

**KNOWLEDGE OF CLIMATE CHANGE AND THE USE OF INDIGENOUS
PRACTICES TO ADAPT TO CLIMATE HAZARDS IN MUTOKO RURAL
COMMUNITY IN MASHONALAND EAST PROVINCE, ZIMBABWE**

by

SHINGIRAI STANLEY MUGAMBIWA

DISSERTATION

Submitted in fulfillment of the requirements for the degree of

MASTER OF ARTS

in

SOCIOLOGY

In the

FACULTY OF HUMANITIES

(School of Social Sciences)

at the

UNIVERSITY OF LIMPOPO

SUPERVISOR: Prof. SA RANKOANA

COSUPERVISOR: Dr. TS NYAWASHA

2017

DECLARATION

I declare that the dissertation 'Knowledge of climate change and the use of indigenous practices to adapt to climate hazards in Mutoko rural community in Mashonaland East Province, Zimbabwe' hereby submitted to the University of Limpopo, for the degree of Master of Arts in Sociology has not previously been submitted by me for a degree at this or any other university; that it is my work in design and in execution, and that all material contained herein has been duly acknowledged.

Mugambiwa, SS (Mr.)

Date

ACKNOWLEDGEMENTS

I would like to thank the Lord for the wisdom and strength that he provided me throughout the course of this study. I greatly appreciate the following people for their enormous contribution to the successful completion of this research:

- I am deeply grateful to my supervisor Professor Sejabaledi Agnes Rankoana who has exceptionally guided me throughout this study. Her wisdom, serenity and patience remarkably motivated me to put more effort on my work.
- I thank my co-supervisor Dr. Tawanda S. Nyawasha whose contributions to this study were insightful and constructive.
- To my brothers Daniel Chabarwa Mugambiwa and Tanaka Richmond Zambuko I thank you for your enormous contributions to make this study a success.
- I am also grateful to the community members who sacrificed their time to share their experiences with me. Without them, this study would not have been possible.
- Kuwandandishe Priscilla Samuriwo thanks so much for being there for me throughout the study.
- Happy Mathew Tirivangasi who has been a true partner in academia, I say thank you.
- I would like to acknowledge the National Research Foundation (NRF) UKZN Indigenous Knowledge Systems (IKS) bursary for funding this study.

DEDICATION

I dedicate this work to my late mother Dorothy Bute who gave me a robust academic foundation that sustains me to this day.

ABSTRACT

Climate change has become one of the most daunting challenges facing humanity in the 21st century. It has direct and profound effects on the environment, economy, health and safety. Since most developing countries have agro-based economies, they are more vulnerable to climate change impacts as compared to the developed world. The aim of this study was to explore Mutoko rural community members' understanding of climate change and the indigenous measures they use to adapt to its impacts. The study was empirical and data were collected using in-depth interviews. The findings show that Mutoko community members have knowledge of changes in climatic conditions which manifest as increased temperature and erratic rainfall patterns. The impact of increased temperature and erratic rainfall were observed. Furthermore, community members mentioned the type of clouds, mountains and the direction from which the rains comes as indications of climate change. It has also been discovered that numerous cultural activities such as '*mafuwe*' (rain making ceremony) have changed due to climate change. As a result various adaptation measures such as changing crop types are employed by community members to sustain their livelihood. The study concludes that even though community members in Mutoko are aware of climate change and its indicators, they still struggle to adapt regardless of them having a few adaptation strategies they have developed and use to lessen the negative impacts of changing climatic conditions on their livelihood.

Key words: Climate change, Climate hazards, Indigenous practices, Knowledge, Mutoko community,

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LIST OF ACRONYMS

°C	Degrees Celsius
AIACC	Assessments of Adaptations to Climate Change
CO2	Carbon Dioxide
CCAFS	Climate Change, Agriculture and Food Security
CEO	Chief Executive Officer
DEAT	Department of Environmental Affairs and Tourism
ENSO	El Niño-Southern Oscillation
FAO	Food and Agriculture Organisation
GHF	Global Humanitarian Forum
GRD	Gokwe Rural District
IEA	International Energy Agency
IKS	Indigenous Knowledge Systems
IPCC	Intergovernmental Panel on Climate Change
ISDR	International Strategy for Disaster Reduction
MAMID	Ministry of Agriculture, Mechanisation and Irrigation Development
MCLZ	Makonde Communal Lands of Zimbabwe
MENRM	Ministry of Environment and Natural Resources Management
MEP	Mashonaland East Province
MET	Ministry of Environment and Tourism
MRC	Mutoko Rural Community
NRF	National Research Foundation
RDC	Rural District Council
TCA	Thematic Content Analysis
USA	United States of America

UK	United Kingdom
UKZN	University of Kwa-Zulu Natal
UNFCCC	United Nations Framework Convention on Climate Change
UNEP	United Nations Environment Programme
UN	United Nations
ViDCos	Village Development Committee
WaDCos	Ward Development Committee

CHAPTER 1

INTRODUCTION

1.1 Introduction and background

The current study explored the knowledge of climate change, its impacts and indigenous adaptation measures developed by Mutoko Rural Community members to adapt to the impacts of climate change. It provides evidence of knowledge of changing climatic conditions by a rural community in Zimbabwe. Climate change explanations by community members corroborates observations of climate change by scientists in rural areas throughout the world. The study also assesses community members' knowledge of the impacts of climate change on their livelihoods. The impacts of climate change on the livelihoods of rural communities are mostly felt by subsistence farmers who depend on rain fed crops for food (Rankoana, 2016).

It is evident from the study that climate change is one of the most challenging and complex problems facing the globe. Its impacts would significantly add to the development challenges of ensuring food security and poverty reduction in the developing world and in Zimbabwe in particular. Global climate change is one of the most daunting challenges facing humanity in the 21st century (Intergovernmental Panel on Climate Change [IPCC], 2007). Climate change has direct and profound effects on the environment, economy, health and safety (Global Humanitarian Forum [GHF], 2009). Since most developing countries have agro-based economies, they are more vulnerable to climate change impacts as compared to the developed world. Vulnerability to climate change can be measured. Physical changes brought about by climate variability and socio-economic vulnerability as a result of people's attempt to adapt to the impacts of climate change. Statistics has it that more than 2.8 billion people are physically vulnerable to climate change and four (4) billion people are vulnerable to climate change and variability in socio-economic terms (GHF, 2009). Possibly, the world's developing and underdeveloped countries are the most affected by climate change, although they are the least responsible for causing it (GHF, 2009; British Broadcasting Corporation World Service Trust (BBC WST, 2010).

The effects of climate change require global cooperation in order to provide possible solutions (Grundmann, 2007). For a long time the issue has drawn serious international attention (Weingart, Engels & Pansegrau, 2000). There is need for communities to understand the facts about climate change. Proponents of this view contend that the majority of members of the community fail to engage and cope with climate change because they lack basic knowledge of its causes, impacts and adaptation methods (Lorenzoni, Nicholson-Cole & Whitmarsh, 2007). Having knowledge about climate change is imperative for community members because climate change is a real, rapidly advancing and a widespread threat facing humanity. Climate threats which include drought, excessive heat and decreased water quality are negatively affecting the livelihoods of local communities (Eriksson & Hewitt, 2007).

Due to the severity of the impacts of climate change, local communities are searching for solutions within their cultures so that they could diminish these climate threats to their livelihoods (Brohan, Kennedy, Harris, Tett & Jones, 2006; Caesar, Alexander & Vose, 2006). Numerous studies have reported the use of indigenous practices to adjust to climate threats (Intergovernmental Panel on Climate Change [IPCC], 2007; Food and Agriculture Organisation [FAO], 2007; Jianchu, Shrestha, Rameshananda, Vaidya, Eriksson & Hewitt, 2007). However, little was researched about the explanations of climate change in terms of the worldviews of the local communities and the indigenous adaptation strategies people have developed to sustain their livelihoods. The current study explores explanations of climate change and the adaptation methods developed to adjust to climate threats in a rural community in Zimbabwe.

1.2 Problem Statement

Rural communities' knowledge of climate change is a result of variations in temperature and rainfall patterns demonstrated as rising temperature trends and occasional rainfall (Rankoana & Mothiba, 2015). Rural communities have vast knowledge that changes in their living conditions such as malnutrition and poverty increased risks of disease, floods and soil erosion are a result of climate variability.

Changes in rainfall and temperature patterns manifest as a result of explanations of a severe increase in temperatures with undesirable impacts on the livelihood of rural communities. The understanding of climate change in this regard is critical in planning adaptation measures to address the effects of highly increasing temperature and occasional rainfall. The widely common effects of climate change on rural communities are drought, exhaustion of water resources, decreased subsistence economies and cessation of cultural activities. Majority of people in developing countries who reside in the rural areas rely more on subsistence crop production which is characterised by low productivity as a result of erratic rainfall (Rankoana, 2016).

People in rural communities have established culture-based mechanisms of adaptation to harsh weather conditions over the years. Adaptation to the impacts of climate change is accomplished through community-based measures to sustain human livelihoods (Bhusal, 2009; Rankoana, 2016). The mechanisms developed by rural communities are complex and they are used within cultures and they depend on the use of indigenous knowledge in the production of subsistence crops. People's knowledge of the seasons motivate them to grow subsistence crops with careful consideration of the soil fertility and texture as well as crop variations which enhance sustainable production of crops. Madzwamuse (2010) asserts that small-scale farmers produce crops through knowledge of environmental conditions without the use modern scientific knowledge. These adaptation methods are a product of the communities' priorities, knowledge and capacities which allow them to plan and cope in the midst of climate change. The present study examined rural community members' knowledge of climate change and their ability to adapt to its impacts on the community.

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, 2007). Scientists have presented evidence and tested models to substantiate observations of changing climatic conditions (Bhusal, 2009). There is evidence of increasing air temperature near the earth surface by 0.74 °C from 1906 to 2005 and

it is estimated to increase by 6.4 °C on average during the 21st century (IPCC, 2007: 35). Rising temperatures are expected to increase flooding in coastal areas, cause declines in agricultural production, threaten biodiversity and the productivity of natural resources, increase the range of vector-borne and waterborne diseases, and exacerbate desertification with adverse impact on Africa's agriculture-based economy (Seo & Mendelsohn 2008). Climate change is also expected to bring changing rainfall patterns with resulting changes in agriculture, food security and economic growth; increased temperatures; increases in the prevalence of vector-borne diseases; decreased water security; sea level rise; and increased variability of floods and droughts (Department for International Development [DID], 2004). Further, climate change is contributing to severe uncertainty on the availability of water in many regions in the future. Precipitation, water quality, water temperature and groundwater recharge will also be greatly affected (Food and Agriculture Organisation of the United Nations, 2016).

Extreme weather events, notably floods, drought and tropical storms are also expected to increase in frequency and intensity across the continent (IPCC, 2007). Madzwamuse (2010) attests that Africa is one of the most vulnerable regions in the world due to widespread poverty, limited coping capacity and its highly variable climate. The African livelihood that appears to be at most risk is subsistence agriculture due to unpredictability of seasons and agricultural calendars (FAO, 2007). Africa is one of the most vulnerable continents to climate variability and change because of multiple stresses and low adaptive capacity. The livelihoods of people in Africa, including South Africa, are often directly linked to the climate of the area (IPCC, 2013). There are projections that by 2020, a large proportion of Africa's population is projected to be exposed to increased water stress due to climate change induced shifts in water availability coupled with increased water demand. Yields from rain-fed agriculture could be substantially reduced in certain areas, which would further adversely affect food security and exacerbate malnutrition (Department of Environmental Affairs and Tourism [DEAT], 2004). Climate change is a major threat to poverty reduction and economic growth, and it may unravel many of the development gains made in recent decades. Both now and over the long run, climate change and variability threaten human and social development by altering customary means of livelihood and restricting the fulfillment of human potential (Verner, 2010).

Knowledge of climate change and its impacts in the local communities have in the past been widely questioned. Understanding of climate change and the threats it poses to rural communities are amongst the most serious challenges faced by scientists. The IPCC (2013) and Ziervogel et al. (2014) show that local communities are aware of changing climatic conditions, the resulting hazards and their on their livelihoods. Bhusal (2009) asserts that local communities share experiences of climatic conditions, ecosystem function and biological systems, that is, all life on earth such as plants and animals which are inevitably linked to the surrounding chemical and physical climate. Community members understand it as increasing warm days, erratic rainfall patterns, biological change, ecological variability, and their adverse effects on people (IPCC, 2013). Adaptation to these changes encompasses adjustments in behaviour that reduce the vulnerability of society to climate hazards. Adaptation to drought, scarcity of rain, and decrease production of crops is accomplished through community-based measures to sustain human livelihood (Nhemachena, Hassan & Chakwizira, 2014).

1.3 Study Purpose

The aim of this study is to explore Mutoko Rural Community members' understanding of climate change and the indigenous measures they use to adapt to its impact(s). Three objectives were achieved and these were; to explore Mutoko rural community members' understanding of climate change, to examine the community's awareness of the implications of climate change and to explain the indigenous adaptation measures to climate change developed and used by the community. Adoption of Afrocentricity as a theoretical basis of the study significantly helped in achieving the above mentioned objectives. Since the Afrocentric paradigm requires Africans to be studied in their own contexts, it significantly helped the researcher to explore the knowledge of climate change and use of indigenous practices in Mutoko Rural Community.

1.4 Significance of the study

Climate change is a problem with devastating impacts which warrants research to provide information about how rural communities adapt to it. This is because rural communities are more vulnerable to climatic conditions as compared to urban communities (IPCC, 2013). Scientific studies on climate change provide little knowledge about rural communities' explanations of changes in seasonal and rainfall patterns (Richard & Klein, 2004). The present study explored a rural community's explanations and adaptation measures developed and used by community members to cope with climate hazards. The indigenous explanations of climate change informed by community worldviews and adaptation measures could inform policy on climate adaptation measures. This would have the community's tone to ensure that climate policies are culture specific and acceptable by rural communities.

Climate change is a significant current issue. It is important to have sufficient knowledge of the origin, effect and future consequences of the phenomenon. Even though it has been indicated that climate and weather will change over time because of regular terrestrial hot and cold phases, it is imperative to note that not every weather and climate variation can be attributed to climate change (Richard & Klein, 2004). Therefore, it is necessary to have knowledge of climate change, its consequences and how humans contribute to it and possible mitigation and measures.

1.5 Ethical considerations

The researcher observed all ethical issues relevant to the study. The researcher explained the purpose and significance of the study, and data collection procedure to the participants. The participants were assured that participation was voluntary and that they had the right to withdraw from the study at any time without penalty. The researcher ensured that all information shared during the interactions was treated strictly confidential. To ensure the participants' anonymity, the researcher did not ask for their names, instead, the researcher assigned numbers such as participant 1 to the participants. The participants were asked to give their written informed consent

before the interviews commenced (Appendix B Consent Form). In order to participate in the research study, the participants were asked to sign the consent form.

1.6 Operational Definition of key concepts

1.6.1 Climate change

Climate Change is any change in climate over time, whether as a result of natural variability or human activity (IPCC, 2013). For the purpose of this study, Bhusal's (2009) definition of climate change is adopted. Explanations of climate change by local communities are centred on observations of change in rainfall patterns (Rankoana & Mothiba, 2015).

1.6.2 Indigenous knowledge

Indigenous or local knowledge refers to the overall body of knowledge, know-how and practices that were developed and maintained by people mostly in rural areas and these people should have extended histories of interaction with the natural environment (Boven & Morohash, 2002).

1.6.3 Adaptation to climate change

Adaptation to climate change means anticipating the adverse effects of climate change and taking appropriate action to prevent or lessen the damage they can cause as well as taking advantage of opportunities that may arise (IPCC, 2007).

1.6.4 Indigenous practice

Indigenous practice refers to the manifestation of a culture or sub-culture, especially in regard to the traditional and customary practices of a particular ethnic or other cultural group (Asante, 2005).

1.6.5 Rural communities

A rural community is a geographic area that is located outside towns and cities. Typical rural areas have a low population density and small settlements. Agricultural areas are commonly rural, though so are others such as forests. Different countries have varying definitions of "rural" for statistical and administrative purposes (Pidgeon, 2010)

1.7 Study outline

The study is made up of five chapters, Chapter one has introduced the study, highlighting the background, study purpose and the significance of the study. Chapter two provides a review of literature on climate change as a global phenomenon, climate change trends and impacts as observed at various geographical scales. Livelihood patterns vulnerability to climate change are discussed vis-à-vis knowledge of climate change and its indicators and adaptation strategies from a regional and context specific perspective. Chapter three provides details on the methodological alignment of the study that is the research design, data collection strategies, instruments and procedures. It also outlines the data analysis techniques employed in generating the research findings. Chapter four presents the findings of the study. Chapter five provides discussion of key findings, conclusions and recommendations.

1.8 Summary

This chapter introduced the study and outlined the most fundamental aspects such as background of the study, research problem, and purpose of the study, significance of the study, ethical considerations and operational definitions of key concepts. These aspects are of an orientation in nature and they pave way for a clear understanding of the rest of the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Perceptions of climate change

The IPCC (2007) asserts that humans are responsible for the emissions and concentration of greenhouse gases in the atmosphere that cause climate change. Majority of the world's adult population is aware of climate change (Pugliese & Ray, 2009) though a majority of world population that includes highly-educated does not seem to understand the causes and effects of climate change (Bostrom, Granger, Morgan, Fischhoff, & Read, 1994; Read, Bostrom, Morgan, Fischhoff, & Smuts, 1994; Brechin, 2003; Reynolds, Bostrom, Read, & Morgan 2010). Majority of the studies conducted in the USA show that most American citizens cannot identify the primary causes of climate change. This is disturbing because most often the key to mitigating climate change is knowledge of its causes (O'Connor, Bord, Yarnal & Wiefek, 2002).

Lack of knowledge of the climate change issue has contributed to the continued increase in carbon dioxide (CO₂) emissions into the atmosphere which is the primary cause of climate change (International Energy Agency, 2011). According to the International Energy Agency's (IEA) 2011 statistics for CO₂ emissions from fuel, China is now the world's largest emitter of CO₂ (emitting 4.85 tonnes per person per year). The United States of America emits 19.10 tonnes of CO₂ per person per year and India with 17% of world population is the world's third largest emitter of CO₂ at 1.18 tonnes per person per year (International Energy Agency, 2011). These

statistics are quite worrisome and suggest a need for people to change their lifestyles in order to reduce carbon dioxide emissions into the atmosphere. Paradoxically, many studies indicate that the public in countries that are most responsible for emitting too much carbon dioxide and other greenhouse gases into the atmosphere are less concerned about climate change than those who are least responsible for causing climate change especially in the global south (Sandvik, 2008).

2.2 Climate change in Zimbabwe

Zimbabwe is a sub-tropical country with one rainy season and the season spans from November to March (Levina, 2006). The country is located in a semi-arid region with limited as well as unreliable rainfall patterns and temperature variations (Brown, Chanakira, Chatiza, Dhliwayo, Dodman, Masiwa, Muchadenyika, Mugabe, Hachigonta, Sibanda, and Thomas, 2012). It receives an average rainfall amount of 657 mm per annum (Levina, 2006). This renders the country vulnerable to droughts and climate change impacts. In Zimbabwe, on average, one to three droughts occur every ten years and this is largely as a result of changes in the phases of the El Niño-Southern Oscillation (ENSO) phenomenon (Chagutah, 2010). There are also unfavourable rainfall conditions which usually result in crop failures that occur three out of every five years (Mugabe, Hachigonta, Sibanda & Thomas, 2012). Moreover, Zimbabwe and other southern African countries have for some time been experiencing frequent droughts alternating with periods of very high rainfall (Mutekwa, 2009).

The increased frequency of floods has resulted in loss of life and property especially in the low-lying areas of the Zambezi and Limpopo basins (Ministry of Environment and Tourism, 2006:15). In a study conducted in Makonde Communal Lands of Zimbabwe (MCLZ), Sango (2014) discovered that climate change has direct impacts on the biophysical environment which conversely happens to be the vital asset for human survival and economics. To him, the conditions and state of the biophysical

environment determines the productivity and availability of ecosystem services and goods to the human environment and their wellbeing.

2.3 Climate change and social construction

According to Bhusal (2009) local people in Kaski District in the Mid-Mountain Region of Nepal share experiences of climatic conditions, ecosystem function and process and biological systems. Climate change is perceived as increasing warming days, erratic rainfall patterns, ecological variability, biological change and their adverse effects on human beings. Other studies broadly found that warming days are increasing, rainfall pattern is unpredictable, seasons are changing, incidents of drought are increasing, hailstorm occur abnormally and water resources are decreasing.

It is reported that rural communities' explanations of climate change are centered on variations in temperature and rainfall patterns (Jianchu et al., 2007) manifest as rising temperature trends and scarce rainfall. Rural 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. The increase in temperature has been a major concern for local farmers (IPCC, 2007). Observed change in rainfall and temperature patterns is supported by annotations of drastic increase in temperatures with negative impacts on the livelihood patterns of rural communities. This type of understanding climate change is crucial in planning the adaptation and mitigation measures to address the effects of increased temperature and scarce rainfall for sustainable livelihood (FAO, 2007).

In a study conducted by Niles and Mueller (2016) in the regions of Marlborough and Hawke's Bay in New Zealand, majority of farmers believed that summer temperatures had not changed and annual rainfall had stayed the same, yet others believe they had decreased, with a small number of farmers believing they had increased. In the same study the largest group of farmers perceived that winter temperatures had stayed the same, while others thought they had increased, and very few felt that they had decreased.

Nkomwaa, Joshua, Ngongondo, Monjerezi and Chipungu (2014) study on indigenous knowledge systems and climate change adaptation strategies in agriculture in Malawi, villagers of Chagaka area described the climate of their area as characterised by very high temperatures and generally low rainfall with an erratic pattern. In the area, rainfall is seasonal and is experienced during November–April. Farmers have always utilised a variety of traditional indicators in order to enhance their farming practices. The indicators are based on cultural and traditional beliefs related to their perceived behavior of the environment, animals such as birds and insects and tree species. The shedding of leaves and the later production of flowers by these tree species than their usual time indicates drought (Nkomwaa et al., 2014). In this regard, Nkomwaa et al. (2014) found that farmers in Malawi reported that a high occurrence of ants and termites indicates good amount of rains for planting crops. Nevertheless, the occurrence of non-flying termites in a maize field indicates a prolonged dry spell, thus, farmers are unable to weed to avoid crop destruction by the termites. Farmers in Malawi also reported that the high temperatures between September and October indicated good rains. In that regard, drought is anticipated when a bird known as Chikhaka is seen around households as well as if there is a high occurrence of grasshoppers. Strong winds with rain clouds are also historically an indication of drought (Nkomwaa et al., 2014).

It has been revealed through various studies that there are high levels of awareness about climate change among the majority of the world's adult population (Lorenzoni & Pidgeon, 2006; Pugliese & Ray, 2009). Also, those who are aware of climate change issues are more likely to concur that climate change is a serious threat to human kind (Pugliese & Ray, 2009; Eurobarometer, 2011). In the USA and UK most people have heard of either climate change, global warming or the greenhouse effect (Lorenzoni et al., 2007). Nevertheless, many studies indicate that there is a gradual decline in climate change concerns among the public in many countries including USA and UK (Dunlap & McCright, 2008; Sandvik, 2008; Pidgeon, 2010). However, In Africa local communities are well informed about devastating changes in their living conditions which include malnutrition and poverty. The Knowledge of climate change

by local communities is based on variations in temperature and rainfall patterns. These variations are buttressed by observations and projections on climate alterations in the form of increased temperatures and erratic rainfall patterns by scientists worldwide (IPCC, 2007; Gandure, Walker & Botha, 2011).

Maddison (2007) discovered that a significant number of farmers believed that temperatures had increased and that precipitation had declined which implies that they understand climate change. Gbetibouo (2008) in a study conducted in the Limpopo Basin of South Africa found that the majority of the farmers surveyed perceived an increase in temperature and a decrease in rainfall over the past 20 years. In addition, “local perceptions and interpretations of climate variability can be broad and diverse among communities and within different social groups” (World Bank and UN/ISDR, 2007). Nevertheless, what is evident from these studies is that farmers are observing changes, which in some cases are supported by historical rainfall and temperature data that confirm changes in the climate.

Kasasa, Mashonjowa, Gwatibaya, Mbozi and Chipindu (2011, 145) found that most farmers are aware of climate change. The farmers explained climate change as:

- *“A general decline in the total rainfall amounts received during the seasons as evidenced by recurrent droughts, absence of winter rains and extension of the dry season.*
- *Drastic changes in the rainfall distribution over the years, as shown by delayed onset dates of the rainy season and increased frequency and length of mid-season dry spells.*
- *The unpredictable nature of the end of the rainfall season. Farmers pointed out that during some seasons the rains were ending abruptly for example the 2007/2008 season where the rains ended early late February to mid-March instead of the usual end of March or beginning of April in most parts of the country.*
- *Drying up of perennial rivers and other sources of water that are normally used for watering livestock, household and other domestic uses.*

- *Higher than normal day time temperatures, warm nights, and warm winter seasons, which are all indications that the climate have become warmer in recent years.*
- *Changes in crop diversity at the farm level over the past one or two decades.”*

2.4 Sociology and climate change

Climate change is an environmental problem and the discipline of sociology helps in understanding how environmental problems are distributed and managed. Giddens (2009: 160) asserts that, “sociology provides an account of how patterns of human behaviour create pressure on the natural environment. It also helps to evaluate policies and proposals aimed at providing solutions to environmental problems”. The main classical sociological pioneers such as Émile Durkheim, Karl Marx and Max Weber debatably had a clear environmental aspect to their work, alas, it was never brought exposed to the public attention, the argument was because American translators favoured social structural explanations over environmental ones (Yearley, 1992).

Since the early years of the field of sociology, isolated works pertaining to natural resources and the environment had appeared and this was mostly within the area of rural sociology, nevertheless, these had never merged into a collective body of work (Sutton, 2004). In agreement with Sutton (2004), Yearley (1992: 17) argues that “social movement theorists ignited short shrift to conservation groups and as a result historians had to explore their roots and significance”. In order to understand the origin of this situation, it is crucial to deliberate on how both geographical and biological theories of social development and social change lost their predominance when sociology arose as a distinctive discipline in the early twentieth century (Seippel, 2002).

In the early years of the discipline of sociology, there was little understanding of the role of sociology in biology and environmental issues. Many sociologists considered psychology as the foundation of sociology in the area of natural and environmental

issues. “This was particularly evident in the social psychological tradition established by Mead, Cooley, Thomas and other American ‘symbolic interactionists’ who stressed that the reality of a situation lies entirely in the definition attached to it by participating social actors” (Seippel, 2002: 25). However, this definition was socially shaped, as in Cooley’s concept of the ‘looking glass self’. Environmental properties became relevant only if they were perceived and defined as relevant by the actors. Therefore, since climate change largely affects societies, the study of the knowledge of climate change and indigenous practices used to adapt to climate hazards perfectly fits in the field of environmental sociology.

Nagel, Dietz and Broadbent (2008) assert that a fundamental understanding of the discipline of sociology is that unequal power dynamics shape patterns of social movement and access to social, political, and economic resources. Knowledge of inequality is among the most powerful tools that sociologists relate to the study of climate change. It is widely understood that the effects of climate change will not be equally distributed around the world. The countries least responsible for the rise in greenhouse gases will most likely suffer from its impacts in changes in weather, human health costs, and economic hardships. Hence, it is of paramount importance for the people in these communities to be well informed about the impacts of climate change and coping strategies to its impacts. This implies that the rural communities such as Mutoko are more exposed to the impacts of climate change and if the residents are not aware of the phenomenon they will be more at risk to its impacts.

2.4.1 Key sociological theories on climate change

2.4.1.1 Social constructionism

Giddens (2009: 160) asserts that, “social constructionism is an approach to studying social problems, including environmental problems. It has investigated how some environmental issues come to be seen as significant while others are seen to be less important or are largely ignored.” Social constructionists suggest that all environmental problems are, to some extent, socially constructed by groups of people. Climate change is among the most complex challenges facing the globe. Its impacts considerably contribute to the development challenges of ensuring food

security and poverty reduction in the developing world. The phenomenon is broadly viewed as substantial as a result of its impacts on social, economic and health of the communities. This implies that people in rural communities like Mutoko need to be well informed about climate change since it has become a social problem such that from a social constructionist perspective the society will be able to craft coping strategies to the impacts of the phenomenon.

2.4.1.2 Marxist theory, Capitalism and Climate Change

Social theoretical reflection of climate change is centred on several essential classic problems. Szerszynski (2010) asserts that sociologists are interested in presenting how climate change is viewed as a topic of scientific concern. The relationship between nature and culture creates an enduring attraction. In sociology and other related disciplines, Marxist theory is increasingly being deployed to examine the phenomenon of climate change. In this examination, emphasis is placed on how capitalism and its attendant processes are intractably linked to climate change. The view that Marxist scholars advance is that capitalism might have a hand in driving climate change especially in those countries which are underdeveloped. Informed by this Marxist theoretical position, Teja Palko wrote that “the sole ideology of the capitalism, with focusing on the profits instead on the sustainable development is responsible for the biggest part of the continuation of the devastating rise of the CO₂ levels, which will have far reaching impacts on the whole world. The privatization of the public sector, deregulation of the private sector with lowering the taxes on profits for private companies and organizations are done at the expense of public spending and have the logic which is incompatible with the sustainability and needed actions to tackle global climate issues”(Palko, 2016, 2).

This same argument is also found in Naomi Klein’s 2014 book, “*This Changes Everything: Capitalism vs Climate Change*”. For Klein, unrestrained capitalism has been responsible for accelerating the consequences of climate change and any attempt to mitigate climate change effects has to first look at how capitalism should be managed or reformed (Klein, 2014). This observation shows that for Marxist scholars, capitalism is frequently seen as the centre of social theory. Urry (2010)

asserts that climate change forms new positions of tension and contradiction in contemporary capitalism. Consequently, statistics suggest that more than 2.8 billion people are vulnerable to climate change and variability in socio-economic terms (Hulme, 2010). Developing and underdeveloped countries are the most affected by the phenomenon (GHF, 2009). Hence, that calls for the need to inquire into the knowledge of climate change as well as methods that communities in the developing and under developed communities are using to cope in the midst of climate change. Therefore, what Marxist theory does is to present a new perspective on how climate change can be linked to global processes unfolding within society. The global economic ordering of the modern capitalist society in particular is identified as the major force behind the changes we witness in climatic conditions.

2.4.1.3 The “Risky Society” Thesis

Within the discipline of sociology, Ulrich Beck’s thesis on “risky society” provides a foundational basis of examining the changes unfolding in contemporary society. It is not surprising that Beck’s theory is now widely applied and considered as providing useful lenses in examining the problem of climate change. The theory attributes the changes unfolding within society to the project of modernity. Thus, at the centre of Beck’s analysis is the way a new form of rationality (centred on the role of science and technology) that governs modern society is creating certain environmental risks to populations. It is important to state that Beck does not consider climate change as the only “risk” that emanates from this new form of rationality. However, for those who follow Beck’s analysis, the causes of climate change are seen as lying deep within the broader enterprise of modernity. Emissions from modern factories and industries, increased energy consumption, growing populations and growing economies are all responsible for giving rise to climate change. As such, the side-effects of the project of modernisation are considered by Beck in his “risk society” thesis as responsible for a host of problems besetting contemporary society (including climate change). In this context, ‘risk’ is theorised by Beck as largely referring to the “unintended consequences” of modernity (Beck, 1992: 21).

Applied to the sociological study of climate change, Beck’s theory sheds light on how scientific and technological development (rationality) are taken as explanatory

variables to account for the emergence and rise of climate change. Rather than pointing on the darker side of modern scientific and technological advancement, Beck highlights that modern society has to address the risks that come with modern scientific and technological change (terrorism, climate change etc.).

2.4.2 Socio-demographic variables on explanations of climate change

A substantial body of literature on climate indicates that socio-demographic variables such as level of education, gender and occupation influence public perceptions and beliefs about climate change (Eurobarometer, 2011).

i. Gender

According to studies on climate change perceptions men and women perceive the risk differently. Women are more concerned and willing to take action to address these problems as compared to men (Mohai, 1992; Davidson & Freudenburg, 1996; Slovic, 1999 Slimak & Dietz, 2006). Until recently, a small number of researchers paid attention to the complex interactions between gender relations and climate change perceptions (O'Connor et al., 2002; Leiserowitz, 2006; Brody, Zahran, Vedlitz, & Grover 2008; Hamilton, 2008; Malka, Krosnick, & Langer, 2009; McCright, 2010). A study by Krosnick, Holbrook & Visser, (2000) indicates that women are more active in climate change awareness than men. O'Connor et al. (2002) found that women perceive climate change as a more serious threat and are most often willing to take voluntary steps to reduce greenhouse emissions than men. It appears that men probably feel more comfortable with the political world and women prefer personal approaches to solving perceived environmental risks (O'Connor et al., 2002).

There also seems to be a relationship between gender and climate change knowledge. The Eurobarometer (2011) study found that while men claim to be better informed about the causes, consequences and ways to combat climate change, women are the ones who consider climate change a more serious problem. There seems to be a general argument that women are more emotionally attached to the

environment than men. The IPCC (2007) assert that though climate change affects men and women, however women in developing countries are one of the groups most vulnerable to its effects. Elaborating on this, Brody et al. (2008) suggests that this is because they are often dependent on natural resources for their livelihoods, do most of the agricultural work, and are responsible for collecting water and fuel [firewood]. Climate change is widely predicted to affect all these areas of women's lives adversely.

ii. Age

Research conducted to investigate the influence of age on environmental risk perceptions has shown conflicting findings. Whereas some studies show that age has a positive effect on perceptions of climate change risk (Lazo, Kinnell & Fisher, 2000), Dietz, Stern & Guagnano, 1998; Guber, 2003 assert that age has a negative effect on the perception of climate change risk. In a study conducted in 30 European countries by the Eurobarometer (2011) one's understanding of climate change correlates negatively with one's age that is respondents aged 55 years and above felt significantly less informed about climate change as compared to young people. It was also found that these older respondents were less likely to consider climate change a very serious problem as compared to the younger respondents. However, other studies found no statistically significant influence of age on concern about climate change (Semenza, Hall, Wilson, Bontempo, Sailor & George, 2008).

iii. Level of education

Level of education is one of the most often used aspects to explore people's knowledge of climate change. Whereas some studies indicate that the better educated are more well-informed about climate change, others show that the less-educated are more concerned about climate change (Eurobarometer, 2011). Other studies found a negative correlation between climate change risk knowledge and level of education (O'Connor et al., 2002; Malka et al., 2009). O'Connor and et al. (2002) discovered that education is inversely related to concern about climate change risks and highly-educated people perceive climate change as less of a risk than the least educated. Consequently, it has been discovered that higher level of

education does not necessarily translate into increased concern and support for environmental issues (Kollmuss & Agyeman, 2002). A survey conducted in the USA by Zia and Todd to examine the relationship between public awareness and the role of personal efficacy in affecting climate change outcomes, showed interesting and unexpected findings. In the findings of the study, those who felt they were more knowledgeable about climate change displayed less concern about the issue whereas respondents who were less educated displayed more concern on the subject.

Zia and Todd (2010) found that college or university education does not increase citizen concern for climate change. Arguably, public education on climate change is essential for people to obtain accurate information about the subject though it is not a sufficient condition for understanding climate change (Leiserowitz, 2006; Pugliese & Ray, 2009). A study conducted to compare 1992 and 2009 survey findings of beliefs and attitudes among educated laypeople in the USA about climate change discovered that despite seventeen years of intense media coverage on the issue, public understanding has not significantly changed (Reynolds et al., 2010).

iv. Occupation

There appear to be a correlation between an individual's occupation and perception, about climate change. White-collar workers and those who are self-employed feel best informed about the climate change issue whereas the retired, unemployed, farmers and manual workers feel the least informed (Eurobarometer, 2011). On the assumption that the white-collar workers and the self-employed would be in possession of some knowledge of causes and consequences of climate change, it was also assumed that they would consider it a very serious problem. Interestingly, these people are most likely to know and act responsibly to mitigate climate change. In two separate studies about Europeans' attitudes towards climate change, it was found that European white-collar workers and the self-employed were more aware and concerned about climate change than people who were unemployed, manual workers and retired people (Eurobarometer, 2011).

v. Religious and/or spiritual values

Religious beliefs have an influence on people's perceptions about climate change (Kempton, 1991; Kempton, Boster, & Hartley 1995; Patchen, 2006). Research has shown that those that believe in God are generally more concerned about ecological and global risks (Kempton et al., 1995). Kempton et al. (1995) found that Americans' support for environmentalism is inspired by the belief that nature is sacred. This implies that religious beliefs reinforce and justify environmental protection.

Religious beliefs may also be a reference point used to explain some complex environmental issues. This usually happens when scientific information is not readily available to help people understand the existing environmental changes. A study undertaken by BBC WST (2010) in ten African countries to explore the public understanding of climate change divulges that one of the important frames of reference that has influence on Africans' understanding of the climate change issue is the will of God. Africans are generally religious, and some believe changes in weather are God's will. Another study by Patchen (2006) examining uptake of climate science among Marshall Islanders in the central Pacific Ocean, between Hawaii and the Philippines discovered that religious beliefs influence understanding on climate change. A study by Zia and Todd (2010) in California's San Francisco Bay Area found no significant influence of religion on the concern around climate change. However, the conflicting religious beliefs with regard to climate change warrants more research. Hence, it is of paramount importance to establish how religious and spiritual beliefs affect people's perceptions about climate change.

2.5 Climate change and the vulnerability discourse

Climate change has the potential to inundate, degrade, and alter the chemistry and composition of the earth, and, in turn, affect cultures, economies, and social systems (IPCC, 2007). These potential effects raise questions about how vulnerable human populations will be affected. Tol, Fankhauser and Smith (1998) reports that vulnerability to climate hazards measures people's knowledge of susceptibility to climate hazards and its ability to cope with, recover from, or adapt to those hazard. Vulnerability to climate hazards may be transient- characterized by rapid onset and

identifiable termination such as a storm, flood, or drought may result from a longer-term change in climatic variables (such as temperature or precipitation), be gradual, or result in related events such as sea level rise, mass coral bleaching, or ocean acidification (Alexander, Zhang, Peterson, Caesar, Gleason, Klein Tank, Haylock, Collins, Trewin, Rahimzadeh & Tagipour, 2006). Vulnerability to climate hazards can be put into three main functions which factor as: exposure, sensitivity, and adaptive capacity. In the rural areas, climate change affect human society through impact to basic needs: water, energy, housing, transportation, food, natural ecosystems and health (Rankoana, 2016). Changes in temperature and seasonality have direct, immediate effects on flora and fauna as well as on human activities and health.

2.6 Climate change impacts

The impacts of climate change are remarkable in many parts of the world (IPCC, 2013). Until the beginning of the 21st century, climate change was regarded more or less exclusively as an environmental issue, however, today it is recognised that it has developmental implications (Nhamo, 2009). Climate change does not affect the environment alone, rather, it also affects the social, economic and political spheres, which consequently negatively affect overall development. Ngigi (2009) proclaims that smallholder farmers are vulnerable to climate change since it reduces their productivity and negatively affects their weather-dependent livelihood systems. Additionally, it is the poorest countries and regions that will suffer the most regardless of the fact that they contributed least to the causes of climate change (Stern, 2007; Chagutah, 2010).

Africa is one of the most vulnerable continents to climate change (UNFCCC, 2007; IPCC, 2007). Many of its areas have climates that are among the most variable in the world that is on seasonal time scales. As a result floods and droughts can correspondingly occur in the same area during the same period (IPCC, 2007). The regional climate scenarios for Africa show that warming on the continent is very likely to be larger than the global annual mean warming (Christensen, Hewitson, Busuioc, Chen, Gao, Held, 2007). Specifically, "Rainfall in Southern Africa is likely to decrease in much of the winter rainfall region and western margins. However, for East Africa,

there is likely to be an increase” (IPCC, 2007). Subsequently, food, water shortages and floods are likely to increase throughout most of Africa, whereas desertification will remain a major threat in arid and semi-arid regions (Christensen et al. 2007). “Although sub-Saharan Africa is not the most disaster prone region, regrettably, it is the most vulnerable to the impact of disasters related to meteorological, hydrological and climate extremes which are increasing across the region” (World Bank and UN/ISDR, 2007:9).

Numerous factors intensify the effects of climate variability in Africa. These factors include poverty, illiteracy, lack of skills, limited infrastructure, lack of technology and information, low levels of education and poor access to resources, (UNFCCC, 2007; Adger, Agrawala, Mirza, Conde, O'Brien, Pulhin, 2007; Eriksen, O'Brien, and Rosentrater, 2008). The vulnerability is “further aggravated by its predominant dependence on primary commodities, which are highly susceptible to climate variability” (Ikeme, 2003:30).

Climate change affects societies in numerous ways. From the year 1906 up until 2005 global average surface temperatures have increased by 0.74 ± 0.18 °C (IPCC, 2007a). As a result of observations of global air and ocean temperatures the Intergovernmental Panel on Climate Change (IPCC) concluded that it is clear that the climatic conditions have warmed (IPCC, 2007). Correspondingly, various impacts on physical and biological systems have been observed (IPCC, 2007b). Numerous studies have been conducted to estimate potential impacts of climate change in Africa. Hassan (2010) studied potential impacts of climate change on agriculture in 11 African countries using the Ricardian method which examines how the value of farm land varies across a set of exogenous variables such as climate and soil. The study discovered that warming was harmful to crop production though it is beneficial to crop production sustained through irrigation. In the case of livestock, warming seemed to be harmful to large-scale while beneficial to small-scale livestock. The reason for this could be that large-scale livestock had lesser lenience to high temperatures, whereas small-scale had higher lenience to high temperatures since they were local breeds.

Oseni and Bebe (2010) piloted a study that examined possibilities and approaches for reducing vulnerability as well as constructing resilience among farmers in Kenya. The strategy of intervention procedures for climate change adaptation for the communities were discovered to be affected by broad knowledge of the overall structure and dynamics of livestock production systems which includes significant information about indigenous breeding strategies relating to animal adaptation and management in climate sensitive dry-lands. The study discovered that the severe effect of climate change was anticipated to have extreme impact on vulnerable pastoral communities involved in widespread livestock production systems in dry-lands of Kenya.

Molua (2008) conducted a study on the impact of climate change on agriculture in Cameroon. The findings showed that 3.5 percent rise in temperature as well as 4.5 percent growth in precipitation in the absence of irrigation facilities would be damaging to Cameroon's agriculture, and consequently that would lead to a loss of 46.7 percent in output value. The loss was projected to have negative effects on the economy of the country as a whole. The numerous effects of climate change on agriculture are also articulated by Mugambiwa and Tirivangasi (2017, 1) who assert that "there are numerous potential effects climate change could have on agriculture. It affects crop growth and quality and livestock health. Farming practices could also be affected as well as animals that could be raised in particular climatic areas." This implies that the impact of climate change in poor communities is very immense because climate change reduces access to drinking water, negatively affects the health of people and poses a serious threat to food security.

Seo and Mendelsohn (2008) examined impacts of climate change on animal husbandry and the way in which farmers adjusted in 10 African countries. The study used the Ricardian method to evaluate potential impacts on climate change on large and small farms. The findings specified that warming ensued an increase in incomes for small farms and reduced incomes for large farms. Small farms were revealed to have a more temperature firmness than large farms since they were able to shift

from crops to livestock as a result of increases in temperatures. Large farms were less responsive to rise in temperatures because farmers focused on livestock production and could not use crops as substitutes. The findings also indicated that rainfall reduced net revenues per farm for both small and large farms. In the case of large farms, precipitation dropped net incomes more than for small farms.

In a study conducted by Galvin, Boone, Smith and Lynn (2001) in Tanzania to assess vulnerability of farmers to climate change indicated a decline in livestock numbers and milk yields due to disease incidences. The findings of the wet seasons pointed out very small impacts on households largely because households in the study area were not well connected to the market. According to Mubaya, Njuki, Liwenga, Mutsvangwa and Mugabe (2010) in Zambia and Zimbabwe, the impacts of drought were seen through shortage of water for livestock. This caused reduced amount of draught power that could be provided by livestock.

In a study by Gbetibouo (2006) in the Limpopo province, South Africa for the 2004–2005 farming season, farmers' observations corresponded with climate change recorded data. The study found that rainfall was characterised by enormous inter-annual variability. It was discovered that roughly half of the farmers in the study had attuned their farming methods in order to deal with climate change effects. The only constraining element to adaptation was lack of access to credit as cited by farmers. The conclusion from the study was that aspects like household size, farming experience and wealth among other traits enabled farmers to adapt to the effects of climate change. It was therefore recommended that the government should craft policies meant to improve these factors.

2.6.1 Impact on water supply

The effect that climate change has on water supply is controlled by changes in temperature and precipitation as well as its effect on drought, floods and water availability. Houghton (2004) and Bates, Kundzewicz, Wu and Palutikof (2008, 7) are of the view that freshwater resources have a high probability of being influenced by

climate change. Bates et al. (2008) continue to suggest that this will have extensive consequences for both ecosystems and humans. Due to climate change the environment and humanity will experience the greatest stress in water availability and quality (Bates et al., 2008). Moreover, climate change findings in unpredictable climate and weather changes that lead to severe natural hazards and unpredictable rainfall patterns. Therefore, climate change influences water supply by conditional changes in precipitation, temperature, drought and floods. "Climate change because of global warming will result in large changes in water supplies in many places" (Houghton, 2004, 164). Houghton (2004) argues that due to unpredictable rainfall and higher temperatures, this will bring about more powerful and larger number of floods and droughts.

2.6.2 Impact on small holder farmers

Climate change and variability have major impacts on smallholder farmers. This is so because it adversely affects ecosystem services which smallholder farmers depend on. Nhamo and Chilonda (2012) are of the view that there are going to be many changes that will affect the whole agricultural production system. In turn, this will have an effect on developmental programmes, which depend on agriculture since the economies of most developing countries depend on agriculture. Climate change causes a rise in temperature and a decrease in precipitation (Bockel & Smit, 2009). Consequently, due to rise in temperature and decrease in precipitation, crop production levels will greatly be affected and water quality will be reduced which will affect revenue to a great extent. Because of drought and flooding, crop farmers suffer the consequences of climate change. This leads to low income generation, job losses and food insecurity. The farmers will find it very difficult to maintain their infrastructure and some of them will end up moving to other areas opening up new farms leading to vegetation being destroyed (Nhamo & Chilonda, 2012).

Thomas and Twyman (2005) argued that the impact of climate change on agriculture is likely to be seen on trends shaping the agricultural environment in general. Examples of such trends are growing populations, continued reliance on income from agriculture and unstable off-farm income as a result of political and socio-

economic factors. Other trends related to the impact of climate change production included land desertification, declining productivity of ranges and reduction of land for livestock production. This negatively affects livestock production which as a result unpleasantly affects household livelihoods.

2.6.3 Impacts on the environment

Due to the unpredictability of amount and time when the rainfall will come, ecological niches could be affected by climate change. As a result, living organisms will have to change their dwelling places in search of better environments (Davis, Archer, Engelbreht, Landman, & Stevens, 2010). In this regard, farmers are faced with a very difficult situation since they are forced to move their livestock around so often.

2.7 Adaptation and resilience

Adaptation to climate change strategies are actions taken by people in response to climatic stimuli which are meant exploit associated beneficial opportunities. The adjustments can be categorised either as responses to current occurrences in climate or planned adaptation to long term changes in climate (Hisali, Birungi & Buyinza, 2011). Adaptation allows for adjustments in a system's behaviour and characteristics that enhance its ability to cope with external stresses. Given constant levels of hazard over time, adaptation allows a system to reduce the risk associated with these hazards by reducing its social vulnerability (Brooks & Adger, 2005). Several lessons can be from sociology and anthropological perspectives on human adaptation to climate change. Scientific studies in the disciplines of Anthropology and Sociology explored the mechanisms of adaptation to changing living conditions as a result of climate change (Yohe & Tol, 2002; Brenkert & Malone, 2005). Gyampoh, Amisah, Idinoba and Nkem (2014) observe that rural communities vulnerable to climate change have strong adaptive capacities. Adaptation to drought, scarcity of rain, decreased production of crops is accomplished through community-based measures to sustain human livelihoods (Gyampoh et al., 2014).

In a study conducted in Pakistan by Abid, Schilling, Scheffran & Zulfiqar (2016) farmers reported the change of traditional cotton variety with genetically modified

cotton varieties due to heavy pest attack on traditional cotton varieties. They also reported a higher use of heat-tolerant wheat varieties in response to an increase in the frequency of extreme maximum temperature events. Another traditional method implemented by these farmers was the use of crop types that differed from the previously used against the incident of substantial pest and insect attacks. Some farmers replaced cotton crops with maize crops since (Abid et al., 2016).

Community-based adaptation is capable of reducing the vulnerability as well as improving on the resilience of the local people to climatic variability and change. Even though subsistence farmers have always adopted adaptive strategies to some of these changes over the years, effective adaptation strategies should be aimed at securing their well-being in the face of climatic changes (Somah, 2013). Nhemachena and Hassan (2007) argue that the climate is already changing such that adaptation is critical and of concern in developing countries, particularly, in Africa where vulnerability is high. Mitigation plans may be implemented but they would not be sufficient enough to avoid changes in the global climate, hence, the importance of adaptation (Akoh, Bizikova, Parry, Creech, Karami, Echeverria, Hammill, and Gass, 2011:24). Furthermore, Gbetibouo (2008:1) states that the “extent to which the adverse impacts of climate change are felt depend on the extent of adaptation; without adaptation, climate change would be detrimental”. The Assessments of Adaptations to Climate Change (AIACC) project that was undertaken in various regions of Africa, Asia, Central and South America, the Caribbean, Indian and Pacific Oceans, found that overall there was an adaptation deficit, which is likely to be widened due to climate change (Leary, Adejuwon, Barros, Batimaa, 2007). “Adapting to climate change will entail adjustments and changes at every level, from community to national and international levels” (UNFCCC, 2007:29). Burton, Smith and Lenhart (1998) are of the view that adaptation can take different forms depending on the action taken in response to the external threat. This implies that if the action is before the threat the adaptation is preventive and if the action is during the time of threat the adaptation is gradual and short-term. Correspondingly, if the action is after the threat, the adaptation is reactive or corrective.

The ability of individual households and communities to adapt to climate change depends on their adaptive capacity. “Adaptive capacity refers to the potential or ability of a system, region, or community to adapt to the effects or impacts of climate change” (Eriksen et al. 2008:18). This capacity is dynamic and is influenced by economic and natural resources, social networks, institutions, governance, human resources and technology. In most cases the poor and the marginalised have low adaptive capacity. Climate variability risks have always been part of agricultural activities such that in most cases, African farmers have survived and coped with its impacts (Mano & Nhemachena, 2007; Ziervogel et al. 2008; CCAFS, 2009).

Ziervogel et al. (2008: 21) attest that “agricultural adaptation taking place in Africa is responding more to perceived climate variability rather than climate change, such that these responses are likely to be overwhelmed by climate change and its longer-term implications”. Adaptation measures in agricultural practices include crop and livestock variation, community-based adaptation, water storage, irrigation, rainwater harvesting, water conserving techniques and use of drought resistant crop varieties. In Zimbabwe rainfall projections point to a drying trend hence, adaptation strategies in the agricultural sector should focus on strategies to conserve moisture, particularly, adopting improved short-season seed varieties and drought resistant small grains (Ministry of Environment and Natural Resources Management, 2006).

In Ghana, farmers have always adopted a range of coping and adaptation strategies, such as permanent and seasonal migrations, new crop varieties and irrigation practices due to increasing incidence of climate-related shocks and stresses (Tambo, 2016). There are various adaptation measures employed by households to enhance their resilience to the changes in climate in Ghana. The most common adaptation measure which is practiced by 95% of the people is changing planting dates (Tambo, 2016). Similarly, in a study by Wahaa, Muller, Bondeau, Dietrich, Kurukulasuriya, Heinke and Lotze-Campen (2013) on adaptation strategies most farmers from different countries in sub-Saharan Africa also use changing of planting dates as an adaptation measure. Tambo (2016) provided some of the most

prominent measures that are used in Ghana. These include the use of drought tolerant or early maturing crop varieties, mixed cropping and crop switching and tree planting which is normally practiced by livestock farmers who plant shade trees to protect their livestock during heat stress.

Wahaa et al. (2013) found traditional sequential cropping system as a strategy used by most farmers in sub Saharan Africa. In the study, they discovered that farmers grow the sequential cropping system most frequently applied in their district composed of two short-growing crop cultivars. These two are single cropping system where farmers only grow one long-growing cultivar of the first crop of the traditional sequential cropping system and highest-yielding sequential cropping system where farmers grow the sequential cropping system composed of two short-growing crop cultivars with the highest yields. In the same study by Wahaa et al. (2013) in 35% of the surveyed districts one or more sequential cropping system exists. The sequential cropping systems frequently applied are mostly based on groundnut and maize as well as cassava, rice, wheat. However, few sequential cropping systems exist with sunflower or soybean, which are of minor importance in the surveyed households.

A study by Hachileka and Vaatainen (2011) found that in Zambia, rural communities are already undertaking activities to adapt to drought and the other climate hazards. The main coping strategies for farmers discovered in the study are contour ridging and ploughing across the slope and working early in the morning before it is hot. In one of the communities the main coping strategies are piecework, digging shallow wells along Zambezi and building strong traditional houses.

In Zimbabwe, rural smallholder farmers and communities in semi-dry agroecological zones have adjusted their behavior in response to past extreme hydrological events and climate related changes (Chikozho, 2010). Similarly, Nhemachena and Hassan (2007) argues that although farmers have a low capacity to adapt to such changes, they have, however, survived and coped in various ways over time. It is therefore, highly likely that most of the farmers are now already grappling with the need to

adapt to altered future climatic and rainfall conditions. In a study by Gwimbi (2009) more than 65% of cotton-producing farmers in Gokwe Rural District (GRD) of Zimbabwe reported that in order to cope with climate change they depend on the use of irrigation, diversification into more drought-resistant crop varieties, diversifying into other crops, timing the planting period to coincide with the onset of the rains.

A study by Unganai and Murwira (2010) on optimising rain fed agriculture as a climate change adaptation strategy in Chiredzi, Zimbabwe discovered that most farmers in the area have abandoned growing crops like maize, cowpeas and cassava. These crops have been replaced with sorghum and ground nuts which require little rains.

2.8 THEORETICAL FRAMEWORK

2.8.1 The Afrocentricity Theory

Afrocentricity emerged as a theory in 1980. The theory was founded by Molefi Kete Asante as a systematic challenge to Western epistemology. It developed in the African American cultural landscape as a set of principles that account for the understanding of an African sense of wholeness in addressing the life and experience of people of African descent in America, in the African continent, and all over the world. The Afrocentric theory emerged from the Afrocentric paradigm which deals with the aspects of African identity from the perspective of African people. This concept has been termed “Afrocentricity” by Molefe Asante in an effort to convey the profound need for African people to be re-located historically, economically, socially, politically, and philosophically (Mkabela, 2005). In his explanation of Afrocentricity Asante argued that,

“To say that we are decentered means essentially that we have lost our own cultural footing and become other than our cultural and political origins, dis-located and dis-oriented. We are essentially insane, that is, living an absurdity from which we will never be able to free our minds until we return to the

source. Afrocentricity as a theory of change intends to re-locate the African person as subject. . . As a pan-African idea, Afrocentricity becomes the key to the proper education of children and the essence of an African cultural revival and, indeed, survival” (Asante, 1995:1).

Afrocentricity became a growing scholarly idea in the 1980s as a large number of African American and African scholars adopted an Afrocentric orientation to data. The paradigm is generally opposed to theories that alienate Africans in the periphery of human thought and experience. It became a paradigm that advocates for the idea that African people should possess a sense of agency for them to gain sanity. In the 1960s a group of African American academics in the Black Studies departments that had just been formed at universities started formulating new ways of analysing information. Most often, these new ways were regarded as viewing information from “a black perspective” not the common “white perspective” of most information which had always been in existence in the American academy (Mkhabela, 2005).

The Afrocentric perspective is a revolutionary shift in scholarship and it is believed to be an adjustment to black disorientation and lack of agency. Afrocentrism seeks to answer the question, “What would African people do if there were no white people?” This implies that, what natural responses would occur in the relationships, attitudes toward the environment and kinship patterns among other aspects of life for African people had there not been any intervention of colonialism or enslavement? In that light, Afrocentricity places the fundamental role of the African subject within the context of African history and in so doing eliminating Europe from the heart of the African reality. Hence, Afrocentricity is evidently a revolutionary idea since it studies numerous aspects of life which comprise of ideas, concepts, personalities, and political and economic processes placing black people as subjects rather than objects. Moreover, as a paradigm, Afrocentricity emphasises the significance of the African, that is, black ideals, values, culture and history which are of paramount importance in African culture (Kershaw, 1990; Keto, 1995; Kharem & Hayes, 1990).

2.8.2 Tenets of Afrocentricity

Asante (1999) is of the view that when using Afrocentricity one can 'claim this space' if the person knows the general tenets of Afrocentricity as well as the practical application of the field. The major tenets identified by the researcher are location of phenomenon, dynamics of phenomenon, cultural criticism, analytic Afrocentricity and Afrocentric Philosophy

2.8.2.1 Location of phenomenon

Afrocentricity suggests that no phenomena can be dealt with adequately without formally locating it. A phenomenon must be carefully studied and analysed in order for the researcher to clearly understand its patterns (Kershaw, 1990). Achieving this will be the only way to investigate the complex interrelationships of "science and art, design and execution, creation and maintenance, generation and tradition, and other areas bypassed by theory". For instance, if one is studying a particular society the only way to get adequate information about the society is through understanding the patterns of life of that particular society.

2.8.2.2 Dynamics of the phenomenon

Afrocentricity considers phenomena to be dynamic and in motion. Hence, it is essential for a person to precisely note and record the location of phenomena even in the midst of variations. As a result, this implies that the researcher must know where he or she stands in the process (Kharem & Haye, 1990).

2.8.2.3 Cultural criticism

Afrocentricity is a form of cultural criticism that examines etymological uses of terms in order to know the source of an author's location. This enables the researcher to intersect ideas with actions as well as actions with ideas on the basis of what is offensive and what is innovative at the political and economic levels (Keto, 1995).

2.8.2.4 Analytic Afrocentricity

Analytic Afrocentricity is the application of the values of the Afrocentric textual analysis. The researcher seeks to understand the principles of the Afrocentricity in order to use them as a guide in analysis and discourse. In that regard, the Afrocentrist cannot function properly without adequately locating the phenomenon. This implies that chronology is significant in some situations as location (Kershaw, 1990).

2.8.3 Afrocentricity and African Development

Imperialism left Africa with two major experiences namely the denial of African identity and the imposition of western thoughts and cultural realities and perspectives. European perspectives prevailed over Africans such that colonial mentality took dominance and Africans began to deny and their intellectual and cultural prowess. The Afrocentric movement is a sequence of actions by African scholars directed towards achieving a particular end and ensuring that the African heritage and culture are reflected in the curricula on every level of academic instruction (Kershaw, 1990; Keto, 1995; Kharem & Hayes, 1990). African development can only be guaranteed if African literature is extensively furnished by African experiences such as their understanding of climate change as well as community based adaptation mechanisms. It is significant for these mechanisms to be documented so that the African community at large may employ.

Knowledge of climate change and adaptation measures to cope with it in Mutoko was explored from the community's worldview and culture. This sociological approach is within the Afrocentric paradigm that requires Africans to be studied in their own contexts (Asante, 1993). The Afrocentric paradigm was adopted to understand how Mutoko rural community members explain climate change. The study examined measures developed by community members to adapt to climate change. The sociological approach to the study argues that culture frames the way people perceive, understand, experience and respond to the world which they live. This argument is grounded in systems of meanings and relationships that mediate

human engagements with natural phenomena and processes (Nazarea-Sandoval, 1995; Rappaport, 1979).

Asante (1993) argues that Afrocentricity has a significant impact on the manner in which Africans view their identity and way of doing things such as farming practices and other indigenous practices they employ in their day to day lives. Africans have been sidelined from the social, political, philosophical, and economic terms. Hence, it becomes necessary to examine data from the viewpoint of Africans as subjects and human agents rather than as objects in a European context. This implies that Afrocentricity has implications for indigenous African culture. Afrocentricity locates research from an African viewpoint and creates Africa's own intellectual perspective. It studies Africa as the cultural centre which is utilized in the study of African experiences such that interpretations of data are drawn from the African perspective and in this case from a rural Zimbabwean perspective. The Afrocentric paradigm provides methods and practices that African people can use for making sense of their everyday experience in an indigenous African's point-of-view. The aim is to be sufficiently detailed and sensitive to actual social contexts so as to investigate the methodological bases or orderly character of ordinary social activities (Mkabela, 2005).

Climate variations are threatening the livelihood of rural communities worldwide (IPCC, 2007). Major climate hazards; drought, excessive heat, disease, depletion of biodiversity and water scarcity impact the livelihoods of communities that depend on natural resources for survival. These communities have developed adaptation measures relevant to their cultural values to lessen the impacts of climate threats on their livelihood patterns. Local communities have developed culture-based mechanisms of adaptation to harsh weather conditions which negatively impact their livelihoods (IPCC, 2007; FAO, 2007 & Jianchu et al., 2007). These mechanisms are complex and were developed and are used within cultures which are in line with Afrocentricity. They imply greater dependability on the use of indigenous practices to sustain their lives (Elia, Mutala & Stilwell, 2014).

2.8.4 Afrocentricity and climate change knowledge

The knowledge of climate change from an African perspective is based on beliefs such as the wrath of the Gods or failure to adhere to certain cultural practices. For instance, failure to receive sufficient rainfall is commonly associated with the anger of the ancestors which would inform the need for rain making ceremonies. Asante (1998) asserts that the civilization of African communities did not separate religion and philosophy and their contributions to literature and science were openly linked to the principles of ancient wisdom. In the current study, ancient wisdom refers to the knowledge that has been passed from generation to generation in order to help communities to adapt disaster risk situations like drought. Afrocentricity helps to fully perceive African institutions, concepts, symbols and voices. It expresses Africans' sense of the world and of their existence as well as an epistemological instrument to deal with social and cultural manifestations from either a cultural or socioeconomic perspective, in order to discover the foundations of African identity.

Apart from having knowledge of the phenomenon, Africans also have a significant role to play in adapting to the impacts of climate change in order to safeguard their communities from its impacts. Afrocentricity enables black people to view themselves as pivotal in their own history such that they see themselves as actors and participants not as individuals on the periphery of their own experiences (Kershaw, 1990; Keto, 1995; Kharem & Hayes, 1990). Hence, Afrocentricity places Africans in the front role in searching for solutions to adapt to the effects of climate change. Subsequently, in African communities the frequently employed adaptation measures are culture based. Nonetheless, that should not imply that other adaptation mechanisms that are not culture based are not used in African communities.

2.8.5 Culture based adaptation and Afrocentricity

Asante (1980) set the basis of Afrocentricity to history and culture. This implies idea of Afrocentricity would be meaningless if it is not attached to African history and experiences. In the African context, culture based mechanisms that are implemented to adapt to climate change are passed from generation to generation. Afrocentricity

draws its orientation from the history of the African subject (Adeleke, 2010). It claims an epistemological basis that associates the scholar with the African experience and African values. In so doing, more emphasis will be on African paradigms, symbols and myths that provides meaning to the history of the African subject and consequently offers a sense of place in the world arena. Afrocentricity is theoretically imbedded in the quest of human knowledge from a culturally and historically based standpoint of the subject.

As a result of its cultural orientation, Afrocentricity is determined to reclaim ancient African orthodox civilizations as the basis of interpreting and understanding the history and ways of life of African peoples, their narratives, spirituality, and culture. By regaining their own platforms, standing on their own cultural spaces, and believing that the way they view the universe is equally valid, Africans have achieved the kind of transformation that is needed to participate fully in a multicultural society (Adeleke, 2010). This enables them to share their stories and experiences on any issue to any audience. For instance, African culture based adaptation mechanisms significantly adds to the body of literature on climate change adaptation. Since Afrocentricity provides agency to the African subject through the ability to voice of his or her own history unlike being the object of the study matter in the framework of Eurocentric disciplines, Afrocentric theory demonstrates a transparent epistemological disagreement with the Eurocentric paradigm (Asante, 1999). In that regard, the fact that Africans are treated as the subject matter not an object provides a preferably excellent platform to understand and document culture based adaptation mechanisms implemented by Africans in rural communities.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Study Area

Mutoko is a district of Mashonaland East Province (MEP), Zimbabwe, in southern Africa. It is located in the eastern part of Zimbabwe, and it covers 4,092.5 square kilometres (Mvumi, Donaldson & Mhunduru, 1988). According to the 2012 population census, Mutoko has 146 127 people (Moyo, 2016). It was established as an administrative station in 1911 and it lies 143 km from Harare, the capital city of Zimbabwe. The place is named after the local Chief Mutoko. The area is occupied by the *Buja* people. The *Buja* people are said to have settled in Mutoko from *Mhingari* in what is now Mozambique.

3.1.1 Economy

The subsistence economy of Mutoko rural community is based on Conservation Farming. Conservation farming makes use of natural ecological processes to

conserve moisture, enhance soil fertility, and improve soil structure, and to reduce soil erosion and the presence of diseases and pests. It does this in three main ways namely, minimal soil disturbance, the retention of crop residues and crop rotation (Fanelli & Dumba, 2011). One of the tenets of Afrocentricity, that is, location of the phenomenon stipulates that no phenomena can be dealt with adequately without formally locating it. A phenomenon must be carefully studied and analysed in order for the researcher to clear understand its patterns (Kershaw, 1990). In that regard, having knowledge of the economy of Mutoko area helps the researcher understand better the community's understanding of climate change.

3.1.2 Farming systems

The most favourable crops in the area include maize, groundnuts, vegetables and sun flour, sorghum, cotton, pearl millet and finger millet. The reason for the dominance of such crops in the area is due to the type of land and climatic conditions. However, maize and pearl millet are the most important cereals in terms of the number of cultivators and hectorage per crop. Almost 80 percent of the cultivators have vegetable gardens with an average of 0.3 ha. Vegetables are an important component in the farming systems of Mutoko. The most commonly grown vegetables include: tomatoes, onion, green leafy vegetables, cabbage beans, peas and cucumber (Mvumi et al. 1998).

3.1.3 Climate

The climate in the area is mild, and generally warm and temperate (Fanelli & Dumba, 2011). In winter, there is much less rainfall than in summer. The average temperature in Mutoko is between 19.4 °C to 22.0 °C. Precipitation averages 713 mm. Precipitation is the lowest in July, with an average of 1 mm. Most precipitation falls in January, with an average of 179 mm and the average temperatures vary during the year by 7.3 °C (Metero365, 2017).

3.1.4 Political and social organisation

Mutoko Rural District is divided into twenty nine (29) wards, each consisting of six (6) villages with about one thousand (1000) people per village or eighty (80) to one

hundred and twenty (120) families. Each village has Village Development Committee (ViDCos) which report to the Ward Development Committee (WaDCos). An elected councillor in the Rural District Council (RDC) represents each ward. The council is headed by a Chief Executive Officer (CEO) (Mvumi et al. 1998).

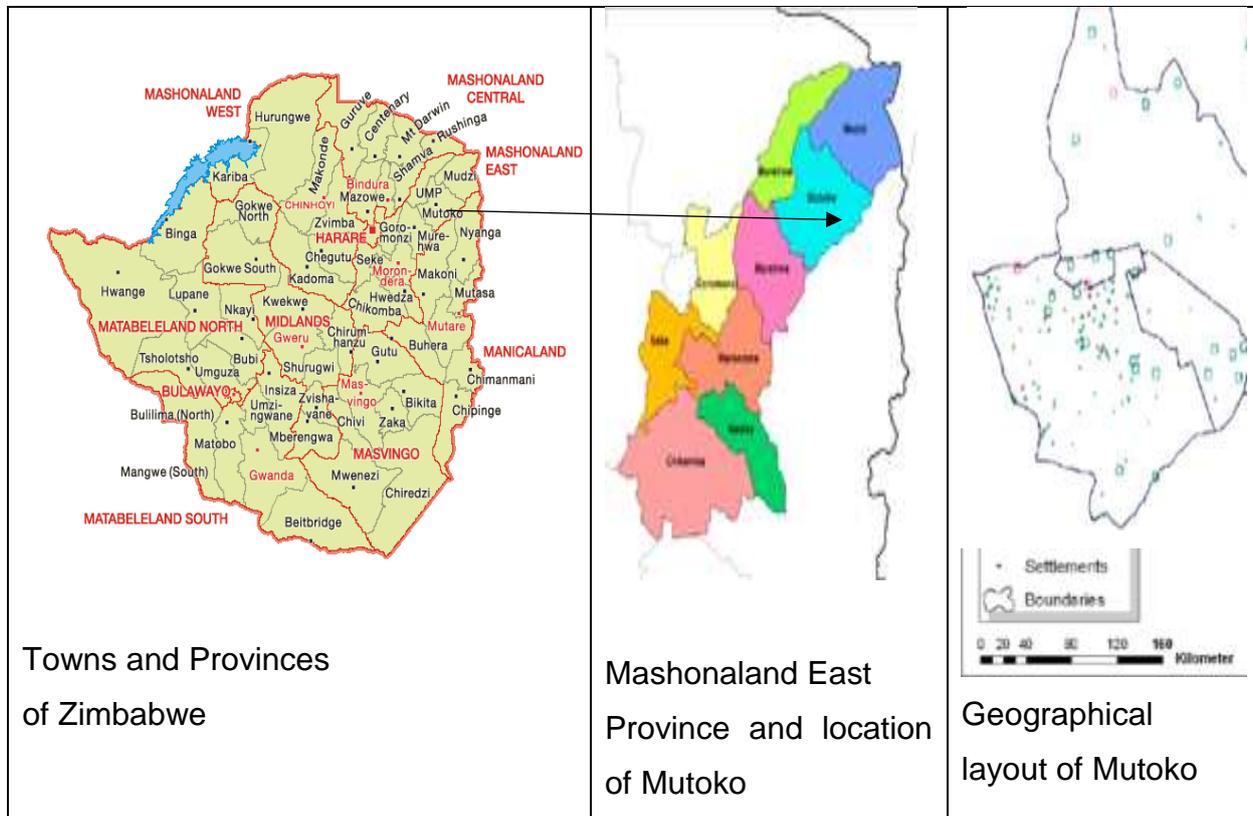


Figure 1: Geographical location of Mutoko Rural Community. Source: Zimbabwe Department of the Surveyor General (2016).

3.3 Research methods

3.3.1 Design

The researcher employed an exploratory research design. Hair, Babin, Money and Samouel (2003) define exploratory research as a research conducted to gain new insights and discover new ideas. Hence, a qualitative, exploratory study was designed to probe the explanations of climate change and the indigenous adaptation measures used to cope with it in Mutoko. The use of qualitative research design enabled the researcher to have full interaction with the study participants throughout the study.

3.3.2 Population and sampling

A non-probability technique known as criterion purposive sampling was employed to select members of the study sample. Bryman (2012) points out that in criterion purposive sampling the sample units are selected because they have particular characteristics that will enhance the exploration and understanding of the aims and objectives of the study. Hence, criterion purposive sampling was used to select thirty (30) members from two (2) villages namely Chibeta and Matedza. The two communities are representative in the sense that they share the same experiences with all other villages in Mutoko rural community. The researcher intended to focus on participants who were either aged fifty (50) years and above or had lived in the area for at least ten (10) years or more. However, these qualities were difficult to establish, therefore, the researcher ended up considering all individuals who had lived in the area for a reasonable number of years and those who proved to understand how climatic conditions had changed in the area. The reason for the age restriction was to engage people who were capable of giving a comparative explanation of climate change between the period they were young and currently or the changes they had noticed in the years they had lived in the area. Nevertheless, the age variable together with the longevity of stay in the area (Chibeta or Matedza) was fundamental in selecting participants to become part of the study sample.

3.3.3 Data collection

Data collection is considered to be one of the most important steps in research. It involves the practical collection of data (Antonius, 2013). Data was collected using in-depth interviews. Data presented in the dissertation are findings of a cross-sectional study conducted in Mutoko rural community of Zimbabwe. Collection of data was informed by factors such as age of the respondents, period of stay in the area and general understanding of climate change and indigenous practices used in MRC. In order to comprehend fully the knowledge of climate change and use of indigenous practices to adapt to climate change by MRC members, a qualitative research method was employed to collect data. In-depth interviews were conducted for qualitative data gathering.

3.3.3.1 In-depth interviews

An in-depth interview is a method of qualitative research in which the researcher asks open-ended questions. It provides a platform for face to face interaction between an interviewer and the study respondent. In-depth interviews help the researcher to achieve the same level of knowledge and understanding as the study respondent. The in-depth interview technique is generally used when detailed information is needed from individuals in the study (Walter, 2006).

The aim of the interviews was to explore the knowledge of climate change and the use of indigenous practices to adapt to climate change in in the two villages of Mutoko rural community. The respondents demonstrated great interest in the research and as it progressed they frequently provided additional information regarding their knowledge on climate change and indigenous practices adopted in the area.

The researchers faced a few challenges during the data collection process. One notable challenge was walking long distance to the participants' homesteads and locating the participants. Some of the participants were not available on the scheduled dates and the researcher had to reschedule interview dates.

3.3.3.2 Interview schedule

The interview schedule (Appendix A) was developed to ask the similar questions to all the respondents from both villages. Open-ended questions were directed to the respondents, though they were also given the opportunity to discuss issues which they considered relevant. Throughout the interviews the respondents were asked for further explanations as new issues arose. A tape recorder was used to record responses from the respondents.

The interview schedule started with biographical information of the interviewees such as age, gender, educational level and other social aspects. These were followed by open-ended questions, which focused mainly on respondents understanding of climate change, effects of climate change, and indicators of climate change as well as knowledge of indigenous practices used in the area.

3.3.3.3 Interviews with community members

Interviews were conducted with thirty (30) community members in their own households. These respondents were identified two to three weeks before the day of the interviews and an appointment was made with each of them. The interviews were conducted in the same pattern in both villages.

3.3.4 Data analysis

Data collected through face-to-face interviews were analysed through Thematic Content Analysis (TCA). Braun and Clarke (2006) define TCA as a method used for identifying, analysing and reporting patterns in the data. TCA proceeds by breaking down the information collected into themes. The researcher identified trends and patterns that developed from the data collected. The patterns were then coded and classified into different categories that were used to analyse the knowledge of climate change and the use of indigenous practices to adapt to climate hazards in Mutoko rural community.

3.3.5 Quality criteria

In order to retain quality, the researcher ensured that all data were accurate and all omissions and contrivances were avoided thereby enhancing credibility, dependability, conformability, trustworthiness and transferability. Trochim (2010) asserts that trustworthiness entails ensuring the findings of the research are believable. The trustworthiness of the findings of the present study was ensured by triangulating the data collection sources. In this regard the structured interviews and field notes were used as a guide when compiling the research report. Credibility refers to the alternative to internal validity, in which the goal is to demonstrate that the inquiry will be conducted in such a manner as to ensure that the subject is accurately identified and information to be acquired will be accurately described

(Denscombe, 2007). Therefore, the researcher approached community leaders from the concerned villages to identify participants who meet the criteria of the study. Transferability refers to the degree to which the findings of qualitative research can be generalised or transferred to other contexts or settings (Trochim, 2010). Hence, the researcher ensured transferability by structuring the interviews in such a manner that those questions and findings obtained from them could be applicable in similar investigations in the future. Dependability ensures that the research findings are consistent and could be repeated (Mikes, 2011). The researcher ensured this by audio-recording the interviews as well as taking down field notes during the entire data collection process.

3.3.6 Ethical considerations

Consent is the prospective respondents' agreement to participate in a study as a respondent. It is ethically compulsory for the researcher to obtain consent from the respondents (Neumann, 2005). During the data collection process, the researcher ensured that all respondents were properly briefed about the aim of the study, their rights and roles in the study. The respondents were also made aware that participation in the study was voluntary, and that they were free to withdraw from the project at any time. They were also asked to give their written informed consent before the interviews commenced (Appendix B: Consent Form). However, some of the participants were unable to read and write hence, the researcher read on their behalf and they gave verbal consent and the researcher printed their full names on the consent form. In order to participate in the research study, the participant were asked to sign the consent form.

CHAPTER 4

PRESENTATION OF RESEARCH FINDINGS

4.1 Introduction

This chapter presents the findings of data collected with the objective of exploring the knowledge of climate change and use of indigenous practices to adapt to observable climate hazards in Mutoko Rural Community. The chapter presents analysis of qualitative data collected through interviews and it is divided into five sections. The first section presents data about the respondents' biographical data, the second section presents analysis of data that respond to the first objective which is community members understanding of climate change. The third section presents analysis of responses to the second objective which is community's awareness of the implications of climate change. The fourth section presents an analysis of responses to the third objective which is indigenous adaptation measures to climate change. The presentation of findings was informed by analytic Afrocentrism which upholds the values of Afrocentric textual analysis. In analytic Afrocentricity, the researcher seeks to understand the principles of Afrocentricity and use them as a guide in analysis and discourse (Kershaw, 1990). Since the study was on the community's understanding of climate change and the use of indigenous practices to adapt to its impacts it was imperative to analyse data from the community world views and perspectives vis-à-vis Afrocentricity.

4.2 Demographic information

4.2.1 Sample composition

A total of thirty (30) study respondents were selected from two communities namely Chibeta and Matedza to facilitate data collection about the knowledge of climate change and the use of indigenous adaptation practices in Mutoko Rural Community.

The sample was constituted by unequal numbers of males and females, which are sixteen (16) males and fourteen (14) females. The study respondents did not have any special positions such as chiefs, headmen, or councilors in the community.

4.2.2 Respondents' gender

The study constituted of both male and female respondents. The larger number of respondents was males who constituted sixteen (16) respondents and females constituted fourteen (14) respondents.

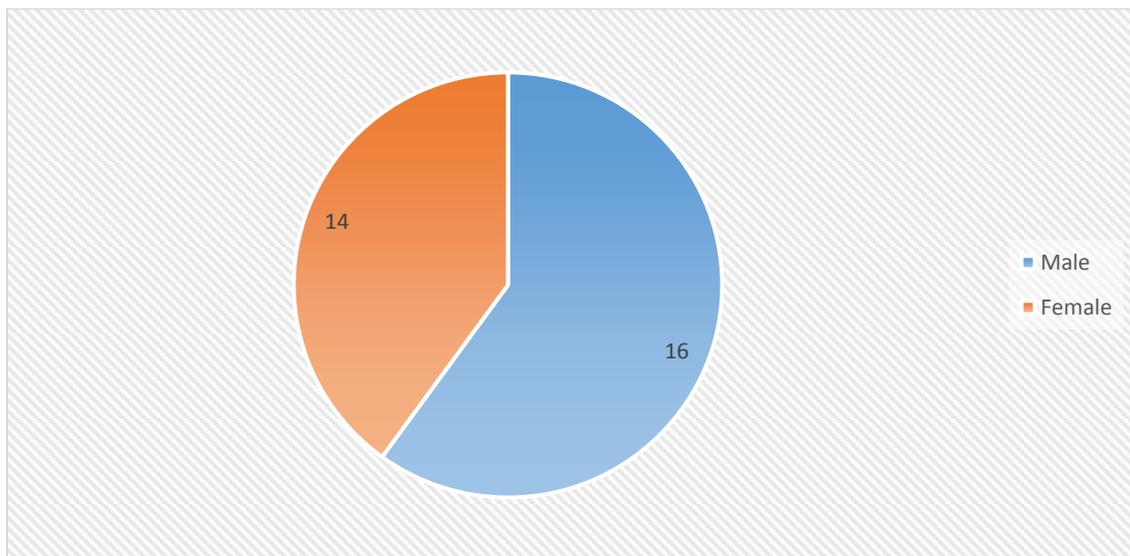


Figure 2: Respondents' gender

4.2.3 Respondents' age

The study sample was made up of adults above the age of thirty (30) years. It was reasonable to involve adults in the study because they were in a better position to give a comparative explanation of the changes in climate from the time they were young and currently as well as the indigenous practices they were involved in to cope in the midst of climate change. Three (3) respondents were between thirty to forty-five years of age, two (2) respondents did not know their age and nineteen (19) respondents were between the ages of forty-six and seventy-four years and six (6) respondents were above seventy-five years of age.

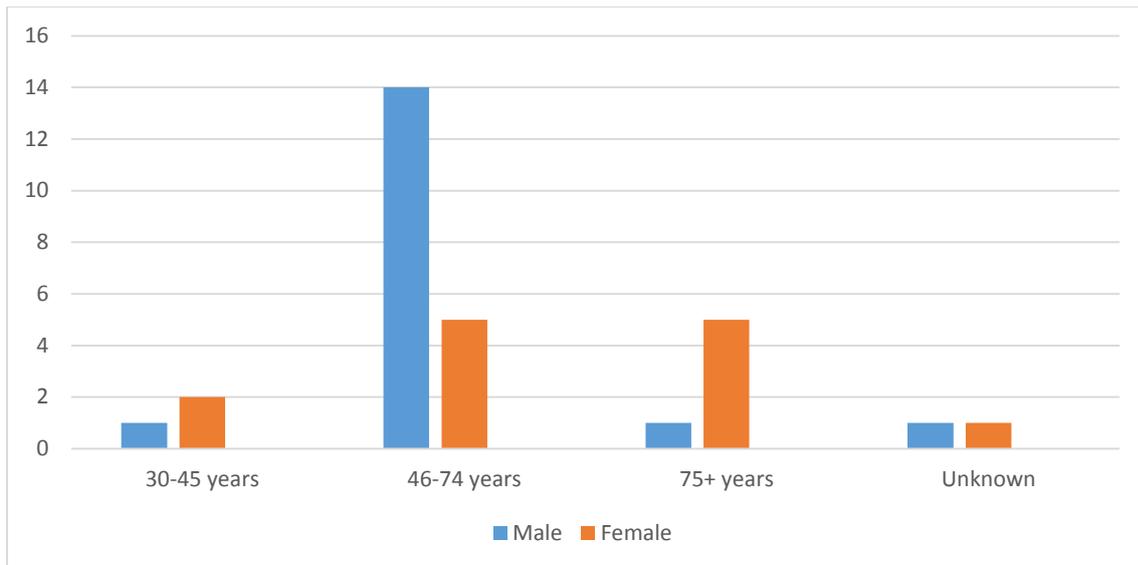


Figure 3: Age of respondents

4.2.4 Respondents' period of stay in the area

The period of stay in the area was of paramount importance in ensuring the respondents' understanding of the changes that were taking place in the area. The longer the period of stay the better knowledge on changing environmental conditions (Rankoana, 2016). Three (3) respondents had lived in the area for fifteen to thirty years, five (5) respondents had lived in the area since birth, and twenty (20) respondents had lived in the area for thirty-one to forty-five years, while two (2) respondents had lived in the area for more than forty-six years.

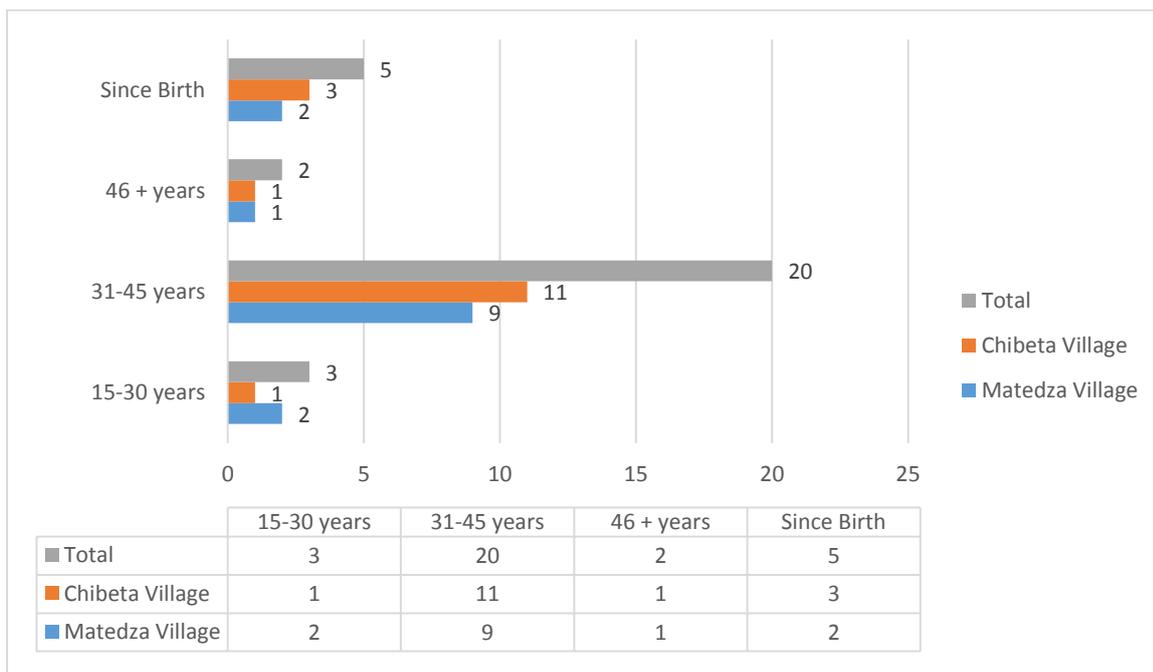


Figure 4: Respondents' period of stay in the area

4.2.5 Respondents' level of education

Education is one of the most important characteristics that determines a person's attitude and the manner in which they look and understand any particular social phenomena. Data collected about the level of education is presented in Figure 5. None of the respondents had attended tertiary education, nine (9) respondents had attended secondary education whereas eleven (11) respondents had attended primary education and ten (10) respondents never received formal education.

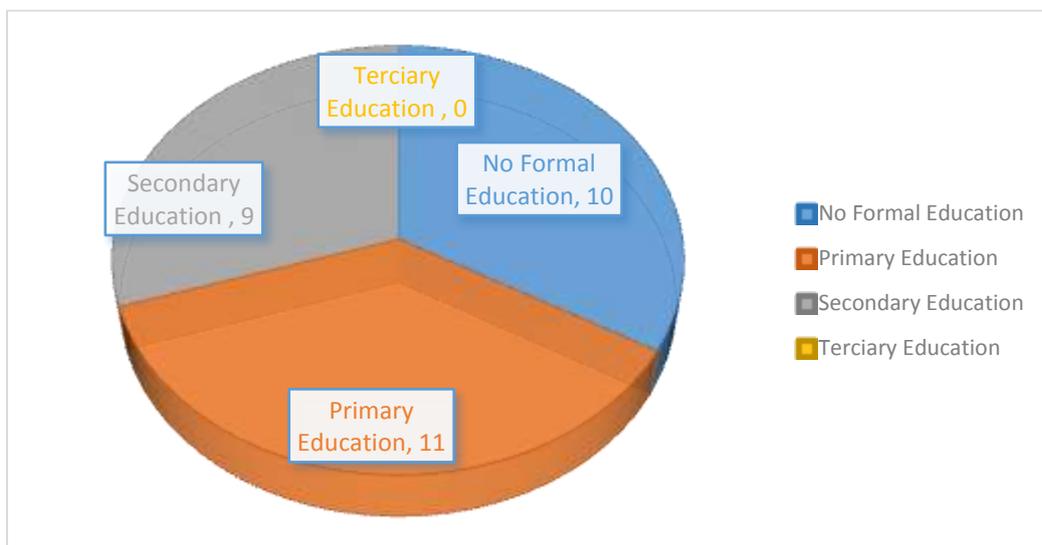


Figure 5: Respondents' highest level of education

4.2.6 Respondents' occupation

A total of fifteen (15) respondents were farmers, five (5) had retired and ten (10) were unemployed. A clear overview of the occupation of respondents is presented in the table below.

Table 1: Respondents' occupation

Occupation	Number of respondents
Unemployed	10
Farmer	15
Retired	5
Total	30

4.2.7 Community members understanding of climate change

This section presents analysis of responses provided during interviews in response to the questions on the community's knowledge of climate change. Two themes emerged from this section and these are explanations of community's understanding of climate change and comparative explanations of climate change from the period they were young up to this date. The respondents provided a comprehensive understanding of climate change and they concurred that there are noticeable changes in climate from the period they were young and now. Their explanations of changes in climate were based on their belief systems and failure to adhere to certain cultural practices. Such explanations explicitly and implicitly fit in the Afrocentric paradigm. Asante (1998) stresses that the development of African communities was closely associated with religion, ancient wisdom and philosophy. Ancient wisdom refers to the knowledge that has been passed from generation to generation in order to help communities to adapt to disaster risk situations like drought. Consequently, the knowledge portrayed by the respondents frequently referred to the information passed to them from their forefathers as well as understanding their environment.

4.2.7.1 Knowledge of climate change

All the respondents expressed same sentiments on their understanding of climate change. When asked to explain their understanding of climate change, most respondents mentioned that they were changes that they were noticing and these changes showed that climate change is real. One respondent indicated that they used to receive rains on time, that is, around mid-October but in the recent past they have been receiving first rains around mid-December and the weather has been very

hot as compared to old days. Most respondents articulated that there is a serious problem of rainfall in the area as compared to previous years. They argued that the seasons were not the same anymore because some years they received rains on time and others later around end of December while sometimes the rains were not sufficient enough to enable them to grow their crops.

Some respondents mentioned that the rain they currently receive is not of the same quantity as in previous years. They indicated that the crops often die before harvesting because of lack of enough water and extreme heat. Respondent 12 articulated that,

“The changes we are witnessing in seasons is immensely visible in the sense that long back we used to receive more rains and reap more harvest but nowadays the rains are unpredictable sometimes our crops die of heat because of lack of sufficient rains.”

[Age: 45; Gender: Male; Occupation: Farmer]

The respondents also indicated that in the 1970s and 1980s they used to receive sufficient rainfall but starting from the early 1990s the amount of rain they receive began to reduce. It was also established that when most of the families first came to Mutoko in the 1980s they used to receive sufficient rainfall but from around 1992 to this day rainfall is not predictable anymore and it's becoming very hot in summer.

Most respondents concurred on the issue of little amounts of rainfall they now receive as well as extremely hot seasons. However, apart from extremely hot days and low rainfall they are now experiencing very cold days. The respondents articulated that in the old days it was not as hot as it is nowadays they indicated that it was common knowledge that October is the hottest month of the year but now any month could be hot. Also, they used to receive first rains in October and the rains were sufficient enough for them to grow their crops but now they no longer receive large amounts of rainfall. To clearly comprehend this, respondent 25 indicated that,

“The temperatures have significantly changed because in the past it could only be extremely hot sometimes during summer and obviously cold during winter. But, these days the temperatures are confusing everything is now unpredictable.

[Age: 70; Gender: Male; Occupation: Farmer]

Furthermore, some respondents pointed out that there is a remarkable change in climate because in the previous years they used to consistently receive rains at a particular time but now the rains come late in December and abruptly go away and it has a serious impact on their crops since their agriculture entirely depends on rainfall.

Some respondents highlighted that rivers are now drying up earlier than they used to in the past. They indicated that there is a remarkable change in climate because in the previous years, rivers around their community could hardly dry up but these days by May the rivers would have dried up and also these days the weather is very hot especially the past two years. Respondent 11 articulated,

“It is worrying that our rivers are now drying up so early. This has serious disadvantages or us because we need water for domestic use, our livestock and irrigation. It has become a norm in our community that from June through November we struggle for water and often queue for water at the local bore hole”

[Age: 65; Gender: Female; Occupation: Farmer]

Most respondents acknowledged that numerous changes had taken place in climate and what they are experiencing now is far more different from when they were young. They indicated that there is a remarkable difference between the current weather conditions and those they had in the previous years. In the previous years they used to receive sufficient rains to grow their crops and grazing grass for their animals could also grow very well and could sufficiently sustain their livestock

throughout the year unlike now where they have to take the animals to faraway places in search of green pastures.

4.2.7.2 Gender related knowledge of climate change

The current study indicated that there is a huge difference in the manner in which males and females understand climate change. It was established that males are more informed about climate change than females. When asked if they had an understanding of any changes in climatic conditions, most men were quick to answer and their observations were strikingly similar. Most of the men indicated that they used to receive enough rains that could fill up rivers and they could go the whole year with sufficient drinking water for humans and their livestock. However, that has long changed since they no longer receive sufficient rains to fill up their rivers and dams. To support this, respondent 28 uttered that,

“As a farmer I understand that there is a significant change in the climate. This is because our farming practices have really changed because of lack of sufficient water. In the previous years, we used to grow crops with throughout the year because when rain stops we could start irrigation with water from the river.”

[Age: 38; Gender: Male; Occupation: Farmer]

Majority of men indicated that in the past two years, rivers dried up soon after the rains had gone which demonstrated a huge difference in climate between now and previous years. One of the male respondents indicated that there is a huge difference in weather considering the fact that they are now having extremely hot days and very low rainfall that findings in the poor harvests since their crops are rain fed. Also, since they do not receive sufficient rains anymore, their livestock is seriously affected since grazing grass is becoming scarce and the whole community scramble for the little available grass.

In the current study a few women as compared to men demonstrated knowledge of climate change. Some of the few women who were knowledgeable indicated that there is a huge difference in climate between now and the previous years when they were young. The change is not merely in rainfall patterns but also in heat and cold conditions. This is supported by the observations of respondent 3 who indicated that,

“In the previous year (2015) we had extremely hot days in summer and winter was not as cold as we used to know in the previous years. Coming to rain it had become common knowledge in this community that we no longer receive sufficient rains for our agriculture and pastoral sustenance.”

[Age: 40; Gender: Female; Occupation: Farmer]

Some of the women indicated that they hear that there are changes in climate but to them the changes are minor and only visible in insufficient rainfall though everything else is still normal. The present study has also revealed that older respondents were more informed about climate change as compared to the younger ones. Most of the older respondents who were above fifty years of age often brought about comparative explanations of the changes in climate. This was usually uncommon among the younger ones who related the changes based on oral history. The younger respondents reported what they heard from their parents yet the older ones were confident because they actually experienced the changes. Therefore, it is explicitly demonstrated in the current study that the older respondents were more knowledgeable about climate change than the younger ones.

The respondents clearly demonstrated an understanding of climate change though some of the female respondents were less informed. This understanding was born out of their daily observations of the environment surrounding them. This is because they mentioned issues of changes in the pattern of rainfall, poor harvests as well as livestock. These aspects are in line with the theoretical basis of the study which is the Afrocentric theory. Asante (1993) indicated that Afrocentricity takes shape when Africans are studied from their indigenous way of living. In this regard Mutoko

community's understanding of climate change is drawn from their daily observations of the community.

4.2.8 Knowledge of indicators of climate change

Most of the respondents revealed that they are aware of the indicators of climate change. Some of them referred to specific plant species that give indication of rainfall availability and scarcity, while others referred to clouds and mountains as well as the direction from which the rains will be coming from. The respondents revealed that these indicators have consistently showed them that there will not be enough rain for a couple of years now. Most of them articulated that they have got trees that show them that there is no rain or the rains they would receive are not sufficient enough for agricultural activities. They gave an example of the 'Nhunguru' fruit tree which is found around the area that it usually tells them that they would probably receive more rains if it bears fruits around June/July but if it bears fruits later during the year or never at all it simply means there won't be enough rain that year. The respondents indicated that for the previous five years, the tree never bore fruits around the period mentioned earlier on. This implies that it is now unpredictable and it's a clear sign that there is a remarkable shift in weather conditions.

The responses given by respondents are convincing enough to demonstrate that they have knowledge of changes in climate. To illustrate the severity of the change in climate respondent 26 indicated that,

"Long back when the rain season comes the setting of clouds was always followed by heavy rains which is no longer the case nowadays. Today, if clouds set we can go for two to three days without rain and most often the clouds just disappear. And also there is a mountain around here where we could see fire probably from the ancestors and that fire was an indicator that there is going to be heavy rains but now there is no such. So what I am saying here is failure of rains to come after the setting of clouds and the fact that we no longer see the fire in the nearby mountain is a sign to us that there is a change in climate".

[Age: 72; Gender: Female; Occupation: Farmer]

Another respondent indicated that the clouds they now see before rains come clearly indicate that there will not be sufficient rainfall because in the previous years they used to see a thick dark cloud that would tell them that they would receive heavy rains but now they only see light cloud which may disperse before the rains come. Also, most respondents indicated that some trees have shifted from their known annual period of bearing fruits and there are trees such as the fig tree which if they bear more fruits that year it means that there is no sufficient rain. However, in the communities under study these fig trees which often grow on riverbanks had been constantly bearing fruits in large amounts for a couple of years. Hence, it is a sign that shows there is a significant change in weather patterns.

Some respondents commented on the direction from which the rains come from. They believed that it tells a lot about the amount of rain they would receive. For instance, in previous years if the clouds set and rains would come from the south it was a sign that the rain could be sufficient enough. However, in recent times according to participants the rains come from any direction and that kind of rain is always short-lived. Therefore, such occurrences are a sign that there is a significant change in climate. Most respondents indicated that they were aware of the indicators of climate change. These indicators were drawn from their observations of certain changes in rain pattern and wind direction among other aspects. These features gave the community a sign that climatic conditions were not the same as before and huge changes in the climate were approaching.

4.2.9 Impacts of climate change

This section presents analysis of responses provided during interviews in response to the questions on respondents' awareness of the implications of climate change. Four themes emerged from this section and these are knowledge of the implications that climate change has on socio-economic conditions in the community, knowledge of the indicators of climate change, awareness of changes in cultural activities as a result of climate change and knowledge of seasonal rituals and celebrations affected

by this change. The respondents provided a comprehensive understanding of the implication of climate change on socio-economic conditions in the community.

4.2.9.1 Impacts of climate change on socio-economic aspects

When asked about the implications that climate change has on their socio-economic conditions, most respondents indicated that there are numerous challenges that they are facing as a result of climate change. These challenges include failure to support their families well since they rely on agriculture for survival, loss of livestock, hunger and poverty. They indicated that there are many challenges that they are encountering as a result of climate change. In the past when they used to receive sufficient rains they used to survive entirely on agriculture in the sense that through agriculture they used to send their children to schools and they could do quite a number of productive activities. However, due to lack of sufficient rainfall they cannot pay for children school fees because agricultural productivity has been immensely affected and their yields are not even enough for consumptions let alone trading. As a result, they suffer from hunger because their yields cannot take them through the whole year and since they only rely on agriculture for survival the only available alternative is government handouts which come once in a while.

4.2.9.1.1 Impacts on economic aspects

Most respondents clearly demonstrated that there are numerous that climate change has on their economic system. Since most of the people in the community are farmers, their economy is largely based on their farm produce and livestock. The more livestock one has the richer he is. In that regard, the community raised serious concerns over the lack of sufficient rains because it seriously affect their economy. Respondent 25 voiced that,

“We entirely depend on agriculture that is livestock production and crop production. In the previous years we used to sell cattle or goats in order to address any financial need that might have arisen such as paying for school fees and buying groceries. However, nowadays as a result of low rainfall the entire agriculture is affected. The number of livestock we keep has remarkably decreased due to lack of sufficient grazing grass and drinking water whereas

our crops usually die before they are ripe which result in hunger. Hence, I can confirm that we are having serious challenges with our children failing to achieve their goals in life because they are prematurely dropping out of school and families are torn apart as a result of poverty.”

[Age: 61; Gender: Male; Occupation: Farmer]

This clearly shows that one major problem that the community is facing as a result of climate change is hunger and most respondents confirmed that it has become a common phenomenon in their community. The respondents acknowledged that their livestock are seriously affected because grazing grass is becoming scarce whereas drinking water for humans and animals is a serious challenge. They indicated that in previous years they used to supplement their yields through irrigation from the nearby dam but it has long been impossible because since the year 2015 the dam has been dry.

The current study has revealed that there has been a significant decline in the subsistence economy. Many respondents revealed that unpredictable rainfall patterns resulted in the decline in crop and livestock production. In previous years, the community depended on rain-fed crops. However in the recent past the community has been producing crops from home gardens which cannot sustain them throughout the year. Some of the respondents articulated that the decline in subsistence economy is also mirrored through cessation of cultural rituals and festivals, brewing of traditional beer and communal labour. One respondent stated that in the past the community used to depend more on communal produces for example they could regularly brew traditional beer from their farm and never used to buy maize meal which is currently the norm.

4.2.9.1.2 Impacts on Social aspects

The study has observed that there are numerous social aspects that the community has is experiencing as a result of the changes in climatic conditions. Some of the social aspects affected include marriages. Most respondents revealed that marriage

patterns have been seriously impacted due to the change in climate. In support of this respondent 15 indicated that,

“The African tradition has it that marriages are facilitated with the payment of cattle by the groom to the bride’s family. But because very few families still own large numbers of cattle it is becoming difficult for our children to properly get married in ways we approve”

[Age: 74; Gender: Male; Occupation: Retired]

Some respondents, especially females confirmed that failure by the community to keep large numbers of cattle as they used to in the past amounts to the reason why most young people now prefer ‘kutiza mukumbo’ (getting married without the consent of families and payment of lobola). The respondents stated that it is of course indecent to get married in such a way but due to prevailing circumstances most young people are left with no option.

Most respondents demonstrated serious concern on the manner in which climate change impacted their day to day way of living. For most family men and women, the fact that rain is not predictable and sufficient enough anymore resulted in the failure to fully fend for families. This demonstrated that climate change has serious social impacts on the community.

It has been revealed that many families are torn apart as a result of the change in climate patterns. Most respondents revealed that failure by the community to produce bumper harvests as they used to in the past has seriously affected families. Since most people in the community rely on agriculture for survival it has long been difficult to do so considering the lack of sufficient rain in the recent past. Hence, most breadwinners now consider leaving the community heading to cities and mining towns in search of green pastures. Most female respondents stated that it is worrying that majority of these men who leave their families are most likely to get involved with other women and could even start families. As a result, at the end of the day

they stop fending for their families back in the village and in some instances they could even contract sexually transmitted infections and infect their wives in the village. For example respondent 4 lamented that,

“Due to limited options and job opportunities in our community, most men are leaving to urban areas and mine towns because they have to fend for their families. But the problem is that in most cases they don’t come back or send groceries usually because they will be enjoying with other women and they subsequently forget that they have families”

[Age: 65; Gender: Female; Occupation: Farmer]

A Majority of the respondents concurred that there are numerous cultural activities that have changed as a result of climate change. These cultural activities include rain making ceremonies that most people are no longer practicing. Some of the reasons cited for not practicing such ceremonies anymore include consecutive lack of sufficient rains. The respondents indicated that in previous years, lack of sufficient rains was a once in a while phenomenon such that when it happens they could consult the ancestors and rain would come. However, since it is now a common phenomenon people do not see the need to keep bothering the ancestors for rains. Also, they reiterated that most people now look up to Christianity for answers on climate change such that even if the elders would want to consult from the ancestors no one would take them seriously.

Most respondents indicated that in their community they used to perform rain making rituals called ‘*Mafuwe*’ once in a while when they did not receive rain on time and soon after they completed performing the ritual rain would come. However, they pointed out that nowadays they no longer perform such rituals and it is most likely because failure to receive enough rain has become a consistent phenomenon. Some respondents indicated that there are quite a number of cultural rituals that they used to perform in times of drought or shortage of rain. They believe that the reason why these rituals are now forgotten is that people now believe in Christianity implying that they now turn to Christianity for solutions to climate change. It has also been discovered in the current study that the other reason the community believes cultural

activities have been affected is because people now only remember to do the rituals because there is climate change yet all along they had forgotten about them.

Apart from numerous reasons given by other respondents for the cessation of cultural activities, another respondent believed that the major reason why the cultural activities have been seriously hampered is lack of obedience for the ancestors. To support this view respondent 9 indicated that,

“Many cultural activities have been seriously affected because people are no longer obedient to their ancestors. Now that there is no enough rain majority of the people would prefer to go to many churches that have erupted instead of going to perform cultural rituals.”

[Age: 72; Gender: Male; Occupation: Retired]

In agreement to the disobedience of ancestral spirits some respondents believed that when they were growing up their parents used to perform cultural rituals. During those rituals the ancestors could communicate through a spirit medium and tell the people reasons why they were receiving low rainfall. Hence, the people could then change their ways and rain would come. However, the respondents strongly believed that nowadays people are too much into churches so the voice of the ancestors is no longer heard because they believe that churches will bring a solution to climate change.

The present study revealed that due to climate change most cultural aspects in the community were seriously affected and some ceased. The reason for the cessation of these cultural activities include failure by the community to receive sufficient rains. As a result, some of the cultural practices such as the rain making ceremonies would not make sense at all. This is because they are supposed to be practiced when there is no sufficient rainfall and under normal circumstances rainfall could be insufficient once in a number of years. Hence, in such instances, community members could perform such cultural practices.

4.2.10 Indigenous adaptation measures

This section presents analysis of responses provided during interviews in response to the questions on indigenous adaptation measures to climate change. Community members demonstrated knowledge of indigenous practices that they use in their community. Some of the adaptation measures such as the use of '*Mujogo*' were slightly unique to the two communities though most of them appeared to be familiar to those used by other communities in Africa as indicated in the literature. The respondents provided numerous indigenous adaptation measures and coping strategies that they use to sustain practices implicated by climate change.

4.2.10.1 Adaptation measures to sustenance indigenous practices

There are numerous adaptation measures which are used to sustain indigenous practices. Since they can no longer grow maize in large quantities, most of the respondents indicated that they have shifted to millet and sorghum in order to adapt to rainfall scarcity. With millet and sorghum they still continue brewing traditional beer which forms the basis for all traditional functions in the Shona culture. Millet compensates maize in preparing '*Sadza*' (thick porridge) which is their staple food.

Most respondents articulated that they had turned from growing maize to growing millet and sorghum because it is conducive in the current state of the climate. They emphasized that this is in line with what their forefathers used to do because they could be told by the ancestors that since there is not enough rainfall they were supposed to grow millet or sorghum. Also, the respondents indicated that millet provide them with mealie meal for '*sadza*' which is their staple food and the sorghum provide them with ingredients for traditional beer which they use for most of their functions such as '*kurova guva*' (veneration of the dead), '*parufu*' (during funerals) and '*paroora*' (during traditional weddings).

Some respondents also indicated that they had tried irrigation as an adaptation strategy but it has since failed because the rivers from which they fetch water dry up

so early. Therefore, they pointed out that the only adaptation strategy they had was supplementing maize with drought resistant crops such as millet and sorghum. Some of them argued that even their forefathers used to do the same and during their time it was easy because they could be told what to grow by ancestors through spirit mediums.

The current study has also established that community members in Mutoko have developed large storage systems that accommodate their produce and help them sustain themselves in future. To support this, respondent 6 articulated that,

“We have developed storage systems where we keep our crops in large quantities. With these storage systems we are supposed to go for a long time with our produce. But since we are having small harvests due to climate change we have turned to growing millet and sorghum.”

[Age: 68; Gender: Male; Occupation: Farmer]

Asante (1980) stipulates that in Afrocentricity, history and culture form the foundation of human activities and life in general. As a result, the use of various adaptation measures used by the community are meant to restore the way of life and cultural activities that their fore fathers used to perform. In the African context, culture based mechanisms that are implemented to adapt to climate change are passed from generation to generation. As a result, in so doing the community will be observing their history. In support of this Adeleke (2010) argues that Afrocentricity draws its orientation to the history of the African subject.

Most of the respondents indicated that the community have turned to growing millet and sorghum instead of maize because with maize they constantly get low harvests because it often dries before it is ripe. However, with millet and sorghum they get good harvests even though they receive low rainfall and extremely hot days. The respondents acknowledged that they have considered millet and sorghum as a perfect alternative because they enable them to continue practicing their activities

since during ceremonies they use sorghum to prepare traditional beer and the 'sadza' that people eat will be from millet. The study has revealed that even though there are numerous adaptation strategies available to adapt to climate change, Mutoko community largely relied on indigenous strategies. These strategies are in line with Afrocentricity which theoretically informed the study.

4.2.10.2 Adaptation to the impact of climate change

Respondents provided various strategies that they use to adapt to climate change. These strategies include adding dry grass around the seeds so that it is sustained if there is low rainfall, burning trees and using the charcoal as manure, tilling the land before the rains come and creating temporary walls on the river banks in order to store water for irrigation. It is explicit that most of these adaptation strategies are community based mechanisms. Adeleke (2010) is of the view that Afrocentricity is determined to reclaim ancient African civilizations as the basis interpreting and understanding ways of life of African peoples that is their narratives, daily activities and culture. Interestingly, all the adaptation measures employed by the community were from an African perspective.

Most of the respondents indicated that since they now receive little rain which often come late they now use various strategies in their farming activities. These strategies include what they call "mujogo" in their local language. "Mujogo" is a process where they dig much deeper holes for their crops and when they drop the seed it will be covered with dry grass and water in order to fast-track the growing process of the plant. Apart from "mujogo" the community also burn trees around their farm lands and they use the charcoal from the burnt trees as manure for their crops. They also make good use of riverside wells to sustain our crops. The other strategy that the respondents now employ is tilling of the land before rainfall in preparation of agricultural activities. Respondent 30 pointed out that,

"We have adopted a system of tilling the land before rain comes so that by the time it comes the soil will be able to hold water for a long time. Also we are now utilizing crops like millet so that we can get good harvests"

[Age: 70; Gender: Male; Occupation: Farmer]

The respondents also articulated that apart from tilling the land before the rainfall they also store water for agricultural purposes by building temporary walls around riverbanks so that when the river dries up they will sustain their crops through irrigation from river bank wells. Generally, the respondents demonstrated that even though climate change has numerous impacts on their livelihoods, they equally have workable strategies. It was discovered that these strategies are unique and they have sustained them for a long time. The view that Afrocentricity implies that Africans should be studied from their own world views is largely upheld on this aspect. The uniqueness of the strategies employed by community members provides the need for this study to be informed by Afrocentricity

4.3 Summary

This chapter provided the findings of data collected with the objective of exploring the knowledge of climate change and the use of indigenous adaptation practices in MRC. The biographical data showed that both men and women who are mostly farmers and aged thirty years and beyond understood changes in climatic conditions. Their understanding was largely informed by their day to day experiences in the community. Most of the respondents displayed great understanding of climate change as indicated by their explanations of the phenomenon. Apart from understanding climate change as a phenomenon, the community was also aware of its implications on their livelihoods. Most of these implications were socio-economic in nature. Many respondents failed to sustain their families well due to the effects of climate change. The respondents also acknowledged the use of indigenous practices to adapt to climate change. Even though there are numerous adaptation strategies available, the community preferred indigenous practices.

CHAPTER 5

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion of findings

5.1.1 Study sample

The study sample was made up of male and female respondents. The larger number of respondents was males which constituted 53% of respondents and females constituted 47%. Males demonstrated more knowledge and concern on climate change issues. Most males were farmers therefore they were directly affected by the effects of climate change since their farming activities were affected by extremely hot temperatures, lack of sufficient rainfall and too much water in some instances. In this regard, men were indirectly forced to be more knowledgeable and concerned about climate change. This finding provides gender-based knowledge of changing climatic conditions as supported by (Mohai, 1992; Davidson & Freudenburg, 1996; Slovic, 1999 Slimak & Dietz, 2006) who discovered that understanding of climate change differ among men and women largely because of communal distribution of roles. However, until recently, a small number of researchers paid attention to the complex interactions between gender relations and climate change perceptions (McCright, 2010). A study by Krosnick et al. (2000) indicates that women are more active in climate change awareness than men even though men are to some extent equally concerned. Similarly, O'Connor et al. (2002) found that both men and women perceive climate change as a more serious threat and are most often willing to take voluntary steps to reduce its causes.

The study sample was made up of adults above the age of thirty (30) years. These adults were in a better position to explain changes in climatic conditions either from the time they were young up to the time when the study was conducted or for the period they had lived in the community. In agreement with this finding, most studies concur that age has a positive effect on perceptions of climate change risk (Lazo et al., 2000; Dietz et al., 1998; Guber, 2003). In a study conducted in thirty European countries by the Eurobarometer (2011) one's understanding of climate change correlates negatively with one's age because respondents aged fifty five years and above felt significantly less informed about climate change as compared to young people. It was also found that the elders were less likely to consider climate change a very serious problem as compared to the rest of the residents. However, these findings strikingly contrast with the findings of the current study which reveal that older respondents understood changing environmental conditions and were more concerned about the impacts of climate change on the community livelihood.

In the current study, the period of stay in the area was of paramount importance in ensuring the respondents' understanding of changes in environmental conditions. The longer the period of stay, the better understanding of changes in rainfall patterns, wind direction, drought, plant species and seasons (Rankoana, 2016). Correspondingly, Dietz et al. (1998) assert that one needs to have lived in a particular area for a reasonable amount of time in order to give a comprehensive explanation of climate trends in the area.

Education is one of the most important characteristics that determines a person's attitude and the manner in which he/she looks at and understands any particular social phenomena. Therefore, the variable 'level of education' was used to examine its impact on understanding changing climatic conditions and their impact on livelihood patterns. Whereas some studies indicate that the better educated are more well-informed about climate change, others show that the less-educated are more concerned about climate change. Other studies found a negative correlation between climate change knowledge and level of education (Malka et al., 2009).

O'Connor et al. (2002) discovered that education is inversely related to concern about climate change and highly-educated people perceive climate change as less of a risk than the least educated. Kollmuss and Agyeman (2002) support this finding by showing that a higher level of education does not necessarily translate into increased concern and support for environmental issues. This is directly related to the current study where none of the respondents had attained tertiary education but they were all concerned about climate change in their area. Correspondingly, Zia and Todd (2010) found that college or university education does not increase citizens' concerns for climate change. Possibly, public education on climate change is essential for people to obtain accurate information about the subject though it is not a sufficient condition for understanding climate change.

There appears to be an association between the respondents' occupation and perceptions of climate change. Unemployed respondents depending on subsistence economy understood changing climatic conditions and their impacts on the produce. This finding is corroborated by observations that unemployed and the self-employed have knowledge about climatic conditions whereas the elite and other groups are less concerned about this change (Eurobarometer, 2011). Consequently, one of the tenets of Afrocentricity, that is, cultural criticism asserts that Afrocentricity associates location and ways of life of the people in the particular community. This enables the researcher to intersect ideas with actions as well as actions with ideas (Keto, 1995). Hence, in this regard the fact that unemployed respondents who depend merely on subsistence economy understood changing climatic conditions and their impacts on the produce is because they are more involved with the natural environment.

5.1.2 Understanding of climate change

All the respondents expressed same sentiments on changing climatic conditions. They reported that there are changes that they are noticing and these changes were indications that climate change is real. The respondents pointed out to scarcity of rain and increased temperatures as major indications of change. Correspondingly, in a study conducted by Niles and Mueller (2016) in New Zealand, majority of farmers believed that summer temperatures were consistent and annual rainfall was the

same as before, yet others believe these had decreased, with a small number of farmers believing they had increased. In the same study the largest group of farmers perceived winter temperatures as stable, while others thought they had increased, and very few felt that they had decreased. All these indicate that the farmers have an understanding of the changes occurring in climatic conditions. Furthermore, in support of the findings of the current study, a study by Nkomwaa et al. (2014) on indigenous knowledge systems and climate change adaptation strategies in agriculture in Chagaka area in Malawi described the climate of the area as characterized by very high temperatures and generally low rainfall with an erratic pattern. In the area, rainfall is seasonal and is experienced during November–April.

5.1.3 Knowledge of the indicators of climate change

Most of the respondents show that they are aware of the indicators of climate change. Some of them referred to specific plant species that show them whether there will be rainfall or not while others referred to clouds and mountains as well as the direction from which the rains will be coming from. The respondents revealed that these indicators have consistently showed them that there will not be enough rain for a couple of years now. In support of this finding, Nkomwaa et al. (2014) found that farmers in Malawi reported that a high occurrence of ants and termites indicates good amount of rains for planting crops. They also stated that high temperatures between September and October predict good rain.

5.1.4 Comparative explanation of changes in climate

Most respondents acknowledge that numerous changes had taken place in their local environments and what they are experiencing now is far more different from when they were young. They stated that they used to receive sufficient rains but now the rains are not sufficient enough for agricultural purposes. These findings are in line with the findings of a study by Nkomwaa et al. (2014) where by villages in Malawi testified that the changes they notice now were not evident in the previous years and recently such changes negatively affect their agricultural practices.

5.1.5 Awareness of the implications of climate change

Most respondents concede that climate change has serious impacts on their socio-economic conditions. There are numerous challenges that they are facing as a result of climate change. These challenges include failure to support their families well since they rely on subsistence crop production for survival. In support of this finding Rankomise (2015) asserts that the direct effects of climate change on local communities are in the form of drought and reduction of water resources which impact negatively on human health and livelihoods. Furthermore, Nhamo (2009) observe that climate change does not affect the environment alone, rather, it also affects the social, economic and political spheres, which consequently negatively affect overall development.

Furthermore, Mubaya et al. (2010) also exposed negative socio-economic impacts of climate change in Zimbabwe and Zambia and these were shortage of income from livestock cultivation. As a result, most farmers could not afford to send children to school. Farmers also experienced theft of livestock and the number of their stock was reduced. The decline in the number of stock resulted in the selling of stock by households in order to meet daily obligations that required cash. Excessive rains that were experienced in Zimbabwe and Zambia had both negative and positive impacts.

5.1.6 Changes in cultural activities

The respondents concurred that there are numerous cultural activities that have changed as a result of climate change. These cultural activities include rain making ceremonies that most people are no longer practicing. Some of the reasons indicated for not practicing such ceremonies anymore include consecutive lack of sufficient rain. The respondents indicated that in previous years, lack of sufficient rains was a once in a while phenomenon such that when it happens they could consult the ancestors and rain would come. This finding is supported by Rankomise (2015) who asserts that the direct effects of climate change on local communities among other things is the cessation of cultural activities which impact negatively on human health and livelihoods. Correspondingly, Rankoana (2016) explains climate change in terms of cessation of cultural activities and important livelihood patterns.

5.1.7 Adaptation measures

There are numerous adaptation measures which are used to sustain indigenous subsistence production practices. Since they can no longer grow maize in large quantities, most of the respondents indicated that they have shifted to millet and sorghum in order to adapt to climate changes. With millet and sorghum they still sustain their indigenous practices by preparing traditional beer which is served in all traditional functions in the Shona culture. Millet compensates maize in preparing 'Sadza' (thick porridge) which is their staple food. The shift from maize to millet and sorghum by Mutoko community members supports IPCC (2007); FAO (2007) and Jianchu et al. (2007) assertion that local communities have developed adaptation measures relevant to their cultural values to lessen the impacts of climate threats on their livelihood patterns. Local communities have developed culture-based mechanisms of adaptation to harsh weather conditions which negatively impact their livelihoods (Jianchu et al., 2007). These mechanisms are complex and were developed and are used within cultures (Rankoana, 2016). They imply greater dependability on the use of indigenous practices to sustain their lives (Elia et al., 2014).

The respondents provided coping strategies used to survive changing climatic conditions. These strategies include adding dry grass on the seed so that it is sustained if there is low rainfall, burning trees and using the charcoal as manure, tilling the land before the rains come and creating temporary walls on the river banks in order to store water for irrigation. Gyampoh et al. (2014) observed that rural communities vulnerable to climate change have strong coping capacities. Coping with drought, scarcity of rain, decreased production of crops is accomplished through community-based measures to sustain human livelihoods.

In the current study most farmers reported that they changed crop types from maize to sorghum and millet in order to cope in the midst of climate change. This is in line with a study conducted by Abid et al. (2016) which show that farmers implemented a method of changing crop types which was adopted against incidents of heavy pest

and insect attacks, soil problems and extreme temperature events. Some farmers reported that they had replaced cotton crops with maize crops since 2010 due to its exposure to heavy pest attacks and changing weather conditions. Even though subsistence farmers have always adopted adaptive strategies to some of these changes over the years, effective adaptation strategies should be aimed at securing their well-being in the face of climatic changes.

A study by Zvigadza, Mharadze, and Ngena (2010) revealed that in Zimbabwe traditional coping strategies are used in order to mitigate the effects of climate change. The study discovered that community members sold small stock such as goats, and sold forest products and firewood, in order to make up for lost incomes. They also diversified their farming practices, recycled water, practised traditional and Christian ceremonies to ask for rain, and used indigenous knowledge systems to prepare for future weather.

5.2 Conclusions

The current study has revealed that knowledge of climate change is widespread in Mutoko Rural Community. Majority of the respondents admitted that there are remarkable shifts in rain and temperature patterns. Community members are noticing numerous changes in climatic conditions. They also acknowledged that numerous changes had taken place in climate and what they are experiencing now is far more different from when they were young. From this standpoint, the current study concludes that climate change is a common phenomenon in rural communities and community members are willing to come up strategies to adapt to its impacts.

The study discovered that climate change has serious impacts on community members' socio-economic conditions. There are numerous challenges that community members are facing as a result of climate change. The negative impacts are more obvious. They include poor production of crops, loss of livestock, hunger and poverty. Community members point to certain features as indications of environmental change. Examples are depleting biodiversity, cloud formation, wind direction and the direction from which the first rain appears. Even though the

community have knowledge of the changes in climate it appears that they still struggle to come up with more effective adaptation measures. This calls for a more inclusive approach where the government and other stakeholders intervene in an effort to help the community adapt to the effects of climate change.

Moreover, there are numerous cultural activities that have changed as a result of poor crop and livestock production. As a result, various adaptation measures are employed by Mutoko Rural Community to sustain the indigenous practices such as continuity of planting crops in which traditional millet and sorghum replace maize. Further measures include adding dry grass to the seed so that it is sustained if there is low rainfall, burning trees and using the charcoal as manure, tilling the land before the rains come and creating temporary walls on the river banks in order to store water for irrigation.

From an Afrocentric stand point, the current study triumphed in achieving its objectives. Asante (1993) argued that Afrocentricity has to do with the need for African people to be re-located historically, economically, socially, politically, and philosophically. In that regard, knowledge of climate change and adaptation measures to cope with it in Mutoko was explicitly and implicitly explored from the community's worldview and culture. The study successfully investigated the views of the community on climate change as well as indigenous practices they employ to adapt to climate change. Asante (1993) argues that Afrocentricity has a significant impact on Africans' way of doing things such as farming practices and other indigenous practices they employ in their day to day lives.

5.3 RECOMMENDATIONS

Based on the findings of this study, the following are recommended by the researcher:

5.3.1 Dissemination of knowledge on climate change in rural communities

Climate change knowledge should be extensively disseminated through workshops, radio broadcasting and television adverts. This is because most of the people in rural communities might be aware of the changes in climate but not all of them are knowledgeable about its possible effects.

5.3.2 Government support

The government through the Ministry of Agriculture, Mechanization and Irrigation Development (MAMID) should support rural communities with sustainable strategies such as biodiversity management strategy, energy and climate change strategy and environmental education and training to ensure sustainable resource use and management in rural communities.

5.3.3 Promotion of the use of indigenous practices

There must be policy and public discourses on climate change and adaptation. This will help the communities in coping with increasing climate change and variability since rural communities often inhabit economically and politically marginal areas and they depend on natural resources which are directly affected by climate change.

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APPENDIX A: DATA COLLECTION INSTRUMENT

Interviewee's biographical information

a. Gender

Male	1
Female	2

b. Age

--

c. For how long have you lived in this village?

1-10 years	10-20 years	20-30 years	30-40 years	50+
1	2	3	4	5

d. Educational level

No formal education	Primary	Secondary	Tertiary	Other
1	2	3	4	5

e. Occupation.....

Theme 1. Community members' understanding of climate change

1.1 Could you please explain to me your understanding of climate change?

1.2 Are temperatures, seasons and rainfall patterns in your area the same as the time when you were born?

1.3 Are you noticing any change?

Theme 2. Community awareness of the implications of climate change

2.1 What do you think are the implications of climate change on socio-economic conditions in your community?

2.2 What are the indicators of climate change?

2.3 Are you noticing any change in the cultural activities as a result of climate change?

2.4 Are there seasonal rituals and celebrations affected by this change?

Theme 3. Adaptation measures developed and used by community members to sustain cultural activities implicated by climate change

3.1 What adaptation measures do you use to sustain indigenous practices implicated by climate change?

3.2 How are you coping with climate change?

APPENDIX B: CONSENT FORM

I _____ voluntarily participate in the project about: **Knowledge of climate change and the use of indigenous practices to adapt to climate hazards in Mutoko rural community in Mashonaland East Province, Zimbabwe.**

Participation in the study is completely voluntary. Be aware that if you decide to

participate, you may stop participating at any time and you may decide not to answer any specific question.

You will be asked to answer questions about the knowledge of climate change and the use of indigenous practices in Mutoko Rural Community. Your responses to this interview will remain strictly confidential.

By signing this form you agree that you have read and understood the information above and you freely give consent to participate in this project.

Signatures

Participant.....	Date.....
Witness.....	Date.....
Researcher.....	Date.....

APPENDIX C: ETHICAL CLEARANCE CERTIFICATE



University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 2212, Fax: (015) 268 2306, Email:noko.monene@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE CLEARANCE CERTIFICATE

MEETING: 03 November 2016

PROJECT NUMBER: TREC/177/2016: PG

PROJECT:

Title: Knowledge of climate change and the use of indifenuous practices to adapt to climate hazards in Mutoko rural community in Mashonaland East Province, Zimbabwe

Researchers: Mr SS Mugambiwa

Supervisor: Prof SA Rankoana

Co-Supervisor: Mr TS Nyawasha

School: Social Sciences

Degree: Masters in Sociology


PROF TAB MASHEGO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: REC-0310111-031

Note:

- i) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee.
- ii) The budget for the research will be considered separately from the protocol.
PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

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