshwater increasing risk of food-borne and water-borne diseases. Nearly one-third of the world's population lives with chronic water shortages that directly threaten human health, agriculture and economic development. Scientists predict an increase in global resource wars breaking out as potable water and oil become scarce and as price escalates. Fresh water is a commodity more valuable than crude oil.

2.2.2 Climate change and environmental sociology

There is a great deal that sociologists in general, and environmental sociologists specifically contributes to understanding the causes of global climate change, for example, which populations are most vulnerable and resilient to the impacts of climate change, and what is the role of competition among states in the global system to accelerating the drivers of global climate change.

Environmental sociologists emphasises addition work on the causes, impacts and solutions to environmental problems, and that is to analyse the processes by which environmental conditions are recognised and successfully defined as problematic, or how environmental problems are socially constructed (Dunlap 2007). Therefore environmental sociology has grown in prominence and credibility because it has recognised that environmental problems such as climate change are people problems. Such problems are caused by human behaviour, viewed as problematic because of their impacts on humans and, for some, their impacts on other species and ecosystems and their solution requires collective action by humans. However, the emergence of a mature environmental sociology has involved a rapid growth in theoretically informed empirical research on the causes, impacts and solutions to environmental problems (Dunlap and Marshall 2007).

Environmental sociology focuses on the social and political dynamics of the environmental movement, studying how people organised around, reacted to, and adapted to air and water pollution, the impacts of technology, controversies over land use, and questions of environmental justice (Dunlap 2007). Environmental sociology expanded its field of inquiry beyond environmentalism as a social and political movement and began examining the underlying organisational, economic, cultural, and emotional factors that have shaped modern industrial society's relationship to the bio-physical world, in particular the implications for the environment of various models of economic development, political contestation, pre-existing structures of inequality, and questions of sustainability (Dietz et al 2007). It is this background which gave birth to environmental sociology as an environmental justice movement in response to environmental injustices and the failure of government and the political system to respond fairly and equitably to social, economic, and health disparities resulting from industrial activity (Dunlap et al 2007).

Environmental sociology and disaster research fields and the mainstream environmental and conservation movement were then slowly acknowledged as the environmental justice paradigm to the research protocol and to real world environmental problems that confront vulnerable populations particularly the marginalised rural dwellers. As a result, an entire field and movement, environmental justice, was built to fill this research, policy, education, community outreach, and organising gap.

2.2.3 What are the current debates in environmental sociology?

Climate Change movements emerged largely out of the mainstream environment and conservation movement because those most affected do not for the most part have a voice at the research, policy, and legislative table in shaping national strategies to address climate change. A parallel Climate Justice Movement has emerged from the convergence of climate change and environmental justice. This new movement, with its diverse allies of researchers, scientists, educators, health professionals, analysts, planners, community activists, and others, has much to offer

in resolving climate change and many of the legacy problems that have resulted from industrial policies and human settlement patterns. Environmental sociological research is needed to better inform and provide data-based support for the response to climate change that include research on the association between climate change and public health particularly mental health, scenario development to forecast health impacts and vulnerabilities, and development and testing of strategies to reduce risk (Nagel et al 2008).

Therefore current debates are on who gets left behind before and after disasters strikes and why. This is a core climate justice research and policy question. As seen in Hurricane Katrina that hit the Gulf Coast in 2005, the effects of climate change fell heaviest on the poor and people of colour. The deadly pattern of climate change is also likely to fall disproportionately on the poor and people of colour across the globe (Dietz et al 2007).

Another sociological research debate is to answer the questions on; will government response to climate change be fair? Does race and class matter? What lessons can be learned from environmental justice research, policy, and community organizing and their applicability to climate change work? Research is needed on institutionalised factors that shape strategies to reduce the direct and indirect impacts of climate change on vulnerable populations' issues surrounding environmental refugees and internally displaced persons (IDP). Also there is a need for privatisation and commodification of water, access to health care and insurance, reconstruction of damaged communities. Lastly, to increase competition for scarce resources such housing, food, energy, etc., marginalisation of already marginalised communities (Nagel et al 2008).

2.2.4 Are there any sociological theories on the environmental climate change?

There is no clearly defined theories on environmental climate change but environmental sociology has drawn theoretical insights from the broader discipline of sociology in a number of areas, including research on social movements, political sociology, organizational sociology, small group and large scale decision making,

micro and macro foundations of social inequality, community studies, network theory, population and migration research, and models of globalization (Nagel et al 2008). Environmental sociologists have reached outside sociology's disciplinary boundaries to borrow and adapt theoretical models from population ecology, geography, and demography, among others. These different conceptual lenses have provided depth and breadth to a number of critical debates among environmental sociologists about the most important and promising theoretical and research questions and about the place of environmental sociology within the discipline of sociology and the social sciences. (Nagel et al 2008).

Environmental sociology has produced a substantive body of scholarship that highlights the motivations, behaviours, and organising mechanisms underlying society's relationship with nature and the physical world. The field has provided important insights into comparative public opinion about the environment, diffusion of environmental institutions around the world. More so, the effects of values on individual environmental behaviour, role of culture in shaping environmental exploitation and regulation also forms part of environmental sociology (Dunlap and Marshall 2007). In addition to the above, social interests driving consumerism and high resource usage production systems, capacity of societies to learn and practice sustainability, environmental effects of local and global systems of resource extraction, social dimensions of environmental impact assessment, interaction of population, technology, and affluence on the environment, trade-offs between economic growth and environmental protection, mobilisation and networking of environmental movements, unequal social and economic consequences of environmental policies in local communities, and environmental implications of economic and political arrangements that characterise international relations and define the relative places of peoples around the world (IPCC 2001).

Sociologists have applied theories from ecology to study the complex relationship between humans and their natural environment. The human ecology perspective underscores the socio-spatial dynamics of climate change and varied interactions humans have with their physical environments across spatial and temporal scales. Drawing on work in geography and urban studies, sociologists have applied this

place-based approach to research on migration, resource competition, and disaster relief. This perspective provides evidence that while climate change is a global threat, its effects are experienced locally, and can better be understood when sociologists include data from humans' biophysical environments. A major contribution by environmental sociology is modelling the social causes and consequences of environmental change. These modelling techniques are directly applicable to the study of global climate change (Nagel et al, 2008).

2.3 Climate change from a global perspective

Climate change is currently one of the most challenging problems faced by the global community. It has certainly become both a local and global phenomenon with its effects being felt at all scales from the household to the global level. Warming of the climate system is evident from observations of increases in global average air and ocean temperatures, widespread melting of snow ice and rising average sea level (IPCC, 2013). Trends from 1900 to 2005 show that rainfall has increased in the eastern parts of North and South America, Northern Europe and northern and central Asia and has decreased in the Sahel, the Mediterranean, south western Africa and parts of Southern Asia. This has affected runoff and earlier spring peak discharge in many glacier and snow fed rivers. Climate change is identified as a leading human and environmental crisis of the 21st century (IPCC, 2012).

Scientists have proven that the local communities are aware of change in climatic conditions in the form of increased temperatures and erratic rainfall patterns (Roncoli, 2006; West, 2007; Haque, 2012; Nemachena, 2014). Bhusal (2009) shows that rural communities' explanations of climate change are centred on variations in temperature and rainfall patterns manifest as rising temperature trends and scarce rainfall (Rankoana & Mothiba, 2015; Rankoana, 2016). Local communities are aware that devastating changes in their living conditions such as malnutrition, poverty, water and air contamination, increased risks of disease, floods, soil erosion and depletion of biodiversity are as a result of climate and environmental variability (Ziervogel et al., 2014).

2.4 Climate change in Africa

The African continent is under pressure from climate stresses and is highly vulnerable to its impacts. Many Africa countries are vulnerable to climate disasters due to the nature of their climatic conditions (IPCC, 2014). As a result of global warming, the climate in Africa is predicted to become more variable, and extreme weather events are expected to be more frequent and severe, with increasing risk to health and life. This includes increasing risk of drought and flooding in new areas (Few, 2004; Christensen et al. 2007) and inundation due to sea-level rise in the continent's coastal areas (Nicholls, 2004; McMichael et al., 2006). These threats are responsible for famine and widespread disruption of socio-economic well-being (FAO, 2016). For example, estimates reported indicate that one third of African people already live in drought- prone areas and 220 million are exposed to drought each year.

Many factors contribute and compound the impacts of current climate variability in Africa and will have negative effects on the continent's ability to cope with climate change. These include poverty, illiteracy and lack of skills, weak institutions, limited infrastructure, lack of technology and information, low levels of primary education and health care, poor access to resources, low management capabilities and armed conflicts (McMichael et al., 2006).. The overexploitation of land resources including forests, increases in population, desertification and land degradation pose additional threats (UNDP, 2006).

Africa will face increasing water scarcity and stress with a subsequent potential increase of water conflicts as almost all of the 50 river basins in Africa are transboundary (Ashton, 2002; De Wit & Jacek, 2006). Agricultural production relies mainly on rainfall for irrigation and will be severely compromised in many African countries. Due to climate change much agricultural land will be lost, with shorter growing seasons and lower yields. National Communications (2009) reports that climate change will cause a general decline in most of the subsistence crops, e.g. sorghum in Sudan, Ethiopia, Eritrea and Zambia; maize in Ghana; Millet in Sudan; and groundnuts in Gambia. Of the total additional people at risk of hunger due to

climate change, although already a large proportion, Africa may well account for the majority by the 2080s (Fischer, 2002; IPCC, 2012).

In addition to decline in subsistence production, the African continent is vulnerable to a number of climate sensitive diseases including malaria, tuberculosis and diarrhea (Guernier, 2004). As a result of climate change, rising temperatures are changing the geographical distribution of disease vectors which are migrating to new areas and higher altitudes, for example, migration of the malaria mosquito to higher altitudes will expose large numbers of previously unexposed people to infection in the densely populated east African highlands (Boko et al., 2007). Future climate variability will also interact with other stresses and vulnerabilities such as HIV/AIDS (which is already reducing life expectancy in many African countries) and conflict and war (Harrus & Baneth, 2005), resulting in increased susceptibility and risk to infectious diseases (e.g. cholera and diarrhea) and malnutrition for adults and children (WHO, 2004).

Climate change is an added stress to already threatened habitats, ecosystems and species in Africa, and is likely to trigger species migration and lead to habitat reduction. Up to 50 per cent of Africa's total biodiversity is at risk due to reduced habitat and other human-induced pressures (Boko et al., 2007). The latter include land-use conversion due to agricultural expansion and subsequent destruction of habitat; pollution; poaching; civil war; high rates of land use change; population growth and the introduction of exotic species. For example, the habitat of the great apes, including the western lowland Gorilla, identified as critically endangered on the World Conservation Union's (IUCN) red list of threatened species, is likely to seriously decline between 2002 and 2032 (UNDP, 2006).

Future sea level rise has the potential to cause huge impacts on the African coastlines including the already degraded coral reefs on the Eastern coast. National Communications (2009) indicates that the coastal infrastructure in 30 percent of Africa's coastal countries, including the Gulf of Guinea, Senegal, Gambia, Egypt, and along the East-Southern African coast, is at risk of partial or complete inundation due to accelerated sea level rise.¹⁶ In Tanzania, a sea level rise of 50 cm would

inundate over 2,000 km² of land, costing around USD 51 million (UNEP, 2002a). Future sea level rise also threatens lagoons and mangrove forests of both eastern and western Africa, and is likely to impact urban centres and ports, such as Cape Town, Maputo, and Dar es-Salaam (UNDP, 2006).

2.5 Climate change in sub-Saharan Africa

There are observations that in the sub-Saharan region rainfall patterns have become less predictable, precipitation has decreased on average, and temperatures are rising (Holmgren, & Oberg, 2006). Evidence shows that the upward trend of the already high temperatures and the reduction of precipitation levels will increasingly result in reduced agricultural production in sub-Saharan Africa (Mano & Nhemachena, 2007; Biggs et. al., 2008) which is the mainstay of most rural economies in Africa. Negative developments in agriculture would adversely affect the rest of the livelihoods that depend on crop production. The Economist (2010: 86) concludes that, “global action is not going to stop climate change. The world needs to look harder at how to live with it”.

The negative effects of climate change are threatening to reverse development gains in many parts of the world especially in sub-Saharan Africa. Davidson et al. (2003:98) argue that “...it is becoming increasingly clear that realization of the development goals can be seriously hampered by climate change”. Simatele, Binns and Simatele (2012) note that climate change is undermining efforts to protect livelihoods in Africa. Relevant development programming will need to increasingly incorporate climate change adaptation in order to holistically address development challenges pertaining to livelihoods in Saharan Africa.

It goes without saying that not all weather phenomena are a result of global warming; however, it is a fact that human induced climate change is already modifying natural weather patterns and aggravating extreme weather conditions. Short-term consequences such as flooding, cyclones and drought are often longer, intensified and more frequent, the impact of which is long-felt on a socio-economic level. Aside from increasing extremities in weather conditions, the mid- and long-term physical

consequences of climate change will be a rise in sea levels, loss of biodiversity and extreme strain on ecosystems (IPCC, 2012).

Assessments of regional impacts of climate change widely agree that the most vulnerable countries and societies are in Africa, especially south of the Sahara. During the last century, a rise in temperature of approximately 1°C was measured on the African continent, higher than the global average. It is beyond a doubt that global warming is proceeding, and that the adverse effects are already being experienced. It must be noted that Africa is especially vulnerable to small changes in temperature and precipitation due to the fact that on the whole its ecosystems and societies are adapted to only a small range of climate changeability. The IPCC has identified environmental and ecological features that are especially vulnerable to climate change and to a rise in overall temperature, many of which are often found on the African continent: Mediterranean-type ecosystems, tropical rainforests, coastal mangroves and salt marshes, coral reefs, water resources in the dry tropics, lowland agricultural systems and low-lying coastal systems. A case in point would be the weather conditions on the Horn of Africa, where severe droughts due to failing rains two years in a row led to widespread famine in 2011. How much of this is directly linked to climate change is difficult to prove, however what is observed, by the IPCC, scientists and international agencies in the area is that weather conditions in the region are becoming severely erratic. While IPCC (2011) predictions foresee wetter climatic conditions for this area, more recent scientific studies predict the opposite and a mixture would appear to be the case, as the region has suffered both severe flooding and droughts in the recent past.

Climate change scenarios indicate substantial losses in the production of food staples linked to drought and rainfall variation, especially in areas of sub-Saharan Africa, where projected revenue losses due to loss of arable land amount to 26 percent by 2060. Such an impact on agricultural production would directly influence food security, leaving 600 million facing malnutrition by 2080 in addition to predictions that do not take climate change into consideration (FAO, 2016).

Increased exposure to coastal flooding and extreme weather events are equally threatening phenomena. Droughts and floods are the most frequent hazards in a steady increase of climate-related disasters. Rising sea levels and more intense tropical storm activity, resulting from warmer seas, will increase the number of people affected by coastal flooding by between 180 - 230 million. Without appropriate adaptation measures, this will lead to widespread displacement of people. The collapse of ecosystems is an unavoidable consequence of the above-mentioned scenarios. All predicted species extinction rates accelerate beyond the 2 °C threshold, with 3 °C marking point at which 20 to 30 percent of species would be at high risk of extinction. Coral reef systems, already in decline, would suffer extensive 'bleaching' leading to the transformation of marine ecologies, with large losses of biodiversity and ecosystem services. This would adversely affect hundreds millions of people dependent upon fish for their livelihoods and nutrition (Mano & Nhemachena, 2007).

Exposure to climate change rates for sub-Saharan Africa accounts for around 90 percent of deaths and are projected to increase by 16 to 28 percent (Nath & Behera, 2011). Accumulatively, the above has a negative impact on income, as well as considerably reducing food security. As most agriculture and food production activities in Africa are sensitive to climatic changes, for instance gradual changes in temperature can affect agricultural yields or production, while climate shocks such as drought or flooding can ruin whole crops, causes food prices to soar resulting in the most vulnerable people facing dire circumstances. Over the last 30-40 years, observations show that Africa is getting warmer: prognoses predict an overall 2.9°C increase in temperature in sub-Saharan Africa by 2060. Fact is that this region is already extremely vulnerable to food insecurity due to climate variability, which contributes substantially to development problems as key development sectors, i.e. health, agriculture, water, energy and transport are particularly sensitive areas. Examples of far-reaching consequences in Southern and Northern Africa are for instance prognosis that predict a 50 percent decrease in rain-fed agriculture by 2020, number of people suffering from water stress will rise from 15 to 250 million people. Furthermore, local food supplies will decrease due to for instance depleting fish in lakes due to rising water temperatures. In Lake Victoria alone, this could endanger

30 million people who rely on fish as a food and income source. Of course, there are many factors that affect income and food security in Africa and it is difficult to pinpoint the exact contributing factors of climatic change. For this reason, research is needed to understand not only this but also the effect of other multiple stresses, looking at local, regional and global level (Simatele, Binns & Simatele, 2012).

2.6 Impacts of climate change on subsistence economy

Currently efforts to mitigate climate change are not sufficient to stop future climate changes while the effects are already impacting negatively on the poor who are more vulnerable to climate change (IPCC, 2013). Adaptation has therefore, become an important part of the climate change discourse and indeed a fundamental and necessary response from communities due to historic and current emission of carbon. While rural communities have been coping with climate change and variability for years, current coping strategies may not be adequate to address the increasing rate of occurrence of erratic and hazardous climate patterns now and in the near future. It is therefore important that communities are supported to urgently improve their coping and adaptation strategies as the rate of climate change and the magnitude of its impacts is increasing (Haque, 2012; IPCC, 2014).

Climate change is impacting negatively on the poor as they are least resilient and their livelihood is tied to climate-sensitive resources such as agriculture, fisheries, forestry and other natural resources (UNECA, 2010; Christensen et al., 2007; FAO, 2003). Furthermore, settlement is most likely to be affected by climate extremes, thus compromising their fragile existence, causing a loss of assets, savings and bringing hardship and suffering. Mano and Nhemachena (2007), The Economist (2010), Simatele, Binns and Simatele (2012) argue that it is becoming increasingly clear that realisation of the development goals would be seriously hampered by climate change hazards as maize, cotton and sorghum suitable areas will decrease by 2080. Rising temperatures and increasing rainfall variability, notably drought, are also expected to exacerbate declining agricultural outputs, further compromising economic growth and stability, employment levels, food insecurity, demand for other goods and poverty reduction (IPCC, 2007; Nath & Behera, 2011).

Concern over the negative impact of climate change has strengthened fear that environmental degradation and demographic pressures will displace millions of people and create serious social upheavals (IPCC, 2007; 2012). According to Holmgren et al. (2006), most scientists studying the potential impact of climate change have predicted that Africa is likely to experience higher temperature, rising sea levels, changing rainfall patterns and increased climate variability, all of which could affect much of its population as well as their livelihood patterns.

The actual and potential impact of climate change is large and wide ranging, affecting many aspects of peoples' everyday lives. Climate models predict negative impacts of climate change on agricultural production, food security, and human health as well as changing daily routine in large parts of Africa (IPCC, 2007). Increased temperature, drying up of soils, increased pest and diseases pressure, shifts in suitable areas for growing crops and livestock, floods, deforestation and soil erosion are the signs that climate change is happening and represents one of the greatest environmental, social and economic threats facing Africa (UNFCCC, 2009). According to UNECA (2010) the impact of climate change will fall disproportionate on the world's poorest countries, many of them here in Africa. Poor people already live on the front lines of pollution, disaster and degradation of resources and land.

Many changes in ecosystems are apparent in Southern Africa. There are changes in grasslands and marine ecosystems. Low levels of fish stocks could be further diminished by rising temperatures (UNFCCC, 2009). There could be drying and diversification of biodiversity in many areas of Southern Africa. Forest ecosystems are threatened by deforestation and forest fires even though two-thirds of the people in sub-Saharan Africa depend on forest products (UNECA, 2010). Grasslands could be ruined. In terms of biodiversity, it is estimated that by 2085, certain species habitats could be lost altogether and almost 80 to 90 per cent of these habitats could be reduced in size or be located elsewhere (Guernier et al., 2004). Climate change could add to Africa's health burden and may alter the ecology of some disease vectors and spread of malaria and dengue fever (McMichael et al., 2004; IPCC, 2007; UNECA, 2010).

2.7 Climate change in Zimbabwe

Climate records demonstrate that Zimbabwe is already beginning to experience the effects of climate change, notably rainfall variability and extreme events. These conditions, combined with warming trends, are expected to render land increasingly marginal for agriculture, which poses a major threat to the economy and the livelihoods of the poor due to Zimbabwe's heavy dependence on rain-fed agriculture and climate sensitive resources. It is expected that farmers, who represent approximately 62 per cent of the total population, will bear disproportionate impacts due to their limited adaptive capacity. Consequently, climate change poses a major threat to sustainable development at the micro and macro levels (Nhemachena et al., 2014).

While several studies have been carried out to explore the impact of climate change on local livelihoods, there is very little dedicated literature to understanding the impact of climate change on subsistence farming in Zimbabwe. Existing studies cannot be generalised to include the Zimbabwean scenario due to several reasons. Firstly, livelihoods differ according to regions because they are ecologically dependent. Saarinen et al. (2012: 273) argue that naturally, some regions and activities are more sensitive to climate change than others. Regional ecological variations mean that livelihood strategies and the impact of climate change on those strategies will differ. Secondly regional climatic variations also mean that the impact would be experienced differently in different regions. For example, it has been suggested that while sub-Saharan countries will bear the brunt of climate change, Arctic regions stand to gain positively from climate change with the warming of temperatures enabling longer periods for growing crops. This argument shows the need for local studies on the impact of climate change on local livelihoods. This study sought to understand how local communities in Mutoko community are experiencing and responding to the climate change phenomenon. Nath and Behera (2011) argue that local assessment of vulnerability enables scientists to understand why and how communities respond to the same type of environmental stress in different ways. As vulnerability varies across regions and sectors, the impact from climate change across the globe is also likely to differ.

Zimbabwe lies in a semi-arid region with limited and unreliable rainfall patterns and temperature variations. Rainfall exhibits considerable spatial and temporal variability characterised by shifts in the onset of rains, increases in the frequency and intensity of heavy rainfall events, increases in the proportion of low rainfall years, decreases in low intensity rainfall events, and increases in the frequency and intensity of mid-season dry-spells (Unganai, 2009). Extreme weather events, namely tropical cyclones and drought have also increased in frequency and intensity (Mutasa, 2008). Moreover, according to the Zimbabwe Meteorological Service, daily minimum temperatures have risen by approximately 2.6°C over the last century while daily maximum temperatures have risen by 2°C during the same period. These conditions are expected to render land increasingly marginal for agriculture, which poses a major threat to the economy and the livelihoods of the poor due to Zimbabwe's heavy dependence on rain-fed agriculture and climate sensitive resources.

Climate change and variability have resulted in a shift in the rainfall patterns in many parts of the world. Zimbabwe has not been spared of these drastic changes in the rainfall pattern. Zimbabwe's agro-ecological zones (AEZ) have shifted drastically due to the devastating effects of climate change and global warming. Zimbabwe comprises of five AEZs (Natural regions I-V) and most of the agriculture is done in natural regions I, II and III which have favorable climatic conditions for crop production. Region IV and V are characterised by low annual rainfall activity and comprise of the country's low laying areas, known as the low veld. According to a research that was carried out by (Mugandani 2012) major shifts have occurred in the drought prone Regions IV and V which have become drier than previously experienced. According to the research, significant changes have been experienced in the size, structure and composition of the five natural regions.

The two main food producing regions in Zimbabwe, that is, NR II and III have shrunk significantly. Region II has shrunk by 49% while region III has shrunk by 14%. These changes in size of region II and III point to a possible reduction in food production and thus problems of food security in Zimbabwe. The dry regions, that is, region IV and V have expanded by 5.6% and 22.6% respectively (Mugandani et al, 2012: 365-

367). What this shows is that Zimbabwe's climatic conditions are drifting towards relatively arid conditions that are not favorable for agriculture. Zimbabwe has an agro-based economy that heavily relies on agriculture. Climate change has greatly affected agriculture in Zimbabwe and this has consequently resulted in food insecurity, increase in unemployment and a reduction in foreign currency earnings which has greatly crippled the economy. The negative influence of climate change and variability on agriculture in Zimbabwe has culminated into a hydra whose effects have choked the country's economic growth.

The shifting of natural regions' boundaries observed in Zimbabwe strongly points to climate change and variability. The effects of climate change are evident in Zimbabwe's increasing variability in rainfall patterns, high average temperatures, increased frequency and extremity of droughts and floods. Despite other factors that have affected Zimbabwe's agricultural sector such as the agrarian land reforms, climate change has played a major role in destabilising food production in the country. In the 2011/12 season, Zimbabwe was forced to import over 50% of its maize requirements (The Zimbabwean, 2012). This has mainly been attributed to a reduction in the amount of rainfall received annually which has greatly affected yields of the maize crop.

Observations in Zimbabwe are corroborated by a report that about 200 million people in sub-Saharan Africa lack adequate food for a healthy and active life (Feyissa, 2007: 103). This has been exacerbated by record food prices and drought which are pushing more people into poverty and hunger (Feyissa, 2007: 103, Nelson et al, 2009: 1). The effects of climate change have been grossly felt by African countries that are already grappling with scarce food reserves and poverty.

2.7.1 Agriculture

The Agriculture sector is the backbone of the Zimbabwean economy, contributing 15-20% to the Growth Domestic Products (GDP), 40% to exports and 60% of the raw materials used by the domestic manufacturing industry (ZUNDAF, 2011: 9). In Zimbabwe, the past decade has seen an increase in food and nutrition insecurity at household and national levels emanating from reduced productivity and production

of the main crops partly due to climate change and other socio-political events that were unfolding in the country. All this is attributed to the country's lack of a comprehensive agriculture policy framework.

Zimbabwe's economy is agro-based. Of the population of between 12.2 and 12.4 million people estimated in 2008, female constitute 52% and 71% of the total population are found in rural areas (CSO, 2009). Generally, all these people depend on subsistence farming for most of their food requirements as well as income generation. Due to persistent drought and low rainfall patterns, most of them have not been able to produce enough food from their land. The immediate cause is climate change though there are other factors such as lack of credit facilities to acquire the much needed inputs; poor market development and poor infrastructure are among the contributing factors (Shumba, 1983). Effects of climate variability are impacting on the rural population resulting in low agriculture production. Both medium to small scale farmers are expected to turn more to indigenous farming as a potential income earner.

The economy and the livelihoods of the poor in Zimbabwe are highly vulnerable to climate change due to their heavy reliance on rain-fed agriculture. Agriculture accounts for approximately 15-18 per cent of Zimbabwe's GDP and approximately 60 per cent of the raw materials required by the manufacturing industry and 40 per cent of total export earnings (GoZ, 2010). Rainfall variability is closely linked with economic growth, which reflects the dominance of the agricultural sector and its vulnerability to water stress. According to the International Fund for Agricultural Development (IFAD, 2015) poor rural households are highly exposed to shocks since their livelihoods depend on an increasingly deteriorated natural resource base and on often volatile climatic conditions. They are also particularly vulnerable to shocks because they have few assets to fall back on and limited risk management strategies.

Statistics from Zimbabwe Agricultural Corporations 2012 Annual Reports also demonstrate a substantial decline in agricultural production since 2000. Between 1993 and 2000, average annual maize production stood at 1.64 million tonnes before

dropping to 1.08 million tonnes between 2001 and 2008. In addition, the average yield for maize during the 2009-2010 farming season was 0.7 tonnes per hectare, down from 0.85 tonnes per hectare in 2008-2009. In 2007, only 45 per cent of national cereal requirements were produced in the country, leaving a deficit of over 610,000 metric tonnes to be covered by imports (FEWSNET, 2007). Similarly, cattle population declined from approximately 6.1 million in 2000 to 5 million in 2011, while dairy production dropped from over 100,000 cows in 2000 to approximately 22,000 cows in 2010.

Rising temperatures and increasing rainfall variability, notably drought, are also expected to exacerbate declining agricultural outputs, further compromising economic growth and stability, employment levels, food insecurity, demand for other goods, and poverty reduction. In particular, climate change is expected to lead to the expansion of marginal lands (IPCC, 2007), which is already beginning to occur in Zimbabwe. If changing climatic conditions continue to expand these regions, traditional agricultural systems will become increasingly unsustainable. Diversified livelihood systems with a livestock component are expected to become more vulnerable. Mixed crop-livestock systems are a traditional livelihood strategy of smallholder farmers in semi-arid rural areas (Kahinda et al., 2007; Wani et al., 2009). These systems tend to be well adapted to climatic conditions characterised by erratic rainfall patterns. However, climatic variability in semi-arid areas poses major threats to natural processes that sustain fodder production for livestock and moisture for rain-fed crop production (Tadross et al., 2009). Pasture and crop production in the absence of appropriate management practices are at risk of frequent failure with predicted future rainfall expected to be reduced or punctuated by concentrated heavy events separated by prolonged dry spells.

The actual and potential impact of climate change is large and wide ranging, affecting many aspects of peoples' everyday lives. Many climate models predict negative impacts of climate change on agricultural production, food security, and human health as well as changing daily routine in large parts of Africa (IPCC, 2007). Increased temperature, drying up of soils, increased pest and diseases pressure, shifts in suitable areas for growing crops and livestock, floods, deforestation and

erosion are the signs that climate change is happening and represents one of the greatest environmental, social and economic threats facing Africa (UNFCCC, 2009). According to UNECA (2010) the impact of climate change will fall disproportionate on the world's poorest countries, many of them here in Africa. Poor people already live on the front lines of pollution, disaster and degradation of resources and land.

Recent studies which use global circulation models show that from the current period up to the year 2080, Zimbabwe will face a general decrease in reliability and predictability of rainfall patterns while temperatures are expected to rise by 2 °C (Bohle et al., 1994: 47). Such a change has a serious impact on the country's food security thus the need for contingency measures to be put in place. It is now universally agreed that climate change and climate variability are among the greatest challenges facing mankind in the 21st century. In Zimbabwe recent concerns have been raised that no one is taking the responsibility to advise farmers on when to plant, what to plant and how to plant in line with the changing climate that has become a reality.

2.7.2 Water

Persistent drought in Zimbabwe has severely strained surface and ground water systems, contributing to the country's deteriorating water supply. Surface water (mostly rivers and dams) is the major source of water in Zimbabwe accounting for 90 per cent of supply (GoZ, 2010). There are no large floodplains and swamps because of the semi-arid climate and topography. The potential to use ground water has not yet been realised mainly due to the unaffordability of the required technology. There is also limited knowledge on how much ground water the country has. However, surface water is prone to high losses due to evaporation caused by high temperatures. In 2007, evaporation led to extremely low water levels in most of Zimbabwe's dams, causing many to be decommissioned. (Chagutah 2010) asserts that the situation becomes worse with climate change where evaporation is predicted to increase by between 4-25 per cent in the river basins. Runoff is also projected to decline by up to 40 per cent, with the Zambezi Basin worst affected. At the same time, annual rainfall levels based on the 1961–90 average are projected to decline between 5–20 per cent by 2080 in all of the country's major river basins. These

projections will worsen the existing deficiency of water resources, particularly in the agro ecological zones IV and V as described above.

At present, the vast majority of Zimbabwe's water (80 per cent) is used in the agricultural sector followed by the urban and industrial sector (15 per cent), rural authorities (2 per cent), conservation (2 per cent) and mining (1 per cent) (GoZ, 2010). Estimates by the International Union for Conservation of Nature and Natural Resources indicate that Zimbabwe's water demand far outstrips supply by 631 million m³. In urban areas, small towns and growth points, access to safe water and sanitation is approximately 90 per cent (GoZ, 2010). However, access to safe and reliable water and sanitation has fallen to approximately 40–60 per cent nationwide. Harare, the capital city, supplies only half of its daily water demand of approximately 1,200 mega liters per day. This situation is common in other towns, such as Bulawayo, Norton, Chitungwiza and Ruwa (Chagutah, 2010).

In the rural areas, water coverage was 75 per cent in 1999, but by 2007, a third of the rural population was estimated to lack access to improved drinking water. Approximately 65 per cent of the water facilities in the rural areas are non-functional (GoZ, 2010). Zimbabwe's water and sanitation infrastructure is generally aged and therefore more expensive to maintain, thereby compounding any challenges presented by reduced availability of rainwater.

2.7.3 Health

Growing evidence suggests that climate change will affect human health through increases in floods, storms, fires and droughts; changes to the range of infectious disease vectors, including the geographical range of malaria and other mosquito-borne diseases, such as dengue; increases in the burden of diarrheal diseases, and of water-borne pathogens such as cholera; and an increase in cardio-respiratory morbidity and mortality associated with ground level ozone. Climate change is also expected to exacerbate the effects of human-induced ozone depletion in the Southern hemisphere, further worsening this situation (Károly, 2003).

The erratic water supply situation in Zimbabwe has already contributed to an increase in water-borne diseases. A nationwide cholera epidemic in 2008, one of the largest outbreaks in recorded history, affected over 100,000 people, killing over 4,000 (GoZ, 2010). Moreover, the potential for cross-contamination of water and sanitation systems make recurrent outbreaks of cholera during the rainy season a major risk factor during flood events, as experienced in Malawi (UNICEF, 2008). Zimbabwe is also vulnerable to having perennially high cases of malaria (Chigwada, 2009). According to the IPCC (2007), by 2100, changes in temperature and precipitation are likely to alter the geographic distribution of malaria in Zimbabwe, with previous unsuitable areas of dense human population becoming suitable for transmission. Disease epidemics in addition to food insecurity, chronic malnutrition and HIV/AIDS are eroding the resilience of households, rendering them less resilient and more vulnerable to hazard shocks.

The Zimbabwe National Network of People Living with HIV and AIDS (ZNNP+) is particularly concerned with how the health crisis will affect the vulnerability of PLHIV groups. It is estimated that approximately 14.3 per cent of those aged 15 years and above were infected with HIV/AIDS as of 2010 (GoZ, 2009). PLHIV groups face multiple vulnerabilities, which climate change will intensify, particularly within low lying, food insecure areas. Cases of diarrhea in some instances can be severe to the extent of weakening immune systems among infected people. Adequate water supply and sanitary facilities are of the utmost importance in reducing diarrhea and other infectious diseases, but are severely lacking in both rural and urban areas.

Despite growing health concerns, government authorities and civil society are increasingly concerned with Zimbabwe's capacity to respond to humanitarian emergencies. In 2010, the Ministry of Agriculture, Mechanisation and Irrigation Development indicated that six provinces in Zimbabwe will become food insecure, and that recurrent malaria outbreaks and cholera epidemics will become more prevalent. These threats demonstrate Zimbabwe's fragility, calling into question its ability to cope with minor emergencies, which can easily turn into crises.

2.7.4 Infrastructure and energy

In the following sections, I reflect on how climate change in Africa is often aggravated by limited infrastructure and energy sources in Africa. The attempt here is to show how multiple factors are responsible in making African countries vulnerable to climate change.

2.7.4.1 Infrastructure

The Fourth Assessment Report of the IPCC reports that Africa is one of the most vulnerable continents to climate change, a situation aggravated by the interaction of 'multiple stresses', including limited infrastructure (e.g. transport, energy, ICT, water, sanitation and irrigation). The African Development Bank (ADB, 2011) annual report estimates that Zimbabwe requires approximately \$14.2 billion to rehabilitate existing infrastructure. Zimbabwe's roads, in particular, were once considered to be among the best in southern Africa, but are now in a state of disrepair due to years of neglect. Climate related hazards, including extreme localized floods are worsening this situation. For example, the severe flooding in Domboshava during Cyclone Eline in 2000 caused substantial damage to infrastructure, including bridges and schools.

The rail and air transport system in Zimbabwe has also deteriorated significantly in the past ten years. Rail capacity utilisation has dropped from 53 per cent in 2000 to 15 per cent in 2009 (GoZ, 2011). The tonnage moved has also declined significantly from 9.5 to 2.7 tonnes during the same period. As a result, heavy vehicles are now responsible for moving the majority of heavy tonnage, which is contributing to road damage. Some of the infrastructural deterioration is, however, attributable to neglect, mismanagement and inefficiencies on the side of institutions involved. This has created a situation whereby infrastructure is both inadequate for current needs, and more likely to be adversely affected by climatic shocks and stresses.

The socio-economic costs of climate change to infrastructure will likely be high if no action is taken. Non-adaptations could lead to the damage and destruction of infrastructure, which will affect all sectors of the economy. As a result, the right policy choices are critical in ensuring that future infrastructure is climate resilient (i.e. able

to withstand increases in climate variability and mean changes) and able to reduce risks among vulnerable groups (Corfee-Morlot & Cochran, 2011).

2.7.4.2 Energy

The literature on energy and climate change focuses largely on the potential of 'green' technology to contribute to a new low-carbon economy (de Gouvello et al., 2008; Never, 2011). While climate change mitigation is an important aspect of development, less than 10 per cent of the rural population in sub-Saharan Africa has access to modern energy services, with just over 20 per cent of the total population connected to electric power supply (ADB, 2008). As a result, energy provision remains one of Africa's principal development challenges. However, climate change is likely to compromise energy development, especially hydropower, which represents 45 per cent of electric power generation in sub-Saharan Africa (*ibid*; Bates et al., 2008).

The commercial energy sector in Zimbabwe is dominated by electricity, while fuel wood provides the majority of energy for domestic use in rural areas. The majority of electricity is produced by the Kariba dam with a capacity to generate 750 MW (40 per cent of national supply), Hwange thermal power station (46 per cent of national supply), Harare thermal power station (5 per cent of national supply), Bulawayo thermal power station (4.5 per cent of national supply) and Munyati thermal power station (5 per cent of national supply). However, energy output has been compromised by recurrent electricity shortages over the past ten years. While national electricity demand is about 2.200 MW, only about 1200 MW is generated in Zimbabwe (Simon & Leck, 2010). Low water supplies since 2007 has also meant that the Kariba hydro-power station is operating at only 87 per cent of its full capacity. Drought conditions created by climate change are expected to reduce run-off, further reducing the water levels required to support the operation of dams. The thermal powers station, especially in Hwange are also constantly failing due to outdated technology.

2.7.5 Human settlement

Urban populations in low-and-middle income nations are most vulnerable and therefore likely to be disproportionately affected by the direct and indirect impacts of climate change (Dodman & Satterthwaite, 2008; Satterthwaite et al., 2007). Almost all of the urban growth between 2010 and 2030 is expected to occur in low-and-middle income nations with the highest rates of growth occurring in Africa (Johnson, 2010; UNDESA, 2011). This means that urban areas are becoming increasingly important sites for combatting climate change (Romero-Lankao & Dodman, 2011).

Urban areas in Africa accommodate large proportions of their populations in hazard-prone areas, including coastal settlements, flood plains and steep slopes. As a result, climate impacts, notably the increased frequency and intensity of extreme weather events (e.g. floods and cyclones), are likely to intensify the existing natural hazard burdens for at-risk populations, particularly in informal settlements and slums (Douglas et al., 2008; Pelling & Wisner, 2009). For example, the floods in the Zambezi and Limpopo valleys in 2000 destroyed substantial housing stocks. Further, the IPCC (2012) reports that disaster risk will continue to grow in many countries as more people and their assets concentrate in areas exposed to weather extremes. Dodman and Satterthwaite (2008) examine how the urban poor are likely to be disproportionately affected because they face multiple vulnerabilities, including higher exposure (e.g. living in hazard-prone areas); lack of protective infrastructure (e.g. drainage systems); lack of state planning and assistance (e.g. disaster preparedness, response and recovery); less adaptive capacity (e.g. limited assets to invest in resilience); and less financial and legal protection (e.g. lack of insurance and insecure tenure).

The effects of urbanisation and climate change are converging in Zimbabwe. The major cities of Harare, Bulawayo, Mutare and Gweru reached population growth rates of over 5 per cent per annum throughout the 1980s. However, overall urbanisation rates have remained relatively constant between 2-3 per cent since the 1970s with an estimated 38.1 per cent of the total population living in urban areas in 2010. Over the past decade, urbanisation has become synonymous with the rapid

growth of informal settlements and slums in peri-urban areas. Zimbabwe's slum prevalence, which was lowest in sub-Saharan Africa at 3.4 per cent of the urban population in 2001, has risen dramatically to 18% in 2006 (UN-Habitat, 2008). Much of this growth has been attributed to overcrowding. Notable examples include sections of Dzivarasekwa Extension, Caledonia and Hatcliffe in Harare where people have squatted on state-owned land. Such areas typically lack municipal trunk sewers, basic water and sanitation, roads and other forms of municipal infrastructure and services, which all play important roles in mediating disaster risks, especially in hazard-prone areas.

Temperature increases are also likely to be intensified by the urban heat island effect, which will further degrade air quality and increase energy demand for cooling. Moreover, increasing water stress will worsen declining energy outputs due to Zimbabwe's dependence on hydro-electric power and contribute to existing water shortages in cities (as experienced in Harare) and food insecurity during drought episodes (Simon & Leck, 2010). Increased mobility, including rural-urban migration, could also become more prevalent if autonomous adaptation strategies fail to cope with future climate variability. Mobility has increased in many countries in southern Africa where climatic variability and declining agricultural productivity, among other stresses has jeopardised rural livelihoods (Potts, 2006; Sall et al., 2011; Simon and Leck, 2010; Stringer et al., 2010). The migration of younger more economically active people to urban areas and abroad has often intensified the vulnerability of young and old people who may not be able to maximize the productivity of land (JIMAT Development Consultants, 2008).

Despite growing vulnerability in human settlements, urban policy in Zimbabwe does not explicitly address climate change. Outdated master plans have also failed to effectively regulate development, as demonstrated by the rapid growth of slums. Experts point to the lack of a national climate change framework as a primary reason for why climate change has not been properly integrated into policy legislative frameworks and climate governance. In addition, since informal settlements are widely regarded as 'illegal', they are under constant threat of eviction. For example, the Zimbabwean government introduced 'Operation Murambatsvina', a slum

clearance campaign in 2005 that affected nearly 700,000 people (Kamete, 2008; Musemwa, 2010). However, recent urban development projects are demonstrating a paradigmatic shift towards pro-poor policy. For example, the Zimbabwe Homeless People's Federation, Dialogue on Shelter and the City of Harare are implementing a five-year slum upgrading programme in Harare. Therefore, slum upgrading can reduce the impacts of climate change on the urban poor by making plans on how to address the vulnerability of slum dwellers and by building resilience into communities through the redevelopment process.

2.7.6 Gender

Climate change presents a significant threat to human security, especially for women who represent 70 per cent (70%) of the world's poor. It is widely recognised that climate change will exacerbate the gender dimensions of vulnerability, which arise from existing social inequalities and gendered divisions of labour (Alber, 2009; Brody *et al.*, 2008; Dodman, 2010; WEDO, 2008). In addition to the disproportionate effects of disasters on women's mortality and morbidity, climate change is expected to jeopardise women's livelihoods by reducing economic opportunities, especially for female headed households (Dodman, 2010).

In Zimbabwe, 70 per cent of women are smallholder farmers dependent on rain-fed agriculture and climate-sensitive resources (Madzwamuse, 2010). Women are therefore particularly vulnerable to the knock-on effects of climate change. For example, women in some areas of Shurugwi reported a shift in livelihood strategies to beer brewing, which led to higher alcoholism and an increase in domestic violence and abuse against women (Musemwa, 2010). In other cases, the impacts of drought and extreme weather have resulted in changes to gender ascribed roles regarding water collection, which have led to additional responsibilities.

Although women and children are expected to be disproportionately affected by climate change, they remain largely absent from decision-making processes on climate change adaptation and disaster risk reduction. This is demonstrated by the absence of gender in policy frameworks involving the management and protection of environment and natural resources in Zimbabwe (Chagutah, 2010). This is ultimately

counter-productive, considering that women often play central roles in adaptation and post-disaster recovery. Accordingly, the United Nations International Strategy for Disaster Reduction (UNISDR) Hyogo Framework for Action states that “a gender perspective should be integrated into all disaster risk management policies, plans and decision-making processes, including those related to risk assessment, early warning, information management, and education and training” (UNISDR, 2009:4). Future planning must incorporate a gender-sensitive perspective, which requires an understanding of the ways in which climate change can intensify pre-existing inequalities between men and women (Chagutah, 2010).

2.9 Theoretical framework

The current study employs an Afrocentric model to examine local perceptions on climate change in Zimbabwe. In what follows, I discuss the Afrocentric approach and show how it can illuminate on people’s understanding of climate change in Zimbabwe.

2.9.1 Afrocentric approach

The present study was designed according to a social science theoretical perspective namely; the Afrocentricity Model, which is an approach that prioritises African knowledge systems in the study of social phenomena. In the context of this study, Afrocentricity was adopted to examine existing perceptions on climate change and its impact on the subsistence farming of a rural community in Zimbabwe. The adoption of the Afrocentric approach necessitates the use of focus group discussions to probe the participants’ cultural experiences of climate change and its impact on the subsistence farming among Africans in Zimbabwe. Data were derived from the study participants’ experiences of climate change and observations of its impact on their cultural practices. Afrocentricity is a paradigm that has its core on the understanding of the African identity as rooted, centred and located in the aspects of the African culture (Asante, 2007; 1993; Mazama, 2001).

Afrocentricity recognises the African voice and reaffirms the centrality of cultural experience as the place to create a dynamic multicultural approach (Mkabela, 2005). For Mazama (2001; 2003), Afrocentricity emerged as a methodology that operates within African ways of knowing and existence and has resulted in the implementation of principles, methods, concepts and ideas that are derived from African cultural experiences. As a tool of enquiry, it operates as a methodological framework to investigate Africans real experiences in their own cultural settings (Pellerin, 2012).

The afrocentric paradigm is a revolutionary shift in thinking proposed as an adjustment to black disorientation, decentredness, and lack of urgency. Mazama (2003) argues that the afrocentric approach asks the question, “What would African people do if there were no white people?” In other words, what natural responses would occur in the relationships, attitudes toward the environment, kinship patterns, preferences for colours, type of religion, and historical referent points for African people if there had not been any intervention of colonialism or enslavement? Afrocentricity answers this question by asserting the central role of the African subject within the context of African history, thereby removing Europe from the centre of the African reality. In this way, an Afrocentricity becomes a revolutionary idea in studying climate change and its impact on the way people sustain themselves in a rural setting because it studies ideas, concepts, events, and personalities and socio-economic processes from a standpoint of black people as subjects and not as objects, basing all knowledge on the authentic interrogation of location (Asante, 2000).

According to Mazama (2003) one of the key assumptions of the afrocentric theory is that all relationships are based on centres and margins and the distances from either the centre or the margin. He debates that when black people view themselves as centred and central in their own history then they see themselves as agents, actors, and participants rather than as marginal on the periphery of environmental and socio-economic experience. He says that using this paradigm, human beings have discovered that all phenomena are expressed in the fundamental categories of space and time. He concludes that it is then understood that relationships develop

and knowledge increases to the extent we are able to appreciate the issues of space and time.

Furthermore, the afrocentric scholar or practitioner knows that one way to express an Afrocentricity is called marking (Asante, 1998). Whenever a person delineates a cultural boundary around a particular cultural space in human time, this is called marking (Mazama, 2003). It might be done with the announcement of a certain symbol, the creation of a special bonding, or the sighting of personal heroes of African history and culture (Asante, 2000). Beyond citing the revolutionary thinkers in our history, that is, beyond Amilcar Cabral, Frantz Fanon, Malcolm and Nkrumah, we must be prepared to act upon our interpretation of what is in the best interest of black people, that is, black people as a historically oppressed population (Mazama, 2003). This is the fundamental necessity for advancing the environmental and socio-economic processes.

Asante (1998) asserts that an Afrocentricity is the substance of our regeneration because it is in line with what contemporary philosophers such as Haki Madhubuti and Maulana Karenga among others have articulated as in the best image and interest of African people. What is any better than operating and acting out of our own collective interest? What is any greater than seeing the world through our eyes? What resonates more with people than understanding that we are central to our history, not someone else's? If we can, in the process of materialising our consciousness, claim space as agents of progressive change, then we can change our condition and change the world.

Reviere (2001) asserts that the principal advantage of an afrocentric approach is that it compels a researcher to challenge the use of the traditional eurocentric approach in the enquiry process. Using this theory, the researcher will try to explore the rural community's perceptions of climate change and its impact on the subsistence economy. According to Asante (2000) African issues need to be approached using African lenses/glasses rather than using other theories which were designed to solve issues completely different from African problems.

Asante wrote a lot about afrocentrism as the best approach ever in solving global issues, though he shuts himself from the worldview. Asante is supported by Collins (1990) who asserts those phenomenon are best understood through the use of its natural methods of analysis. The African methods of analysis are ways of looking at African matters which analyse them (African matters) within the African context. Asante (2000) argues that afrocentricity seeks to relocate the African person as an agent in human history in an effort to eliminate the illusion of the fringes.

According to Asante (2000) an Afrocentricity draws its concept from and bases itself on the culture of the African and totality of African experience. He explains that a Afrocentricity has four main characteristics:

- Protection of African cultural elements in the context of art, music and literature and of the Pan Africanist cultural elements as based on responses to situation, environment and conditions.
- A devotion to finding the subject place of Africans in social, political and religious phenomenon with implications to questions of sex, gender and class.
- A concern in psychological relocation as determined by ritual, symbols and signals.
- A devotion to lexical refinement to avoid gender and sex pejoratives of any other person including Africans and also celebration of centeredness and agency.

Keto (1989) argues that the African centred perspective rests on the premise that it is valid to position Africa as a geographical and cultural starting base in the study of people of African descent. He mentions that the objective therefore is to view the world from the perspective of the people studied. He asserts that the afro-centric comprehensive model for the teaching and learning of knowledge about African peoples makes possible an understanding of, and appreciation for the social, environmental, cultural and intellectual patterns of African people.

The afro-centric approach was used in this study because it is holistic and centred on the African worldview. At the centre of this study are the African people, their culture, identity, values and socio-economic activities, experiences with regards to their history and belief system in relation to climate change. The African methods of

analysis are very important in this study because they will help the researcher to understand impact of climate change within the African context. For example, the researcher will be able to understand climate change in Africa, why climate is important to the African people and why is it necessary to have climate change solution programmes in Africa. Looking at the different arguments which different scholars have advanced concerning the afrocentric approach, one can argue that the central theme of the ideology is to regenerate African people. The regeneration of the African people should take place in all aspects of their lives; for example culture, socio-economic factors to mention but a few. The main idea of the theory regarding the regeneration of the African people helped the researcher to understand the rural community's perceptions of climate change and its impact on the subsistence economy, given that the main aim of the study is to explore perceptions of climate change and its impacts on subsistence farming among rural, Zimbabwean African people.

The above arguments are of crucial importance and need to be highlighted in this study. This theory helped the researcher in exploring the rural community's perceptions of climate change and its impact on the subsistence farming in an African context. As such a central question that guided my analysis was; what are the views and values of the people concerning climate change? The afro-centric ideology is of paramount importance to this study because of its notions which suggest that when dealing with African issues there is need to re-generate African people and their methods because they are the best in solving their own problems and also because of the theory's consideration of Ubuntu. According to the Ubuntu Community (2002) 'Ubuntu' refers to an African concept of 'humanity towards others'. It is a belief in a universal bond of sharing that connects all humanity. The ideas of the African perspectives are inseparable with the way how climate change impacts the African rural people.

2.10 Conclusion

The chapter has reflected on the nature and extent of climate change in Zimbabwe. It gives a synoptic view on how climate change has affected communities in Zimbabwe and beyond. More crucially, it revisits existing debates on the subject of

climate change. Also the chapter, introduces the theoretical framework that guides the study. The theory of Afrocentricity was adapted in this study mainly because it allows the examination of social phenomena (climate change) from the standpoint of those people who are affected by it. The study is about local experiences and indigenous mechanism of addressing climate change and as such an Afrocentricity give the much needed theoretical purchase to examine climate change in Zimbabwe.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Overview of the study area



Figure 1. Mutoko map (<https://www.google.co.za/search?q=mutoko+map&esp>)

The study was conducted in two villages namely Chingwena and Chimuti which are governed by Mutoko Rural District Council. The district lies 143 kilometres from Harare. It is named after the local Chief (Mutoko). Mutoko community is inhabited by the *Buja* people known for being amongst the best tomatoes and mango farmers in Zimbabwe. It is from these rural villages like Chingwena and Chimuti, the country as they produce maize, cotton, beans and recently tobacco. Mutoko is considered one of the major bread baskets of Zimbabwe. In both villages (Chingwena and Chimuti); a local Shona dialect called '*chitoko*' is spoken. Primary education medium of translation is English but '*chitoko*'

is dominantly spoken in the homes. These communities have inhabited the places they stay in many years back, which is an indication of long history of cultural interaction with the local natural environment spanning many generations. They are retaining traditional practices and maintaining their district linguistic heritage and succumb to their cultural affinities under Chief Gude(<https://en.wikipedia.org/wiki/Mutoko>, Accessed July 2016). The area is relatively dry, with short grass covering the high-lying area and sparse bush covering the valleys. The soil cover is of a brown to red sandy type and is thick in the valleys. It has a high infiltration rate and a low holding capacity. Because of its sandy and loose nature, the soils are susceptible to erosion.

3.2 Methodology

3.2.1 Research design

A qualitative, exploratory study was conducted to examine perceptions of climate change and its impacts on subsistence farming. An exploratory research design is deemed necessary for its ability to produce descriptive information appropriate in the analysis of people's individuals and collective social actions thoughts and perceptions. Qualitative research methods are often used to gain better understanding of such phenomena as intentionality (from the responses of the respondents) and meaning (why did this person/group say something and what did it mean to them). The broad research strategy used in this research is qualitative in nature.

A qualitative methodology of inquiry is rooted in the phenomenological paradigm as opposed to the positivist school of thought (Corbetta, 2003). The phenomenological paradigm emphasises understanding, analysing and describing phenomena without necessarily relying on quantitative measurements and statistics (Dawson, 2007). In direct contrast to positivism, phenomenological approaches accept subjectivity as opposed to objectivity. Phenomenology also allows for interpretation of events and phenomena such as those identified in the investigation of rural livelihoods and climate change challenges in Mutoko community of Zimbabwe as opposed to strict quantitative measurements. The phenomenological approach is characterised by a

focus on qualitative interpretation of people's perceptions and meanings attached to social phenomena, attitudes, beliefs and value systems (Lincoln & Guba, 2000). Within the context of this research, social phenomena such as personal experiences, beliefs, attitudes and opinions of the members of the Mutoko community were investigated. According to Leedy (1989), the qualitative research methodology might be considered a 'warm' approach to the central problem of research as this kind of research investigates issues identified earlier in addition to interpersonal relationships, meanings construction, experiences and associated thoughts or feelings. With this, the researcher attempted to attain rich, deep, real and valid data on climate change experiences and responses in the Mutoko communal lands.

3.2.2 Population and sample

The sample of the study was drawn from two villages of Mutoko rural community to collect quality and reliable data. A fifty (50) participant population sample was selected to explore a wider perspective of the rural community's perceptions of climate change and its impact on the subsistence farming.

The researcher used non-probability sampling, which was purposive sampling. A sample simply refers to the element of the population considered for actual inclusion in a study, or it can be viewed as a subset of measurements drawn from a population in which the researcher is interested (Tashakkori & Teddle, 2005). Neuman (1997) argues that purposive sampling is an acceptable kind of sampling for special situations. He claims that, in purposive sampling, a particular case is chosen because it illustrates some features or processes that are of interest for a particular study. This type of sampling (i.e., purposive sampling) is based entirely on the judgment of the researcher, in that a sample is composed of elements that contain most characteristics representative or having typical attributes of the target population (Singleton, 2004). The selection in purposive sampling might also be made with the view of choosing information-rich cases.

In qualitative research, the study respondents are selected on the basis of their knowledge of the phenomenon being studied. The respondents should have good,

relevant knowledge of the domain of the study and should also be able to interpret the meaning of their own cultural phenomena (Cotton, 1996). For the purpose of this study, the sample was purposively selected to be comprised of people who have extensive knowledge of phenomena, situations, conditions and elements in the natural, socio-economic and spiritual environments that are responsible for the cause of a variety of challenges caused by climate change which is affecting their livelihood. The selected villages are typical of any other cases (villages) in Mutoko and Zimbabwe because they are heavily reliant on subsistence farming and the effects of changes in climatic and environmental changes appear to be evident. The research respondents were also selected on the basis of places of residence. All participants were recruited with the help of the village heads who are known as the 'sabhuku' in the local Shona language. The researcher was given permission by village heads in the two villages of Chimuti and Chingwena to meet up with the villagers as they gathered for their monthly meetings. It was at these meetings in both villages that all the participants were selected and recruited. The respondents were all local inhabitants of the two villages identified for the study.

3.2.4 Sample size

Equal numbers of sample groupings were selected from the two villages within Mutoko rural community. Selection of the participants was done on the basis of longevity of stay in any of the two selected villages (Chingwena and Chimuti) because the researcher was more concerned on those who have stayed in the community for more years and those who have a better understanding of what has been happening in that particular community of Mutoko. The age variable was also key in the selection of participants. This was so because the researcher was interested in selecting those participants who at least have some of knowledge on how changes in climatic conditions impact of their farming activities. Therefore, the study sample was made up of fifty (50) members who were purposively selected from the community. The participants were the community members who stayed in the community for more than 35 years which is evidence of long period of stay in the area and immense knowledge of cultural values and livelihood patterns. The sex

ratio of the participants was 50% female and 50% male. The age of participants ranged from 35 and above years.

3.3 Data collection

Primary data for this study were collected through the use of focus group discussions. Krueger (1998) views focus group discussions as a carefully planned discussion designed to obtain perceptions on a defined area of interest in a permissive and non-threatening environment. He argues that such discussions often enable the participants to discuss issues they consider important. This approach can also be used to explore where little is known or views of a certain sample, such as particular culture, age group or gender, need to be obtained (Neuman, 1997). Focus group discussions generally comprise of four to eight research participants whose participation is voluntary and who are homogeneous in some respects (Krueger, 1998). The reason why the study employed focus group discussions is that the researcher is far more concerned about group input in gathering relevant information to the study aim. Participants were brought together to share experiences about changing climatic conditions and their impact on subsistence farming in their cultural settings. The researcher conducted focus group discussions with five groups of about six members each, the participants were grouped into groups after the researcher made arrangements with the village head, '*sabhuku*' to meet up with them on Saturday mornings during their weekly briefing meetings with the elders of the community. Therefore, the discussions were centred on the participants' experiences and knowledge of changes in climatic conditions. Experiences and knowledge of changing rainfall patterns were examined by asking questions about observable changes in rainfall and temperature patterns. These questions were followed by questions about the impacts of observable changes on the local practices of making a living.

Participants were grouped in the same group because they were sharing same qualities to make the discussions productive and faster. There were six participants in each group to make the groups to be easily manageable. Each group of participants was interviewed once; each session had the same thematic questions.

In total, five sessions were conducted during the focus group discussions. The discussions were carried out at Mutoko in the two villages from the 1st to 10th of September 2016. Each session of the focus group discussions lasted for more than one hour. The researcher made use of pseudo names during the discussions, as a way of protecting the identity of the participants.

The following were the two themes which were handled in the focus group discussions:

- Determining participants' knowledge about climate variations in the form of increased temperature and erratic rainfall patterns.
- Examining participants' knowledge of the impact of variations in temperature and rainfall patterns on the community's subsistence farming.

At the beginning of each session the researcher briefed the participants about the themes of the session through explaining and defining key terms and what was expected of them. The discussions were conducted in Shona. All the sessions were recorded through the use of a tape recorder and then transcribed into English. At first the participants were not comfortable to be recorded, but the researcher explained to them that their real names would not be mentioned or appear anywhere in the final document.

3.4 Data analysis

Analysis of data was done through a thematic approach to categorise data under two themes namely; perceptions of variations in temperature and rainfall patterns and their impact on the community's subsistence farming practices. According to De Vos (2005:31), "thematic data analysis qualitative analytic method is used for identifying, analysing and reporting patterns (themes) within data". Therefore captured themes in the data were related to the research objectives and represented some level of patterned response or meaning within the data set. This characteristic of thematic data analysis enabled the researcher to derive meaning from the data collected.

According to Burns and Grove (2003:479) data analysis is a mechanism for reducing and organising data to produce findings that require interpretation by the researcher.

Data analysis is a challenging and a creative process characterised by an intimate relationship of the researcher with the participants and the data generated (De Vos 2002:339). The researcher made use of thematic data analysis. Data analysis is a multipronged process that every researcher embarks on to make sense of the data: break it down, study its components, investigate its importance, and interpret its meanings (Patton, 1999; Bailey, 2007). The analysis of data helps to structure the production of the final manuscript.

3.5 Ethical considerations

3.5.1 Introduction

Ethics are a set of moral principles that are widely accepted, which guide the researcher in observing the rules. Ethical considerations required special attention during the study. The researcher sought for ethical clearance from the University of Limpopo Ethics Committee (Appendix C) before conducting this research. Permission to undertake the research in Mutoko community (Appendix B) was also sought from local authorities, the ward chief and councillor. Throughout the study period the researcher was guided by code of ethics informing scientific research with human beings (De Vos et al, 2005).

The following were observed to ensure that the research is conducted in an ethical manner:

3.5.2 Informed consent

Consent is the prospective respondents' agreement to participate in a study as an informant. It is ethically compulsory for the researcher to obtain consent from the respondents (Neumann, 2005). The participants were made aware that participation in the study was voluntary, and that they were free to withdraw from the project at any time. They were asked to sign the consent form if they agree to take part in the study (Appendix A). All the participants consented to participate in the study by signing the consent form.

3.5.3 Confidentiality

Confidentiality and anonymity of the participants were considered. The participants were not mentioned by their real names and information obtained by the researcher was used for clear scientific purposes and this was made clear to the participants at the time of consenting to participate in the study.

3.5.4 Right to privacy

Privacy is the freedom that individuals have to determine the time, extent and general circumstances under which private information will be shared with or withheld from others (Burns & Grove, 2005). The identities of the participants were protected and not revealed in the research findings. The participants' privacy was protected by obtaining their informed consent and they were assured that there would be no invasion on their privacy. The researcher ensured the respondents that the information collected would only be used for the research purposes.

3.5.5 Right to fair treatment

The study respondents have the right to fair and equitable treatment before, during and after their participation in the study (Martin, 1995). During the study, the respondents were fairly treated to participate freely in the study and their cultural preferences were taken into consideration. For instance Shona was used as a medium of expression during focus group sessions.

3.5.6 Voluntary participation

The principle of respect for human dignity encompasses the respondents' right to make informed choices, voluntary decisions about study participation, which requires full disclosure (Neuman, 2005). Prior to data collection, the respondents were provided with full information about the study and the value of their participation in the study, the participants were also informed that participation is voluntary and that they can withdraw at any time from the research process

3.6 Justification of research methods

As has been stated already, this study used qualitative research methods. The first advantage of qualitative methods is that data typically comes from fieldwork and the researcher makes first-hand observations of both the activities and interactions being measured. This suited very well with this study because it was possible to collect first-hand information on the rural community's perceptions of climate change and its impact on the subsistence farming. Qualitative research methods were also used because the purpose of group discussions was to find out what is in and on peoples' mind. For instance, the research sought to investigate the views of the residents of Mutoko rural community on socio-economic, environmental outcomes of the climate change impacts. The qualitative approach was adopted to explain some phenomena which cannot be quantified, for example, the explanations on how climate change affected the rural residents' socio-economic and environmental situations.

3.7 Challenges

The researcher could not exhaust information from the rural residents' due to national shutdown, strikes and demonstration caused by political instability in Zimbabwe during the time the research data was collected. Zimbabwean government ordered police officers to arrest all those seen having meeting or public gatherings without authorisation from the Zimbabwe Republic Police. This instilled fear to residents which made them not to want to partake in the focus group discussions. This could have impacted the data collected because some of the contributions made by the participants were brief. However the researcher produced a Zanu -PF membership card to the councilor for him to be granted permission to hold public gatherings as well as getting full attention from the participants.

The issue of agriculture is highly linked to the land issue which is a political issue in Zimbabwe. The socio-economic outcomes of the climate change impacts cannot be explained without mentioning some of the government's failures to address the challenges being faced therefore it was difficult for them to respond to some of the questions being asked. As a result not all the possible information was gathered. For example, to probe on the information on how climate change affects the subsistence

economy of the community, some of the answers blamed the government for not initiating programmes and providing inputs to the residents as published by certain scholars and organisations. To deal with this the researcher tried to be neutral by all means possible.

Most of the residents did not want to hear negative opinions of the outcomes of the climate change impacts on the agriculture. Since agriculture is highly linked to the land issue in Zimbabwe is a political issue and most of the beneficiaries of the land for agriculture are ZANU-PF members, they were not comfortable to discuss negative opinions on agriculture. The researcher had to listen to the participants' contributions to avoid heated arguments. Also, the researcher produced a Zanu- Pf membership card and it made them feel comfortable to discuss openly.

The major problem with qualitative methods was that the researcher was too instrumental and central in the research and the validity depended on the skills, competence and rigor of the person doing the fieldwork. Thus, the element of human fatigue could have possibly obscured the attainment of high quality data, especially in the discussions, though however, the impact might not have been too significant. However, in summation, despite the above mentioned weaknesses, the research method used made it possible to collect sufficient and relevant information for the study.

3.8 Conclusion

The chapter has reflected on the methodology that informed the study. A qualitative exploratory design was employed to explore the various perceptions that ordinary villagers hold on climate change and its effects in Zimbabwe. Data collection proceeded through focus group discussions. The main reason for making use of focus group was the need to capture 'group inputs' on how climate change is affecting communities. In this context, the group set-up allowed participants to freely share ideas and in some cases corrected each other on matters relating to climate change and effects on their everyday lives. The data from the focus groups were analysed through the breaking down of focus group responses into themes (thematic content analysis).

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

The focus of this chapter is the presentation, analysis and interpretation of data from the focus group interviews with the residents of Mutoko rural community on the impacts of climate change on subsistence economy. The problem investigated in this study was the impacts that climate change has on subsistence farming. The chapter presents and discusses the main findings, the extent to which the aim and objectives of the study have been achieved.

The discussions were carried out in two neighbouring villages namely Chimuti & Chingwena in Mutoko community from the 1st to 10th of September 2016. The main themes originated from thematic analysis of data were:

- Participants' knowledge about climate variations in the form of increased temperature and erratic rainfall patterns.
- Participants' knowledge of the impact of variations in temperature and rainfall patterns on the community's subsistence farming.

4.2 Demographic information of participants

4.2.1 Gender distribution of the sample

Table 1: Gender distribution of the sample of the residents of Mutoko rural community

Gender	Responses	Percentage
Male	30	60
Female	20	40
Total	50	100

The imbalance shown in the table above might have been caused by the Shona cultural beliefs, that men are more superior to women and therefore women are less active in activities such as agriculture, infrastructure developments and health to mention but a few. The gendered and unequal distribution of opportunities is against one of the main tenets of afrocentricity which Asante (2000) argues it is a devotion to avoid gender and sex pejoratives of any other person. Gaidzanwa (1995) and Goebel (2005) confirm this by asserting that most programmes in Zimbabwe are not gender sensitive.

Despite some effort to have fairness exercised in the programmes concerning climate change solutions, patriarchal approaches are refusing to die out completely, principally because more men are more concerned in participating in these initiatives because they have much access to land as compared to a small fraction of women. Women are less active in partaking in initiatives like this because they think it is a man's role to know what is affecting their livelihood. This kind of approach militates against poverty alleviation which results in poverty being gendered in most economies especially in Third World economies.

4.2.2 Age distribution of the sample

Equal numbers of Mutoko rural community members were drawn from the community targeted for the study. Of the respondents, 46% (n=50) was constituted by adults above the age of 65 and above. It was reasonable to involve more adults in the study because the impacts of climate change on subsistence economy are understood and more valued by adults who are custodians of socio-economic values (Rankoana, 2016).

Table 2: Age distribution of the sample

Age Range	Participants	Percentage
35-44	3	6
45-54	7	14
55-64	26	52
65+	14	28
Total	50	100

There were many participants between the ages of 55 and 64 because most of the Mutoko rural community members are elderly people who have been staying in the area for so long. Also, these are active citizens of the area as they have moved from urban areas back to rural areas especially when they retire from their occupation in respective towns and cities hence they possess more knowledge on how climatic conditions impact on the area. This is also because most of these participants are mostly involved in agricultural activities in the area so they are the most affected group therefore they were willing to participate in the research because of their willingness to express how climate change was affecting their lives. There were few participants between the ages of 45 and 54 because most Zimbabweans between these ages are interested in town life hence they don't stay in the area and they don't have much knowledge about the impacts of climate change on the subsistence economy of the area (Vambe, 2000). The reason could be that they are more interested in urban life where they got involved in projects with quick returns like selling foreign currency unlike farming which has a long process for one to realize profit (Vambe, 2000).

There were few participants between the age of 35 and 44 because most of the citizens between these ages are not interested in farming. They are not interested in farming because most of them are urban dwellers and they prefer staying in urban areas sustaining their lives through entrepreneurial occupations and self-employed activities in towns such as shoe repairing, selling cobra, brooms and car washing, and they do not yet have financial resources to fund agricultural projects. People

who are sixty five (65) years and above find it difficult to be involved in labour intensive activities which is the reason why there were few participants who were sixty five years and above because farming is labour intensive.

4.3 Subsistence farming, Cultural History and Climate Change

The participants practice subsistence agriculture. Most of the products they farm are not even found on the shelves of many shops. The indigenous vegetables which define most Zimbabwean household food stuff were produced consistently for example 'muboora' and 'gusha'. There are some types of crops which are specifically farmed by a certain race or tribe. For instance, Shona people cultivate maize and this is the case with some cultural groups throughout sub-Saharan Africa. However, in the context of Zimbabwe, maize is grown because it a staple food. A good example is the production of some traditional crops such as millet, rapoko and groundnuts. These kinds of crops are very important for they correctly connect the villagers to their ancestors as custodians of subsistence farming. The participants mentioned the following:

Tinei

"We have shifted from farming maize and cotton to sorghum, rapoko and millet. This is because these crops can survive even if we receive less water. But in our gardens downs there in the river banks that's where we are having large pieces of land to grow maize, tomatoes, ground nuts, vegetable for commercial purposes."

Bhauti

"Due to climate changes I am able to practice all the African cultural activities, for example rearing goats, cattle, indigenous chickens and farming, millet, rapoko, groundnuts and traditional vegetables which are not available in the shops. It has also (climate change) helped me to engage with our elders to practice farming celebrations such as mafuwe."

This process of shifting from being reliant on maize production to growing crops like rapoko, millet and sorghum) which is one of the key ideas of afrocentricity (Asante, 2000). Afrocentricity as it is broadly conceived, entails shifting from modern ways of life and resorting to cultural (traditional) practices. This concurs with Unganai (2009) who argues that in the specific context of climate change, adapting therefore means taking action to adjust to a new set of climatic attributes, either different from those already existing, or changed parameters of existing attributes. The participants indicated that they are engaged in various projects which include maize, sweet potatoes and peanuts farming but due to changes in the rainfall patterns, they were forced to revisit cultural farming. The impacts of climate change are making communities resort to cultural mechanisms of mitigating some of these for example the growing of drought resistant crops such as sorghum and rapoko seems like a disadvantage in the sense that the people had adapted to modern way of farming commercial crops, therefore to shift to cultural farming seems to be a setback in the sense that the current generation had already adapted to modern ways of relying on commercial crops. In this case shifting to traditional farming it's not something you can adapt to overnight, but however, due to climate change demands, you will have no choice but rather shift to traditional farming as an adaptive measure to cope up with the situations.

The evidence from Mutoko seems to reveal also how some crops such as sorghum and rapoko are not being grown as a mere response to the changes in rainfall and other climatic conditions. These crops are being grown because communities have traditionally relied on such crops and thus the crops have a place in their everyday cultural system. There is no denying that it is this cultural history that in some respects informs the growing of crops such as sorghum and rapoko by some in rural Zimbabwe. It appears that this connection between the growing of some crops and local (cultural) history that this study establishes is crucial in understanding indigenous cultivation practices in Zimbabwe especially in the age of climate change.

4.4 Participants' knowledge about climate variations

Study findings tend to reveal that ordinary villagers in Mutoko are quite aware about the changes in climatic conditions. This awareness stems from the way villagers observe changes in rainfall patterns and those that occur in their immediate environment. In the following sub-sections, I will discuss how ordinary people in Mutoko define and explain the changes that they consider as attributable to climate change.

4.4.1 Changes in environmental conditions

All the respondents were aware of changing environmental conditions which are impacting negatively on their livelihoods. They reported that they are experiencing warmer days than cold days, which results in less rainfall in the community and their livelihood is at risk. Most importantly the farming activities are ceasing and water sources like dams and rivers are dry. The following are some of the observations from the participants:

Magwenzi

“Indeed we do have changes in the environmental condition in this community. We used to have cold days and hot days but to date, it's like we are having more warm and hot days than cold days. We always expect cool weather but surprisingly we are not getting this”.

Kanjanda

“Yes these days we don't really know what's happening because we always expect cold weather but it's a shock to us that we are always having warm and hot days as compared to cold days which we used to get in the past few years”.

Matondo

“We are very worried about the environmental conditions of this community. We used to have better features to predict the

upcoming of the new season, we used to believe and rely much on natural features from the fig trees. If you see the fig tree blooming, it meant summer is approaching, but to date, the myth is no longer relevant because even if the trees bloom, we are not receiving rain at all”.

The above observations are supported by Roncoli (2006), West et al. (2007), Hague et al. (2012), Nhemachena et al. (2014) as they alluded that indeed the problem of understanding climate change is one of the major challenges confronting Africans. The local communities are aware of changes in climatic conditions in the form of increased temperature and erratic rainfall patterns which lead to less rainfall expectations. Evidence shows that the upward trend of the already high temperatures and the reduction of precipitation levels will increasingly result in reduced agricultural production in sub-Saharan Africa (Mano & Nhemachena, 2007; Biggs et. al., 2008). Ashton (2002), De Wit and Jacek (2006) assert that African rural communities are facing increasing water scarcity and stress with a subsequent potential increase of water conflicts as almost all of the river basins in Africa are transboundary.

4.3.2 Changes in temperature patterns

All the participants indicated that the area is highly experiencing more hot days than nights which are affecting the community particularly the rainfall pattern. The community members indicated that these changes in temperature are a major blow to their wellness. They expressed that these changes are posing a threat to their sources of physiological needs such as water sources and agricultural setback. Having been exposed to such conditions means that the agriculture sector will deteriorate due to water shortages in sustaining farming activities as well as water for human use is a major blow to the community. The community is experiencing shortage of water in its reliable sources, to sustain the community. The following are some of the points which were made by the participants:

Kapeyi

“Yes we are experiencing more hot days than cold ones and it’s forever hot these days and the signs of rainfall but it won’t rain at all. And this is impacting our water sources such as dams and rivers are not full, in fact they are dry as we speak even our borehole are not supplying water at all”.

Kanjanda

“I agree with the previous speaker, we are having more hot days and nights than cold one and no enough rainfall at all in this community. Water is the main challenge our rivers and dams are dry and we are all sharing water source down there with animals”.

Indeed the participants indicated how much their welfare was greatly affected as a community due to water shortages. This concurs with the fact that African rural communities are facing increasing water scarcity and stress with a subsequent potential increase of water conflicts as almost all of the river basins in Africa are transboundary (Ashton, 2002; De Wit & Jacek, 2006). This is supported by an official government press release when they report that, in rural areas, water coverage was 75 per cent in 1999, but by 2010, a third of the rural population was estimated to lack access to improved drinking water. Approximately 65 per cent of the water facilities in the rural areas are non-functional (GoZ, 2010). Zimbabwe’s water and sanitation infrastructure is generally aged and therefore more expensive to maintain, thereby compounding any challenges presented by reduced availability of rainwater.

4.3.3 Changes in rainfall patterns

Majority of the participants were aware of a shift in the seasons. As the rain season is no longer predictable residents expressed the view that farming was now done on

the basis of trial and error. Planning was virtually impossible given the nature of rainfall patterns. The participants noted that the rains were normally now starting late in November or December and ending early before the crops could mature. They agreed that in the past, rains would normally begin sometime in October. However, the seasons appeared to have shifted as the rains could now start as late as December. Even when the rains come in November, it was reported that the amount of rainfall could be very low or the distribution of precipitation afterwards could be too far spaced for crops to grow. There was a general feeling of uncertainty about when the best time to plant would be. Farmers generally felt that they needed an efficient weather forecasting system if they were to remain effective in farming. The unpredictability of rainfall patterns made farming a high risk business. More importantly, the community is also unable to predict either they should embark on early farming or late farming. The following are some of the opinions shared by the participants:

Madhibhani

“We are not receiving enough water which sustains our crops at all. Even if we want to plant, it is now very difficult to know how to do it ... because it’s now unpredictable, if you try to plant in November, or in January, that might be how you perish ... and perhaps those that started early in November might get something ... you see ...”

Chikukwa

“It is well known in our community that we receive our first rainfall early October, but as we speak we haven’t received rainfall. This shows changes in rainfall patterns and it’s very unfortunate for the community because we are no longer sustaining our farming production at all, due to the changes in rainfall patterns.”

Nyenda

“Talking about farming, things have changed very much ... When I was growing up the first rains used to come in September. We would start planting in September, October and November. By December to January we would start eating farm produces. But now the rains start in January here in this area ... but in the olden days we used to herd cattle putting sacks for rain coats ... but now you never need a rain coat. I remember we used to hide under the trees ... we had one tree that we weaved so that when it was raining and we were herding cattle we would have a place to hide.”

Persistent dry spells and drought that the area of Mutoko often experience is explained by most of the participants who took part in this study as a sign of climate change. As a consequence, these participants revealed to me that they are forced to alter their planting (or farming) pattern whenever such dry periods are experienced. Therefore, their perception is that the rainfall pattern has changed significantly from being a predictable one. Climate change is seen as the reason behind the unpredictable rainfall pattern that has become characteristic of most villages in rural Zimbabwe.

4.4 Causes of environmental changes: Sin, Punishment from God and Cultural Decadence

Of the participants, 40% indicated that the main cause of climate change was the ravenous cutting down of trees by the people for firewood as well as a means to sustain them. They alluded that the main cause of deforestation was the need for money as the people were engaging in selling firewood since the area is very rural and doesn't have electricity, therefore majority of the residents rely on selling firewood as a means to get money. Some of the participants also indicated that the cause of environmental changes is more of a punishment from God and also a result of cultural decadence. This idea of viewing environmental changes as a punishment from God comes from the fact that the community is said has gone astray in going against God's will therefore to them, it's more like a punishment from God rather than being caused by other factors. Also, participants also argued that environmental

changes is a result of cultural decadence, there were many atrocious activities and behaviors in the community which are making the ancestors to be angry towards the community, for instance, the issues of teenage pregnancy is said to be more serious in the area of Mutoko and this has been perceived as one of the reasons which might be contributing to environmental changes. The following are some of the views which were shared by the participants:

Matogwa

“I think one of the reasons why we are having changes in the environmental condition is because of people who are sinning by doing things which are not part of our culture and therefore the ancestors are not happy with what is being done in the community. For instance, the way young boys and girls are engaging in sexual activities at a tender age which is not part of our culture and this is angering our ancestors.”

Manyange

“I think the changes are mainly caused by deforestation, the cutting down of trees and not planting the trees. This will cause global warming; I think high school students know much about this because if we cut down the tree it will affect the climatic processes for us to receive enough rainfall.”

Ngavaseke

“It’s a punishment from our ancestors because people are no longer following our traditional and culture in this community. I don’t want to blame young boy and girls only as mentioned by the previous speaker, but truly speaking, most people in this community are no longer valuing our culture. For instance, the way we are burying a dead person is not the way our culture does, I can tell you, I attended this other funeral and I was shocked we were not singing but rather listening music from the

radio. This is something our culture doesn't allow at all. So I think we are running away from our tradition and this is making our ancestors to be angry and that's why we don't have reliable rainfall in this community."

These observations are supported by UNDP (2006) with the argument that the overexploitation of land resources including forests increases in population, desertification and land degradation pose additional threats (UNDP 2006).

Eighty five percent of the participants reported that climate change is a result of a shift from our traditional beliefs as a result of the dilution of their culture by European cultures like Christianity.

4.5 Climate Change and Subsistence Farming: community knowledge on how climate change impacts on subsistence farming activities

Information from the study participants shows that the actual and potential impact of climate change on subsistence farming is large and wide ranging, affecting many aspects of their everyday lives. This is supported by observations that many climate models predict negative impacts of climate change on agricultural production, food security, and human health as well as changing seasonal rainfall pattern in parts of Africa (IPCC, 2007). Increased temperature, drying up of soils, increased pest and diseases pressure. Commenting on how climate change affects subsistence farming, one of the participants in Chingwena had this to say:

Bondamakara

"Climate change has greatly changed our farming seasonal routine of the people in this community; we are all relying on cultural farming of crops like millet and rapoko each and every year due to rain water shortages. We no longer able to grow crops for commercial purpose like tomatoes, maize and cotton because the crops needs a lot of water throughout the season, and it's becoming impossible due to unreliable rainfall pattern in this community"

From the evidence gathered, it appears that subsistence farming activities are the most affected by climate change in Mutoko. This needs to be seen against the backdrop that villagers in Mutoko largely rely on subsistence agriculture for their livelihoods and everyday sustenance. Erratic rainfall for ordinary villagers in Mutoko means that in some cases their yields are substantially affected and for those who grow tomatoes and other vegetables, persistent dry spells might mean that they will not be able to grow these and send them to the market. This failure to send some of their products to the market (due to poor yields or the crops dying off before harvest) is seen as having an economic effect. Therefore, what this entails is that climate change in one way or the other impacts on household economic well-being. This is the case because most villagers rely on subsistence farming for mainly food security and also for cash generated from the surplus products they sell on the market.

4.6 Challenges in the crop production as a result of change in rainfall patterns

All the participants mentioned that their crop production is affected by lack of enough rainfall. Rainfall shortage was regarded as the most pressing challenge in the crop production. It is mentioned that the most immediate consequence of drought is a decline in crop production, due to inadequate and poor rainfall. This situation has negatively impacted production of crops which is marked by poor harvest. The following are some of the observation made by the participants:

Nyazvigo

“Farming nowadays is like gambling ... When I say farming is like gambling I mean that if you do not plant with the early rains, like this year, the ones who planted early got something but those who planted late got nothing. We were thinking that the rains would come in January, but only a little came ... so the crops dried up ... it's like gambling. In some years it is possible to start early and the crops wilt and die while those who started late may be able to reap ... it is unpredictable.”

Chingwena

“Crops like tomatoes need a lot of water so due to water shortages, we no longer expecting much from tomato production because they are drying up before harvest. We also don’t have enough inputs such as fertilizers and insecticides to sustain these crops like tomatoes, tobacco and cotton due to financial strains since we are unable to buy on our own due to decrease in the yield per harvest as a result of shortage of rainfall.”

Macheke

“We are facing a challenge when it comes to weather we should do early planting or late farming in an attempt to catch up with the little water we receive. Sometimes you will do early farming and we don’t receive rainfall, therefore our seeds will die underground due to water shortages and also if you do late planting, you will also face a challenge that your crops will die before they are ready for harvest.”

The general feeling was that rainfall patterns had become more erratic and unpredictable leading to difficulties in planning agricultural activities for farmers. The dominant view was that rain is presently starting late and lasting for a shorter period which makes it difficult to sustain the crops. Twenty three participants also noted that in previous years the community had rain in September. The World Bank (2008) asserts that the developing world needs to be taught how to deal with environmental problems such as water shortages and also how to diversify in order to remain relevant in responding to changing climatic conditions. From the participants’ observation, this rain is becoming unpredictable which signifies a change in climate processes. The farmers lack irrigation equipment and knowledge which means that the sustainability of the agricultural projects was highly questionable (Boko et al. 2007).

The following was further mentioned:

Manyange

“We used to periodically perform traditional ceremonies which involve offerings of millet beer to the spirits concerned, Mafuwe, small libations are poured, and the remainder is consumed by the gathering, amid singing and dancing. Sacrifices may occasionally be offered to ancestors and territorial spirits but are regularly offered to Mwari. But these days, our elders are no longer taking a lead in doing this because our community is now a combination of Christians and those who still believe in traditional ways of doing things. So yes few are still gathering and performing the traditional ceremonies but some are resistant because they have turned their souls to church.”

Chakanyuka

“When illness is persistent or when it is accompanied by tension in the community, spiritual causes are suspected and traditional healers are consulted. But to date, due to environmental changes caused by climatic conditions, we no longer access these herbs in abundance in our community. So what I am trying to say is that we are stuck in a situation where we don’t really have a consensus to what should be done as a community because the few available traditional healers are too expensive to consult and it’s hard to mobilise the community because majority are now Christians and they no longer believe in traditional consultation as a way of communicating with the ancestors.”

Indeed the findings from respondents claimed that the climate change impact shows that there is a need to resort back to their Shona cultural practices which was attested by some of the respondents above. Such practices like *mafuwe* in the Shona culture are necessary and therefore conform to the afrocentric paradigm’s idea of the substance of African regeneration (Asante, 1998). This means that the

effects of climate change are positive for the Shona cultural practices restoration. Climate change is serving as an alarm to let people about the need to revisit their Shona culture because some of the activities being done have repercussions to their communities. This position is also supported by Asante (2000)'s idea that African people should be returned to their history. According to Asante (2000) African issues need to be approached using African lenses/glasses rather than using other theories which were designed to solve issues completely different from African problems. Asante wrote a lot about afrocentrism as the best approach ever in solving African issues, though he shuts himself from the worldview. Asante is supported by Collins (1990) who asserts that African phenomena are best understood through the use of African methods of analysis. The African methods of analysis are ways of looking at African matters which analyse them (African matters) within the African context.

4.7 Adapting to changing climatic conditions

In this section, the focus is on how local communities in Mutoko adapt to the effects of climate change. The section therefore looks at the various mechanisms or strategies that local communities are using to deal with the adverse impacts of climate change.

4.7.1 Adaptation to the impacts of increased temperature

Mutoko rural resident's adaptation strategies to increased temperature include for example; working early hours for instance, ploughing is done early in the morning before dawn to avoid physical fatigue especially during the day. Also to avoid increased human pain such as headache, the residents are having voluntary care givers provided by the health department in the community. Therefore they work hand-in-glove with the available care givers in the area to access medication such as painkillers tablets and energy drinks provided by Schweppes company who will be providing them for free as part of their marketing strategy through advertising its products to the rural populace. Commenting on adaptation strategies to increased temperature, some of the participants in Chingwena and Chimuti respectively had this to say:

Chamanga

“You know we are now used to these high temperatures as a community. We all wake up in the morning around 2:30 am and do our farming activities like ploughing before sunrises. This is how we are trying reducing physical fatigue and severe headache caused by high temperature in this village”

Kateera

“I would like to thank our councillor with the Ministry of health through the so called community based workers programs. These people are really assisting us as a village and community at large, they are providing us with painkillers for headache and also they keep on educating us on the effects of expose ourselves to direct to direct sunlight. More importantly the caregivers are the ones with direct link to Schweppes representatives who always come here with energy drinks.

From the observation drawn from the data, rural village communities have developed culture-based mechanisms of adaptation to the harsh weather conditions threatening their subsistence agricultural production. Adaptation to increased temperature is accomplished through community-based measures to sustain livelihoods. These mechanisms were developed within their culture and hence imply a greater dependability to do farming activities in the early hours of the day also with the use of the available individuals who are voluntarily working with the health department in making sure that treatment for headache is always available in the rural communities.

Rural communities in Mutoko have developed culture-based mechanisms of adaptation to the harsh weather conditions threatening their subsistence farming production. Adaptation to drought, scarcity of rain, decreased production of crops is accomplished through community-based measures to sustain human livelihoods. These mechanisms are complex, developed and used as their culture and imply greater dependability on the use of indigenous knowledge to carry on production of

subsistence crops. Production of subsistence crops in the era of climate change is planned in terms of the people's knowledge of the season, soil fertility and texture and seed variations which enhance sustainable production of crops. Small scale farmers sustain the production of crops, knowledge of environmental conditions and seasonal change without access to modern scientific knowledge. These community-based adaptation methods are grounded in the community's priority, needs, knowledge and capacity which empower people to plan and cope with the impacts of climate change. Studies on rural communities' explanations of climate change and their potential for adaptation to climate change hazards are limited. The present study examined rural community members' perceptions on climate variation and their capabilities to adapt to the impacts of climate change hazards on the production of subsistence crops on which they depend on for a livelihood.

4.7.2 Adaptation to rainfall scarcity

Mutoko rural residents are relying on what they call '*Mafuku*'; these are small pits in the river basins where people dig down searching for water to sustain them. Also, residents are also farming crops near the river basins using '*Mafuku*' as the source of water for agricultural production. Generally, community members are able to predict rainfall scarcity and availability using indigenous knowledge methods of observing the behaviour of animal and plant species and the position of the appearance of the moon and sun. It is observed that at the beginning of the month of September, the '*Mutufu*' trees found near the mountain will produce many fruits which denote the beginning of a good season characterised by plenty of rainfall. On the contrary if the '*Mutufu*' produces less fruits it signifies limited rainfall. The appearance of a '*Nhowa*' (edible insects) in greater numbers in spring signifies shortage of rain in the coming season. In spring if the moon is seen in a bright circle, it signifies that more rainfall will be expected in the coming season. In summer the sun is situated in the south and in winter it will be in the north, changes in these positions will be an indication of less rainfall the coming season. The participants rely much on these observations to plan the planting process. Commenting on adaptation strategies to rainfall scarcity, some of the participants in Chingwena and Chimuti respectively had this to say:

Maguma

“We are all relying ‘mafuku’ in the river basins there, where we are fetching water for farming in our gardens there. You can see in the mountains there we have many Matufu which is a sign that this year we going to have rainfall shortages throughout the season”

Ngavaseke

“Last month we were all busy catching edible insects (Nhowa) which is a sign that we going to have water shortages this season. Also if you can check the moon during the night, it’s not even covered with round rainbow circle, this is a clear sign that this year we going to have a serious drought”

When there are signs or predictions on limited rainfall to be received in a particular farming season, the community will shift to more drought tolerant crops such as millet, sorghum and ground nuts. These observations are consistent with the Malunga community farmers’ explanations of the positions of the sun in Tanzania. When the sun is positioned in the northwest during rainfall season, it signifies imminent rainfall. Furthermore, it is observed that the blowing of wing from east to west direction in August predicts a season with less rainfall (Chigwada, 2009).

The participants showed that a good season with plenty rain is seen by wind blowing from south to north direction in August. Higher temperatures at the beginning of spring symbolise a good season ahead with plenty rainfall. Climate prediction methods observed in the study have cultural and religious dimensions because they are informed by the community’s cosmological views. The predictions are highly linked with the weather and rain predictions in Malunga and Chibelela communities in Tanzania in which community members use plant phenology, birds, insects, wind directions and solar system to predict the weather (Gandure, et al 2012). Therefore Mutoko rural residents use these indigenous forecasts to predict weather patterns

because it enables them to make necessary farming adjustment to adapt to climate changes and rainfall scarcity (Chigwada, 2009).

It is also important to note that the various mechanisms that communities adopt to counteract the effects of climate change are largely informed by their awareness or knowledge on climate change. In as far as climate change is concerned, it is crucial to observe that community knowledge is an important determinant in the way ordinary people adapt to the effects of climate change. In simple terms, existing knowledge on climate change is essential in informing the mechanisms of adaptation.

4.8 What needs to be done to address the problem of Climate Change: Cultural Cleansing

Majority of the participants indicated that there is a need to perform a ritual to revisit their culture and traditional ways of doing things like brewing beer for their ancestors after harvesting as a way of showing appreciation to them. Beer brewing has remained one of the overused channels through which ancestors can be praised and remembered in most communities, especially the African people. All the participants indicated that they should return to their ways of praising the ancestors through organising big occasions/gatherings where ancestors were praised for the good harvest and good health. The following are some of the facts which were raised by the participants:

Chihumbe

“The cutting down of tress is one of the causes because we no longer have forest there, if you look to the mountains there, you can only see stones, all the tress are being cut down by people to sustain themselves through selling firewood. And this I think it’s a major impact to this rising temperatures affecting us in this community.”

Kamwari

I think one of the speakers on the previous question mentioned about most people in this community no longer valuing our culture by engaging into things which are making our ancestors to be unhappy with what is happening. That's why we have high temperatures which are affecting us. Our ancestors are not happy at all. We need to perform mafuwe to praise our ancestors as well as asking for forgiveness for our sins as a community."

The term 'Mafuwe' has always been a way of appeasing ancestors in times of drought in Mutoko. Thus as way of addressing the problem of climate change, communities seem to suggest that such a practice can be of rescue. *Mafuwe* helps to build relationships among the residents and the ancestors as well as praising the ancestors for providing. Hence, one of afrocentricity's main ideas is protection of African cultural elements (Asante, 2000). There is a perception among community members in Mutoko that performing the 'Mafuwe' festival or ceremony can end a dry spell or result in improved rainfall patterns especially during a drought season. Such a practice is an African way of doing things and therefore, conforms to the afrocentric paradigm's idea of the substance of African regeneration (Asante, 1998).

4.9 Conclusion

This chapter has reflected on the major findings of the study. Such findings relate mainly to the way ordinary villagers in Mutoko understand and explain the various changes in climatic conditions that they experience. The study has established that a majority of the villagers in Mutoko is aware of climate change and its effects. Most notably, the effects of climate change in Mutoko are seen in the way climate change severely affects subsistence farming. This happens in several ways but the more pronounced effect is seen in the way climate change results in reduced crop yield due to persistent dry spells or drought. It is also important to note that despite the challenges that climate change poses on mainly farming activities, communities in Mutoko are devising adaptive mechanisms to counteract the effects of climate

change. These mechanisms include a shift in cultivation patterns and also the growing of crops near river basins.

CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a summary on the major findings of the study and highlights on some of the recommendations that might assist policy makers and environmental officials in attending to the problem of climate change in rural communities. As the final section of the dissertation, the chapter gives a summation on all key sections of the dissertation. The chapter begins by highlighting the purpose and methodology of the study. It proceeds by reflecting on the major findings arrived at in the study.

5.2 Summary: Reflecting on Study Purpose, Methodology and Major Findings

The problem investigated in this study relates to the socio-economic changes brought about by changing climatic conditions in the form of increased temperature and erratic rainfall. The study presents community members' observations of changing climatic conditions, the impacts of change on subsistence farming and adaptations measures they have developed to adapt to change. The residents of Mutoko rural community indicated that climate change has negatively affected their socio-economic lives to a larger extent. For example, the participants observed that they are facing hardships to feed their families as a result of rainfall scarcity which makes it difficult to sustain agricultural production.

The study employed qualitative research methods which were descriptive. Data collection in this study was carried out through the use of focus group interviews. The population comprised of all the residents of Mutoko rural community in Zimbabwe. Fifty (50) respondents were interviewed and the researcher made use of non-probability sampling, which was purposive to make up the study sample. Analysis of data in this study was carried out through the use of thematic approach analysis.

The following is a summary of the major findings:

- The participants are aware of change in climatic conditions in the form of increased temperature and lesser rainfall.
- There are observations that increased temperature and scarcity of rain have negatively impacted subsistence crop production which is marked by poor yields.
- Community members are adapting to the impacts of increased temperature and scarcity of rain through their culturally informed mechanisms. The mechanisms include change of crops and mulching.

5.3. Recommendations

Any recommendations that arise from the results of this study must be considered preliminary and are offered as points for discussion especially by members of rural communities in Zimbabwe, SADC region and Africa as a continent as deliberations go forward concerning the possible widespread adaptation means against climate change. On the basis of the empirical findings from this study carried out in Mutoko rural community, the researcher makes the following recommendations:

5.3.1 Effective cultural reinforcement

- There is need to revisit cultural ways of doing things such as adherence to traditional farming for indigenous crops which can survive without enough water,
- Also communities should also reconsider the cultural beliefs as a ways of communicating with the ancestors on the pressing issues affecting the community,
- There is a need for rural communities to employ indigenous practices as adaptation strategies. Adaptation strategies may be individual-based, community-based or government directed,
- Traditional leaders should also play a leading role in bringing back indigenous knowledge in the community as an adaptation measure against climate change.
- There is also a need for collaboration between the Ministry of Environment, Water and Climate and traditional leaders. The two should work hand in hand

so that they can share ideas and experience in a bid to implement Indigenous Knowledge (IK).

5.3.2. Awareness campaigns against climate change

- The Metrological Service department in collaboration with the Ministry of Environment, Water and Climate should design outreach programmes specifically on climate change adaptation so that that it will be known in each and every corner of the community,
- The government should develop climate awareness campaigns aimed at government (especially councilors), civil society and the general public (especially farmers) in planting more trees in each and every community,
- Governments need to consider climate information in Community Based Adaptation (CBA) projects, including scientific data and local knowledge about climate trends and changes.
- Governments and civil society organisations need to undertake participatory vulnerability and adaptation assessments from grassroots level across a variety of sectors in both rural and urban areas. Share the results openly to foster cross-scale learning between the public, government and civil society,
- Cutting down of trees and destroying of fauna should be declared a serious offense.

5.4 Conclusion

Considering the major findings arrived at in this study, the researcher concludes that generally the impact of climate change is real on the socio-economic lives of rural communities in Zimbabwe. The researcher considers climate change to have negative impacts on subsistence farming which is climate-dependent. The participants' adaptation measures are largely informed by the knowledge they have on climate change.

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APPENDIX A

DATA COLLECTION TOOL

PERSONAL INFORMATION

GENDER

AGE

HOME LANGUAGE

VILLAGE

THEMES FOR DISCUSSION

Determining participants' knowledge about climate variations in the form of increased temperature and erratic rainfall patterns.

1. Are there any changes in environmental conditions in your community?
2. What explanation would you give?
3. What do you think is causing environmental changes?
4. Why do you think so?
5. Are you experiencing any change in temperature patterns?
6. What do you think is causing this?
7. Is there a change in the rainfall patterns recently?
8. What do you think should be done to address the shortages of water in your community?

Examining participants' knowledge of the impact of variations in temperature and rainfall patterns on the community's subsistence economy

1. What types of crops production are you engaged in?
2. Why do you choose these crops?
3. Explain the challenges experienced in these crop productions?
4. How are you coping with the challenges?
5. How do changes in rainfall patterns impact your health as well as the environment?
6. How are you coping?
7. What do you do as a community if you didn't receive enough rainfall?
8. Is it helping the community?

9. What do you think are the effects of climate change on African pride?

10. Why do you think so? Probe

APPENDIX B

ENTRY INTO RESEARCH SITE

RE: Request for permission to conduct study in Mutoko Community

My name is Mr Dyke Tayengwa. I am Masters Student in Sociology at the University of Limpopo. The research study on perception of climate change and its impact on subsistence farming in Mutoko community is part of my Master's degree programme. I am hereby requesting your permission for me to conduct my study in this community. I am expected to collect data from 50 participants in the community. During the data collection, the researcher will make use of an interview schedule for focus group discussions. The data collection process is expected to take 5 days only. The collected data shall be kept by myself and my supervisors. I am pledging my respect for the rights of the participants as in line with research ethics which I am expected to abide by. I hope you find my request in order and I thank you in anticipation

Yours sincerely

Tayengwa D.

APPENDIX C

Consent for Participation in the Study

This study seeks to explore the rural community's perceptions of climate change and its impact on their livelihood patterns of community members. The study has no foreseeable risks to the participants. No costs or payments are associated with participating in the study. Based on the information provided regarding the research project, I understand that:

1. The time required for the interview is about 20-30 min.
2. The nature of my participation is Focus group discussion
3. My participation is entirely voluntary and I may terminate my involvement at any time without penalty.
4. All my data are confidential and the data will be destroyed within five years after completion of the study.
5. The discussion may be tape recorded if I accept it to be so.
6. All data are for research purposes only.
7. If I have questions about the research, or if I would like to see a copy of the final findings of the study, I can contact the researcher by calling him on the number given or write him on the address given.

I **agree** to participate in this study.

Name of participant

Name of Investigator

Further information is available from

Name of investigator : Tayengwa Dyke

Telephone : +2776 823 8658

Email : dykel.taye@gmail.com