

**CLIMATE GOVERNANCE THROUGH INDIGENOUS KNOWLEDGE SYSTEMS
FOR SUSTAINABLE DEVELOPMENT IN MUTOKO DISTRICT OF
MASHONALAND EAST PROVINCE, ZIMBABWE.**

By

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**This thesis is submitted in fulfilment of the
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Date: June 2020

DECLARATION

I, Shingirai Stanley Mugambiwa, student number 218082877, hereby declare that this thesis is my own original work. It is hereof submitted to fulfil the requirements for the degree of Doctor of Philosophy in Sociology at the University of KwaZulu-Natal, Durban. I confirm that this thesis has not previously been submitted for any other degree or examination in any other University. Where I have used the work of other authors, I have properly referenced in accordance with the requirement of the Department of Sociology, Faculty of Humanities, and the University of KwaZulu-Natal. In addition, I have not copied any author or scholars' work with the purpose of passing it as my own.



Student signature

08 June 2020

Date

DEDICATION

*To my late mother who taught me to trust in God, believe in hard work
and that so much could be done with little.*

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ABSTRACT

Climate governance has over the years become a topical issue among scholars and policymakers. The concept has come into prominence as a result of the severe effects that climate change has on the livelihoods of communities around the world. In Zimbabwe, rural communities have been grappling with various climate-related challenges occurring in the country since the early 1990s. Nevertheless, the current climate change theories have not effectively established a comprehensive system of climate governance that is within the context of Indigenous Knowledge Systems. Therefore, the main aim of this sociological inquiry was to explore climate governance using Indigenous Knowledge Systems in pursuit of sustainable development in a Zimbabwean rural community. The study takes a swipe at adopting either a purely positivist or constructivist paradigm despite the fact that the constructivist paradigm is considered important for understanding Indigenous Knowledge and practices that are employed by local communities to adapt to climate change risks. As such, the study employs an approach that acknowledges the social interpretation and construction of IKS climate governance necessitated by grounded theory. The study adopted a qualitative method and data was collected through in-depth interviews and a focus group discussion. Grounded theory and Thematic Content Analysis were adopted as methods of data analysis. This qualitative enquiry linked climate change with rural livelihoods opportunities in an effort to determine how the impacts of climate change affect rural communities vis-à-vis sustainable development. The inquiry was executed through the theoretical specs of a triangulation of Grounded theory, Sustainable Livelihoods Approach and Afrocentricity. The study found that knowledge of climate change plays a pivotal role in paving way for IKS climate governance. The study also revealed that indigenous climate change adaptation dominates the communities' adaptation options and it stands as a key informant for Scientific Methods employed and IKS climate governance. Lastly, the major contribution of the study was the development of an IKS climate governance conceptual model that was informed by the findings of the study.

Keywords: Climate governance, Climate change, Afrocentricity, Indigenous Knowledge Systems, African Epistemology, African Ontology, Sustainable Development

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LIST OF ACRONYMS

°C	Degrees Celsius
AGRITEX	Agricultural Research and Extension
COMMUTECH	Community Technology Development Organization
COTTCO	Cotton Company of Zimbabwe
DDF	District Development Fund
DEAT	Department of Environmental Affairs and Tourism
EMA	Environmental Management Agency
ENSO	El Nino Southern Oscillation
FAO	Food and Agriculture Organisation
GHF	Global Humanitarian Forum
GMB	Grain Marketing Board
GNU	Government of National Unity
GoZ	Government of Zimbabwe
GPA	Global Political Agreement
GRD	Gokwe Rural District
IEA	International Energy Agency
IKS	Indigenous Knowledge Systems
IPCC	Intergovernmental Panel on Climate Change
LPDO	Livestock Production and Development Officers
MDC	Movement for Democratic Change
MEP	Mashonaland East province
MRD	Mutoko Rural District
MRDC	Mutoko Rural District Council

NCCO	National Climate Change Office
NCCRS	National Climate Change Response Strategy
NCCSC	National Climate Change Steering Committee
NCCTT	National Climate Change Task Team
NGO	Non-Governmental Organisations
RDC	Rural District Council
SK	Scientific Knowledge
SLA	Sustainable Livelihood Approach
UK	United Kingdom
UN	United Nations
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
ViDCo	Village Development Committee
WaDCo	Ward Development Committee
ZANU PF	Zimbabwe African National Union- Patriotic Front

CHAPTER ONE: RATIONALE OF THE STUDY

1.0 Introduction

This chapter provides the introduction and orientation of the study. The chapter begins by providing the general background of climate change in Zimbabwe and the strides that have been made thus far in response to the negative impacts of the phenomenon. The background was also channelled to provide the manner in which the concept of climate governance came into being and how it is administered from both the scientific and indigenous perspectives. The chapter goes on to establish the problem statement and significance of the study whose chief attribute was a contribution to scholarship. Having established these fundamental background aspects of the study, the chapter moves on to provide the purpose of the study, which constitutes the main aim, the research objectives and research questions accordingly. Lastly, the chapter provides the roadmap of the thesis, which gives a hint on what every chapter incorporated in the study, entail.

1.1 Background

Climate governance has become a topical issue among scholars and policymakers over the years. Recently, some scholars have diverted focus from scientific causes and nature of climate change to the social and political aspects of the phenomenon (Mugambiwa & Rukema, 2019). The concept of climate governance has come into prominence as a result of the severe effects that climate change has on the livelihoods of communities. This implies that to best deal with the effects of climate change, there is a need for governments, local authorities and individual households to come up with mechanisms that are aimed at managing and dealing with the negative effects of the phenomenon. Dodman & Mitlin (2015), present the governance structure of climate change in Zimbabwe. The structure is composed of three elements. First, the National Climate Change Office (NCCO) which is responsible producing the National Communications and engaging the United Nations Framework Convention on Climate Change (UNFCCC). Second, the National Climate Change Task Team (NCCTT) responsible for producing the National Climate Change Response Strategy. Third, the National Climate Change Steering Committee (NCCSC) that is intended to guide the production of the National Climate Change Response Strategy (NCCRS). The existing climate governance structure as presented by Dodman and Mitlin (2015) is far-fetched because it does not involve local

communities on their indigenous ways of climate change adaptation and resilience vis-à-vis climate governance.

Climate change is a phenomenon that is widely considered to have dire effects on developing countries. Countries in Sub-Saharan Africa are reported to be taking a lead in the climate change vulnerability discourse because the region has high exposure and low adaptive capacity to climate change risks (Niang et al., 2014). A temperature increase of 0.7 °C had been reached in most parts of the African continent during the 20th century. However, it is imperative to note that despite the fact that warming seems to be uniform on the continent; the impact and effect thereof are not the same (Intergovernmental Panel on Climate change¹ [IPCC], 2013). As a result, Yanda (2011) stress the importance of research on the phenomenon in order to establish the underlying factors around the climate change. This provides an explanation for undertaking more research activities on climate change throughout the continent and the research outcomes are considered important because they inform policies focusing on addressing climate change-related challenges (Yanda, 2011).

Furthermore, climate change has become a matter of international importance because it has brought together developing and developed countries as well as international organisations to assign one another different responsibilities for addressing climate change issues under the United Nations Framework Convention on Climate Change (UNFCCC) (United Nations [UN], 1992). The UNFCCC² has therefore mandated developed countries to take care of the costs of adaptation measures for the developing countries. However, the task at hand for developed countries was difficult to fulfil due to lack of monitoring and different circumstances surrounding climate change adaptation in the developing world (Warrick, 2011). This points to the fact that in many rural communities in Africa the adoption of IKS on climate change adaptation is considered to be the best option that yields positive results. As such, the role of the developed world as assigned by the UNFCCC will be inconsequential.

¹ The Intergovernmental Panel on Climate Change is an intergovernmental body of the United Nations, dedicated to providing the world with an objective, scientific view of climate change, its natural, political and economic impacts and risks, and possible response options.

² The United Nations Framework Convention on Climate Change is an international treaty adopted on 9 May 1992 and opened for signature at the Earth Summit in Rio de Janeiro from 3 to 14 June 1992.

Chanza and De Wit (2015) emphasised the need to adopt IKS in climate governance. Their argument was consistent with the fact that the current tempo of climate change strategies places the concept of sustainability in question. Moreover, there is a growing realisation that the effectiveness of climate change adaptation and resilience hinges on climate governance and the outcome thereof informs sustainability. The application of the climate governance concept by technocrats to communities exposed to growing climate change risk is poorly executed and this is regardless of the extensive coverage by scholars (Chanza & De Wit, 2015). Therefore, given the lack of a comprehensive approach by technocrats and policymakers Chanza and De Wit (2015) propose the adaptation of IKS, which they argue, could be deployed in the practice of climate governance. Orlove et al. (2010) define IKS as an approach that is place-based and rooted in local cultures that are associated with long-settled communities with strong ties to their natural environments. It is important, however, to note that the concept is now acknowledged by the IPCC as evidenced by distinct sections covering IKS in one of their reports (Parry et al. 2007). Moreover, the use of IKS has been considered useful and impactful because it inculcates a better understanding of climate change impacts (King et al., 2008).

1.2 Environmental humanities

The field of Environmental humanities, which is about four decades old, has come a long way from a fledgling subfield to an interdisciplinary field of study (Yearley, 1992). Environmental sociologists play an important role in producing research findings that inform governmental bodies and policymakers around the world (Borden 2008, Dunlap & York 2008). Accordingly, the inquiry into IKS based climate governance takes a considerably important role in contemporary environmental humanities because it informs governments and policymakers on the African continent as well as the UNFCCC on its commitment to oversee climate change issues around the world. Equally, McCright & Dunlap (2008) emphasises on the importance of the interdisciplinary nature of environmental humanities and the relevance of understanding sociological aspects that are manifest in climate governance-IKS nexus. This brings about the need to understand climate governance from a sociological perspective.

1.2.1 Environmental Sociology and climate change

This study is situated within the context of environmental sociology and it is influenced by the insights of early preservationists and conservationists such as Aldo Leopold, John Muir, Robert Marshall, George Perkins Marsh, and Rachel Carson. Dunlap & Van Liere provided one of

the earliest inquiries into the study of environmental sociology (McCright & Dunlap, 2008). The argument by the scholars was that in order to establish a healthy balance between human economic activities and the needs of ecosystems, human social systems are supposed to reduce their demands and impacts on nonhuman nature. Moreover, Freudenburg (2009) asserts that environmental sociology was born out of a broad cultural and political context, which was a response to the perceived human exceptionalism within the classical sociological tradition. This was established from the scholarship of Max Weber, Karl Marx and Emile Durkheim, and many other classical sociologists (Buttel, 2002). This corresponds with Rosa and Richter (2008) who argued that foundational writings about climate change and sociology by Durkheim, Marx, Weber were interdisciplinary and accustomed to human and nonhuman interactions.

Moreover, the field of environmental sociology has over the years matured and developed to accommodate the link between humans in society and the natural environment. That refers to the manner in which human activities contribute to environmental hazards and how humans conspire to find ways to deal with the disasters that come out of the natural environment in their societies vis-à-vis climate governance. Furthermore, Freudenburg (2009) acknowledges the interdisciplinary nature of Environmental sociologists because it collaborates with numerous other fields such as climate science, political science, history, anthropology and biology among many others to produce competitively robust and defensible accounts of socioecological reality (Boyce, 2008). That is of paramount importance for this thesis because the knowledge of climate governance through IKS is not complete without a clear understanding and inclusion of history and policy notions as indicated within anthropological and political science disciplines respectively.

1.2.2 Social constructionism and climate change

Giddens (2009: 160) asserts "...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." The overall reason for this sociological enquiry into climate governance through IKS for sustainable development is that climate change is considered one of the environmental problems that are considered more important than others are. To put this into perspective, social constructionists according to Giddens (2009) reveal that all environmental problems are often

socially constructed by groups of people. Consequently, climate change is socially constructed and adaptation to its impacts requires communities to bring about ways to deal with the stress and shocks that are caused by the negative impacts of the phenomenon. Thereupon, the concept of IKS is treated as a notion of social change where individuals employ solutions from their cultural contexts to deal with their day-to-day challenges. Likewise, the concept of climate change in this thesis brings sustainable development to question because the impacts of climate change affect the developmental opportunities in communities such that food security and poverty eradication will be at risk. That is essential taking into consideration the fact that sustainable development refers to the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations (Mensah & Casadeval, 2019).

Further, it is important to understand how rural communities perceive the phenomenon of climate change and how they adapt to the impacts thereof. This is because their perceptions speak to the notion of social construction within the field of environmental sociology. Bhusal (2009) assert that local people in Kaski District in the Mid-Mountain Region of Nepal share experiences of climate change, ecosystem process and biological systems. It has been established that rural communities' explanations of climate change are based on variations in temperature and rainfall patterns (Jianchu et al., 2007). That suggests rural communities are aware that devastating changes happening in their living conditions such as poverty, water and air contamination, risks of disease, floods and depletion of biodiversity are a result of climate change and variability. IPCC (2007) asserts that the rapid increase in temperature has become a major concern among smallholder farmers in the developing world. The livelihood patterns of rural communities have been significantly impacted by the shifts in temperature and weather in general. Ideally, this kind of knowledge about the climate change phenomenon is significant in planning adaptation measures vis-à-vis climate governance in order to address the effects of increased temperature and scarce rainfall to insure sustainable livelihoods (Food and Agriculture Organisation³ [FAO], 2007).

Now that it has been established that climate governance is important in the developing world in order to deal with the effects of climate change, consequently, there is dire need to explore

³ The Food and Agriculture organization is a specialized agency of the United Nations that leads international efforts to defeat hunger.

IKS options of which a few scholars have paid attention to. A study by Nkomwaa et al. (2014) on IKS and climate change adaptation strategies in agriculture in Malawi revealed that farmers have always utilised a variety of traditional indicators in order to enhance their farming practices. The indicators are informed by traditional beliefs that are related to their perceived behaviour of the environment as well as animal and tree species. This shows that the IKS in climate change connects communities with their physical environment for a better understanding of the dynamics and crafting of informed response strategies. The connection thereof is informed by human action on different levels, which include behaviour that harms the environment such as deforestation and behaviour towards protection of the environment such as the various adaptation and resilience measures employed by communities. Therefore, the indication by Nkomwaa et al. (2014) is a classic example of how climate change, governance and the use of IKS fit into the broad Environmental sociology discourse.

1.3 Problem Statement and significance of the thesis

Climate change has been established to be a global phenomenon that has severe effects on the livelihoods of communities and it is expected to affect all regions and countries in some way (IPCC, 2007). Rural communities in sub-Saharan Africa are faced with a plethora of socio-political, cultural and economic challenges that result from the phenomenon of climate change (Nkoana et al., 2018). Climate change is expected to pose serious effects on the livelihoods of communities and some of the anticipated impacts include increased incidence of drought and floods which result from erratic rainfall patterns and that consequently have severe impacts on small scale farming (IPCC 2007; 2013; Mugambiwa & Tirivangasi, 2017). Many communities in the developing world significantly rely on the natural environment such as natural rain for their crops, wild fruits and vegetables for their meals and wild vegetation and water for their domestic animals. Therefore, small-scale farmers are usually left with limited ability to cope up with escalating destructive disasters and this coincidentally affects rural livelihoods and food security. With the use of IKS, local communities play an important role in shaping adaptive capacity targeting the most vulnerable small-scale farmers.

Indigenous knowledge refers to a set of ideas and wisdom accumulated over generations and guides human societies in their interaction with the surrounding environment (Manyani et al. 2017). Further, Berkes (2009) defines such knowledge as a collective body of knowledge pertaining to the relationship between human beings and their environment as well as practices

and beliefs that are handed down through generations by cultural transmission. Jiri (2015) purports that valuable local knowledge relating to climate change assessment and adaptation is held by rural societies. Supposedly, these knowledge systems are transmitted and observed by each succeeding generation and in the process, they ensure the wellbeing of communities by providing food security, environmental conservation as well as valuable skills for disaster risk management. Mafongoya and Ajayi (2017) consider IKS as social capital for the poor, which is relied upon for food production and to ensure survival. IKS is considered the basis for local-level decision-making rural communities. Further, the value of IKS is not only found within the culture in which it evolves, but also for scientists and planners aiming to improve conditions in rural localities (Mafongoya & Ajayi, 2017). Equally, important, Manyanhaire and Chitura (2015) opined that local communities in Africa have developed intricate systems of gathering, predicting, interpreting and decision-making in relation to weather. Hence, the systems, which are consistent with the communities' culture, make it easy to adapt to the effects of climate change, which supports the importance of IKS climate governance.

Furthermore, climate change has the potential to degrade and alter the chemistry and composition of the earth, which in turn affect cultures, economies, and social systems (IPCC, 2007). These potential effects raise questions about how vulnerable human populations will be affected. Thus, the socio-cultural effects of climate change can best be described through a sociological explanation. Tol et al. (1998) assert that vulnerability to climate hazards measures people's ability to cope with, recover from, or adapt to those hazards. Vulnerability to climate hazards can be put into three main functions, which factor as exposure, sensitivity, and adaptive capacity. In the rural communities, climate change affects human society through impact to basic needs such as water, energy, housing, transportation, food, natural ecosystems and health (Rankoana, 2016). Consequently, one of the presumed effective strategies is good climate governance.

Climate governance refers to mechanisms and measures that are developed and used to steer social systems in order to prevent, mitigate and/or adapt to climate change risks (Jagers & Striiple, 2003). The concept of Governance generally is defined as processes that determine the manner in which power is exercised, how decisions are made and the manner in which citizens or other stakeholders are involved in the decision-making process (Mugambiwa et al., 2015). Thereupon, this thesis holds that the interactions of local communities and responsible authorities on climate change issues constitute climate governance. That being the case, there

are minimal literature sources known to the researcher that have explored climate governance through the use of IKS in the context of Zimbabwe. Those who have explored the phenomenon have focused largely on indigenous adaptation to climate change (Manyani et al. 2017; Mafongoya & Ajayi, 2017; Mugambiwa, 2018). Notwithstanding, Chanza & De Wit, (2016) propose that there is need for climate governance to be administered within the confines of IKS. Their argument was that the existing tempo of climate change strategies places the notion of sustainability in question thus, IKS would be the best possible option to address the dearth of sustainability resulting from climate change impacts. Additionally, Chanza & DeWit (2016) propose the need for empirical research on climate governance through the use of IKS since little has been done in the field and the authors emphasise on IK as the best alternative to inform climate change adaptation in rural communities. In this philosophy, climate change adaptation strategies should be appropriate to the sectors and communities that are targeted. This is because there is a growing realisation that the effectiveness of these strategies hinges on climate governance, which also informs their sustainability. Petheram et al. (2012) assert that despite growing international attention to the development of strategies and policy for climate change adaptation, there has been a little allowance for input from Indigenous people⁴.

Furthermore, Zimbabwe's National climate change policy is limited on the use of IKS on climate change matters. The 2016 Zimbabwe National Climate Change Policy states that Zimbabwe recognises the utility of IKS in complementing mainstream climate knowledge and practice (Zimbabwe climate policy, 2016). In this respect, the government is said to be proposing the strengthening of documentation of IKS in order to complement scientific knowledge for climate change forecasting and early warning systems through research institutions. However, the principal underpinnings of the national climate policy are not explicit on the role of IKS in climate governance. Hence, the gap portrayed by the policy document as well as the scientific community brings about the need for this thesis to investigate climate governance through the use of IKS and to develop a conceptual model on IKS climate governance.

⁴ Indigenous people are ethnic groups who are the original owners and caretakers of a given region, in contrast to groups that have settled, occupied or colonized the area more recently.

1.4 Purpose of the study

1.4.1 Main objective

The main objective of this thesis was to explore climate governance through the use of IKS for sustainable development in Mutoko district of Mashonaland East province Zimbabwe.

1.4.2 Research objectives

The objectives of this thesis were as follows:

- To ascertain perceived climate change impacts on the livelihoods of the communities in the district.
- To investigate indigenous climate change adaptation strategies employed by the communities in the district.
- To examine traditional and spiritual leaders' role in climate governance
- Based on the outcomes of the above, develop a theoretical model that explains climate governance from an IKS perspective.

1.4.3 Research questions

The following research questions were proposed for this thesis:

- What are the perceived climate change impacts on the livelihoods of communities in the district?
- What are the indigenous climate change adaptation strategies employed by communities in the district?
- What are the traditional leaders' roles in climate governance?

1.5 Thesis Roadmap

Chapter One presents the introduction of the study. The focus of the chapter was to give the background of the field of climate change in general, IKS and climate governance. Therefore, the chapter established that climate governance has become a topical issue among scholars and the focus of this thesis is not on the scientific causes and nature of the phenomenon but rather on its social and political aspects. The chapter also links climate change with communities' livelihoods in an effort to determine how the impacts of climate change affect the communities vis-à-vis sustainable development. The link among climate change, climate governance and IKS was established and the chapter tackled the concept of environmental humanities under which the field of environmental sociology lies. After placing the study within the field of environmental sociology, the chapter established the problem statement. The problem

statement in that regard was born out of the premise that the current climate governance structure for Zimbabwe is next to mum on climate governance through IKS yet scholars across the board have established the high necessity for IKS to be championed in rural communities as an essential climate change adaptation strategy. Further, the main objective of the thesis was established and it aimed to assess climate governance through the use of IKS and four objectives and three research questions were established.

Chapter Two presents an overview of existing literature on the fundamental aspects of the thesis that are namely climate change, climate governance, adaptation, resilience, sustainable development and IKS. The literature reviewed demonstrate that numerous scholars have contributed to the field of climate change, which gave the researcher room to explore in-depth the concepts surrounding the problem statement of the thesis and the main objective thereof. The chapter took off by establishing the general understanding of climate change in communities and institutions around the world, which is important because any inquiry into socio-political aspects of the phenomenon is born out of the general understanding of the concept. At that juncture having established what climate change is and how it is affecting communities around the world, the chapter went on to discuss the socio-economic effects of the phenomenon of climate change. Numerous adaptation strategies were identified and they were considered significant because for one to be in a position to inquire into matters pertaining to climate governance the concept of climate change adaptation is fundamental. The use of IKS and how it is relevant in climate change adaptation and other climate-related aspects was documented with reference to a plethora of scholars in the field.

Chapter Three presents the theoretical framework of the study, which is a triangulation of Grounded theory, Sustainable Livelihoods Approach and Afrocentricity. The chapter employed Grounded theory mainly because the concept of IKS climate governance is new and situating it within existing theoretical paradigms was thought to be problematic and theoretically limiting. Hence, the chapter goes on to present how the researcher saw it fit to use the closely related theoretical perspectives namely sustainable livelihoods approach and Afrocentricity as supporting theoretical paradigms for the conceptual model that was established through Grounded theory. The chapter went on to weigh how the combination of the theories is of paramount importance for this thesis. The major reason established was that grounded theory entertains theoretical saturation that evolves from data collection, which was important because one of the major contributions of the thesis was to establish a conceptual

model for IKS climate governance. Consequently, the chapter went on to establish how the model borrowed some facets from the existing theoretical perspectives in order to gain prominence in academic circles.

Chapter Four presents the research methodology of the thesis, which is qualitative in nature and grounded in the Afrocentric ontological standpoint. The chapter began by describing the study area where a narrative of the state of Mutoko district was laid out. The chapter then went on to present the methods and materials of the study where fundamental methodological aspects are unpacked. These include population and sampling, data collection and data analysis. Lastly, the chapter presents ethical considerations and the limitations of the study.

Chapter Five is the first empirical chapter of the study. The chapter's main aim was to interrogate climate change and variability discourse among community members and smallholder farmers. The chapter goes on to establish how the knowledge of climate change and variability discourse play a pivotal role in paving way for good climate governance. Further, the chapter establishes some of the fundamental aspects related to climate change and variability discourse and these are namely challenges faced by the community due to climate change, indicators of climate change, cultural activities hindered by climate change and methods used to ensure better harvests (adaptation strategies). These aspects were considered instrumental in determining communities' perceptions of climate change. This was so considering the fact that knowledge of climate change was considered fundamental in crafting adaptive capacity and developing the conceptual model for climate governance.

Chapter Six is the second empirical chapter of the thesis and it focuses on indigenous climate change adaptation and governance, which appeared to be a broad and diverse concept. The chapter begins by establishing how IKS is often mistaken with ancient ways of doing things and it quickly corrects the paradox. The chapter then goes on to present the manner in which knowledge passed from one generation to another is helping smallholder farmers to adapt to climate change. The chapter established various IKS based adaptation methods, which include irrigation methods from river waterholes, growing variety of crop types and regular crop change. The chapter also presented the role of spirit mediums and the role of traditional leaders in climate change adaptation, which was later important in the developing of the conceptual model on IKS climate governance. The other purpose of the chapter was to establish the state of climate governance in the area. The chapter goes on to unravel the IKS that is hidden within

the use of scientific methods in climate change adaptation and governance largely because the adaptation methods practised have been passed from generation to generation and some of them are transformed into scientific methods which is important for sustainable development.

Chapter Seven serves as the third and final empirical chapter of this thesis. The chapter's main purpose was to formulate an IKS based climate governance conceptual model and this was done to provoke a paradigm shift from Western to Afrocentric ontology and epistemology. The chapter begins by giving a background to the African epistemology and ontology. After presenting the two concepts, the chapter goes on to develop an IKS climate governance conceptual model. In the light of the African epistemology and ontology, the climate governance model presented in this chapter is a unique overview of the Indigenous climate governance that exists in African communities in Mutoko district. In the chapter, the researcher clarifies that the developed model is born out of the premise that African epistemology is rooted in African ontology. This implies that the epistemological view of the traditional African is consonant with his metaphysics. As such, the knowledge of climate governance and adaptation practices employed by Africans cannot be separated from the African way of life. Consequently, epistemology deals with the claims that are made concerning the facts of people's experience, thus, the facts are interpreted within certain concepts, theories and worldviews.

Chapter Eight concludes the thesis and provides recommendations. The chapter begins by providing a summary of the major findings of the thesis and then goes on to establish the key findings that were established from the study. The conclusions and key findings were essential for the purpose of theoretical and conceptual contribution to the body of knowledge and the chapter served to identify areas for future research.

1.6 Conclusion

This chapter provided the introduction and orientation of the study. This was established by laying down a detailed summary of the general background and what informed the study. The concept of climate governance was unpacked and the quest to explore it within the lances of IKS was established. That formed part of the significance of the study though the overall anticipated significance was its unique contribution to scholarship.

CHAPTER TWO: NEXUS OF CLIMATE CHANGE, GOVERNANCE AND IKS IN PURSUIT OF SUSTAINABLE DEVELOPMENT

2.0 Introduction

This chapter presents an overview of existing literature on climate change, governance, adaptation, mitigation and resilience as well as IKS. Numerous scholars have contributed to the field of climate change and their contributions were of paramount importance in the formulation of the chapter. To start with, in this chapter the researcher presented the general understanding of climate change in communities and institutions around the world. The chapter goes on to discuss the socio-economic effects of the phenomenon of climate change. Numerous adaptation strategies are presented in this chapter and these refer to activities such as crop change, irrigation and natural mulching among many others. This significantly informs the chapter because climate change adaptation enormously guides climate governance. The use of IKS and the manner in which it is relevant in climate change adaptation will also be documented with reference to a plethora of scholars in the field. Having understood the various aspects around the concept of climate change, the chapter will also focus on the concept of governance, which is of paramount importance for the study.

2.1 The phenomenon of climate change

The concept of climate change refers to the long-term variations in the earth's climate, which has been found to be caused by the release of greenhouse gases that trap heat in the atmosphere resulting in the planet becoming hotter (Eriksen et al., 2008). The process is also referred to as global warming or global climate change in some sections. The greenhouse gases are a product of human activities that make use of fossil fuels that are namely coal, oil and natural gas among others (McDevitt, 2009). The other largest contributor to the phenomenon is considered commercial agriculture and deforestation, which are considered potential causes of the phenomenon of global climate change. The anticipation by climate experts and scientists is that the average atmospheric and ocean temperatures around globally will rise as a result of climate change and it will necessitate the widespread melting of snow and ice at the poles (UnmuBig & Cramer, 2008). As a result of the melting of snow and ice at the poles, sea levels will rise because there will be extra water and accordingly weather patterns will change across the planet. Consequently, there will be an emergence of extreme events, which include storms and floods. These events will have huge impacts on the livelihoods of people around the world and

the effects will be more severe in the developing world largely because of their location, economic status and the burdens they are already experiencing which include hunger, poverty and disease. The consequence of climate change is also expected to cause severe changes in Zimbabwe and this will be through the rise of average temperatures to about 3°C before the end of this century (McDevitt, 2009). Also, the effects will be witnessed in the annual rainfall which is expected to decline by between 5% and 18% and rainfall will become more variable. This will then be a cause for the increase in droughts, floods and storms and consequently the effects thereof will be on the country's food security, health, energy supply and the economy (Frost, 2001; UnmBig & Cramer, 2008; Gwimbi, 2009). Given the explanation of the climate change phenomenon by various scholars it is important to pose the question, is climate change a future phenomenon or it is currently hitting the world in a way that it should be considered to be the explanation for the shifts in weather conditions that are currently witnessed globally. Accordingly, this chapter makes efforts to assess available literature in order to address the paradox as well as the various issues around the phenomenon such as the effects, knowledge, IKS and climate governance among many other related issues.

In Zimbabwe, rainfall patterns are immensely variable in terms of distribution across time and space (Bhatasara, 2016). However, dry spells and droughts have always been part of the normal cycle (Manyeruke et al. 2013). This is so considering the various droughts resulting from dry spells that the country has previously witnessed. Such instances are predicted to perpetuate and result in the rise in hardship and poverty in Zimbabwe. Brazier (2015) opined that the incidence of climate change would have severe effects on the vulnerable members of the population that constitute women, children and the disabled, as well as those living in rural areas, are expected to be affected even more. Consequently, the country will be put to test on resilience and development of effective adaptation strategies. Gutsa (2017) argues that over the past centuries the earth's climate has witnessed significant changes as a result of anthropogenic release of greenhouse gases. To that effect, Gutsa (2017) adds that global warming will continue into the future due to increased greenhouse gas emissions among other factors. In that regard, Gutsa (2017) concur with Manyeruke et al. (2013) that already the earth's temperature is on the increase resulting from greenhouse gas emissions and the consequences include varying precipitation, extreme weather events and shifting of seasons. That, therefore, resolves the paradox on whether climate change is simply an anticipated futuristic phenomenon or an ongoing occurrence.

Now that the paradox is resolved, the concern for social scientists is on the effects of the phenomenon. In essence, the role of social scientists on climate change is to assess and document how the incidence of climate change threatens food security and other development options due to the rapid pace at which climate change is taking place among other social factors related to the phenomenon. Other factors for concern among social scientists will be the increase in global population and slow income growth, which puts sustainability to question (Manyeruke et al., 2013). The effects of climate change are also witnessed in agriculture due to the fact that a drastic decline in food production has been reported (Manyeruke et al., 2013). Further, it should also be noted that the currently experienced high temperatures around the globe would consequently reduce yields of desirable crops and encourage weed and pest proliferation. Consequently, one can argue that climate change is one of the complex challenges facing the globe today. As a result, its impacts significantly adds to the development challenges of ensuring improve livelihoods, food security and poverty reduction in the developing world.

IPCC (2007) concurs that climate change threatens food security and adds that climate change is one of the most daunting challenges that face humanity in the 21st century. Consequently, climate change effects are significantly witnessed on the environment, economy, health as well as safety of people and communities around the world (Global Humanitarian Forum [GHF], 2009). Most parts of the world have agro-based economies, which put them at higher risk of climate change because the production of crops is impacted by the shifts in weather conditions. This is largely witnessed through the physical changes that are brought about by climate variability and socio-economic vulnerability that is a result of the attempt by people to adapt to the impacts and consequence of climate change among many other factors. GHF (2009) provides the statistics of people and communities affected by climate change in the world by the year 2009 which amounts to over 2.8 billion people who were considered to be physically vulnerable to climate change and over four billion people were considered to be vulnerable to climate change and variability in socio-economic terms. The statistics also revealed that the developing world is the most affected and yet they are the least contributors the phenomenon of climate change (GHF, 2009)

2.1.1 Global cooperation and climate change

Global cooperation is of paramount importance if there is to be sustainable solutions to the effects of climate change (Grundmann, 2007). This global cooperation takes the form of the involvement of the international community in bringing together local communities and all interested stakeholders to work on these pressing issues (Weingart et al., 2000). It is recommended that to achieve international cooperation, there is need to get the communities and all people concerned to understand the facts about climate change. The reason for this is that lack of detailed understanding of facts about the phenomenon leads to difficulties to find workable and sustainable solutions to the effects of climate change. This is supported by scholars who subscribe to that view and their contention is that many communities fail to engage and cope with climate change due to the fact that they lack basic knowledge of its causes, impacts and adaptation methods (Lorenzoni et al., 2007).

The possession of climate change knowledge is of paramount importance for the generality of community members because climate change is real, advancing rapidly and becoming widespread such that it is a threat that humanity is faced with (Mugambiwa & Tirivangasi, 2017). Further, Erikson and Hewitt (2007) are of the opinion that the aforementioned effects of climate change are a real threat to the livelihoods of communities, which implies that they should be taken seriously. Due to these severe effects, that climate change has consistently posed on local communities there has been a rise in the search for workable and sustainable solutions within the vicinity of cultures in order to diminish the negative effects of the phenomenon within communities (Brohan, et al., 2006; Caesar, et al., 2006). The use of IKS to adjust to climate threats which will be discussed in detail later in this chapter is becoming one of the most effective and affordable remedies to the negative effects of climate change in the developing world (IPCC, 2007; Food and Agriculture Organisation [FAO], 2007; Jianchu et al., 2007). Further, it can be argued that the use of IKS in climate change is of paramount importance because existing research has not widely explored explanations of climate change in terms of local communities' context-specific worldviews as well as the indigenous adaptation strategies.

2.1.2 Scientific explanation of climate change

The role of social scientists is to present socio-economic effects of climate change that is how the phenomenon of climate change is adversely affecting the general livelihood of communities. However, the inquiry into the socio-economic effects of the phenomenon is essentially guided by the understanding of the scientific explanation, which gives a clue on what certainly climate change is. Bhusal (2009) asserts that scientists around the world have presented evidence and tested various models to substantiate their observations of changing climatic conditions. Further, IPCC (2007: 35) suggests that “there is strong 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”. Due to the scientific events resulting in global climate change, many changes are anticipated in many communities around the world. The challenges associated with this rapid shift include an increase in flooding in coastal areas, declines in agricultural production, a threat to biodiversity and the productivity of natural resources. Further, it is anticipated that an increase in the range of vector-borne and waterborne diseases, will be constantly experienced (Seo & Mendelsohn 2008). In addition, one of the major scientific consequence of climate change will be a change or shift in rainfall patterns that will see huge impacts in agriculture, food security, economic growth and many other socio-economic challenges. Apparently, availability of water is also at stake due to climate change and this is a challenge witnessed in many regions around the world.

IPCC (2007) notes that extreme weather events related to floods, drought and tropical storms are expected to increase in frequency and intensity in most parts of Africa. Madzwamuse (2010) acknowledges the fact that Africa is one of the most vulnerable regions in the world due to the incidence of poverty, limited coping capacity and highly variable climate on the continent. The reason why the African livelihood is at risk the most is because of the fact that communities on the continent, especially in the rural communities, are largely reliant on the natural environment for their survival. IPCC (2013) also acknowledges that the livelihoods of African people are often directly linked to climatic conditions. It is also expected that the same communities from the African continent are expected to be exposed to huge water stress due to climate change-induced shifts in the availability of water and this will be precipitated by increased water demand. In addition, the Department of Environmental Affairs and Tourism [DEAT], (2004) asserts that yield from rain-fed agriculture could be reduced in certain areas and that will have severe effects on food security and eventually exacerbate malnutrition. These arguments lead to the assertion that climate change and variability are a huge threat to human

and social development because they alter customary means of livelihood and restricts the fulfilment of human potential (Verner, 2010).

2.1.3 Climate change in rural communities

Scholars have established that rural communities suffer the most from the negative effects of climate change. However, this is despite the fact that they contribute less to the causes of the phenomena. It has also been established that despite the fact that rural communities are not at the same pace with people in urban areas on to access to information and new technologies, they still possess considerable knowledge about climate change. To put this into perspective, Ziervogel et al. (2014) acknowledge that rural communities are well informed about climate change. It was also fundamental to note that their knowledge goes beyond just knowing but they also understand the hazards, anticipated effects and the actual effects of climate change. The most important part on the finding by Ziervogel (2014) was that the knowledge rural communities possess is not knowledge acquired through reading material or media but rather it is knowledge from their observation of natural weather events.

Similarly, Bhusal (2009) revealed that the process of observation is taken further to a stage whereby rural communities engage one another in order to share their experiences of climatic conditions, ecosystem function and biological systems. It is also important to know that the communities in rural areas and the developing world, in general, may not know climate change in scientific terms but their knowledge is informed by the knowledge related to observations on increasing warm days, unpredictable rainfall patterns and their adverse effects on people (IPCC, 2013). Now that it has been established that communities possess knowledge about climate change and they also understand the possible effects of the phenomenon, it is also important to establish their knowledge of adaptation measures. Accordingly, Nhemachena et al. (2014) established that rural communities are making strides in establishing methods that are culture-specific in order to adapt to the effects of climate change. These measures constitute what is referred to in this thesis as IKS.

2.2 Climate change perceptions

An inquiry into perceptions of climate change is significant in this study because it gives a background on the level of knowledge people have about climate change in general. That is important because it gives background information and a springboard from which to leap

forward on the overall inquiry. Pugliese & Ray (2009) are of the opinion that a majority of the world's adult population have knowledge about climate change in general. It has also been established that a majority of educated people do not possess knowledge about the causes and effects of climate change. This is supported by Brechin (2003) and Reynolds et al. (2010) whose findings are substantiated by Mugambiwa and Dzomonda (2018) who acknowledge that educated people do not possess considerable knowledge about the effects and causes of climate change. However, Mugambiwa and Dzomonda (2018) go on to suggest that it would be ideal for institutions of higher education to provide modules on climate change across all the faculties in order to provide a platform for the educated to have information about climate change. The authors further argued that if the educated have knowledge it will also be easy to develop robust adaptation strategies.

Furthermore, the blame on the continued increase in carbon dioxide emissions into the atmosphere can be blamed on the lack of knowledge about the causes of climate change (International Energy Agency⁵ [IEA], 2011). Thus, it can be established that the most important aspect in all social research around climate change is an inquiry into knowledge of the causes. The argument posed here is if people, in general, possess considerable knowledge on the causes of climate change, it will help in enhancing behaviour change on practices that exposes the environment to the effects of the phenomenon. IEA (2011) established that in the year 2011 the amount of CO₂ emitted per person was 19.10 tonnes whereas India had 1.18 tonnes per person. However, Sandvik (2008) indicated that it is consequential that the countries that contribute more to the general causes of climate change are less concerned about the phenomenon i.e. knowing about its effects causes and any other important aspects about it.

2.2.1 Climate variability and change in Zimbabwe

Understanding climate change and variability is of paramount importance for this study considering the fact that the study area is within the country. Levina (2006) asserts that Zimbabwe is a sub-tropical country that has one rainy season that spans from November to March. The country is situated in a semi-arid region that has limited rainfall patterns and temperature variations (Brown et al., 2012). The average amount of rainfall received in Zimbabwe by the year 2005 was 657 mm per annum (Levina, 2006). This puts the country at

⁵ The international Energy Agency is an autonomous organization which works to ensure reliable, affordable and clean energy for its member countries and beyond.

a higher risk of climate change such that the country is susceptible to droughts and other negative effects of climate change. Additionally, Chagutah (2010) indicates that in Zimbabwe one to three droughts on average occur in every ten years. In relation to Chagutah's (2010) assertion, Mugabe et al. (2012) established that Zimbabwe also has unfavourable rainfall conditions that result in crop failures and this occurs in three out of every five years. Also, Mutekwa (2009) established that for some time the Southern Africa region which is home to Zimbabwe has been experiencing frequent droughts. Further, Sango (2014) found that climate change has direct impacts on the biophysical environment in Makonde Communal Lands of Zimbabwe. It is also purported that the conditions and state of the biophysical environment has an impact on the productivity and availability of ecosystem services.

Furthermore, Muchie and Mudombi (2011) are of the view that climate change is responsible for the creation of variations that are witnessed in the quantity of rainfall received. This can better be explained by the fact that some regions experience more rainfall which usually results in floods whereas in others very little rains are received and the regions are mostly associated with erratic rainfall patterns which often result in droughts. Consequently, it can be established that some of the major effects of climate change are both drought and floods resulting from either more or less rainfall and in either instances the major cause is climate change. A perfect example of this is the finding by The IPCC (2013) that there are instances where East Africa could receive more rain whereas Southern Africa would be dry. Further, United Nations Environment Programme⁶ [UNEP] (2003) projected that there would be continuation of desertification that would have severe effects on many regions. Subsequently, El Nino Southern Oscillation⁷ [ENSO] is considered to be one of the most significant controlling factors inasmuch as inter-annual rainfall variability is concerned in most African regions.

Climate change is a serious cause for concern in Zimbabwe because the country is experiencing more hot and fewer cold days than before. In addition to that, it has been established by the scientific community that the country's annual mean surface temperature has warmed by 0.4oC from 1900 to 2000 (Unganai, 1997). Further, it has been established by the scientific community that the period between 1980 and 2000 in Zimbabwe was the warmest and the driest

⁶ The United Nations Environmental Programme is a programme of the United Nations that coordinates the organization's environmental activities and assists developing countries in implementing environmentally sound policies and practices.

⁷ El Nino-southern Oscillation is an irregularly periodic variation in winds and sea surface temperatures over the tropical eastern Pacific Ocean, affecting the climate of much of the tropics and subtropics.

(Mutekwa, 2009). It has also been found that the timing and amount of rainfall received continue to be increasingly uncertain. From the year 1980, a trend has been established that is associated with the reduction in rainfall or the increase in the average amount of rainfall and both instances would result in drought. In support of this, Mutekwa (2009) found that Zimbabwe has often been experiencing frequent droughts as a result of high rainfall or in some cases very low rainfall and in either instances the production of crops would be severely affected such that there would be low harvests by the farmers. Further, Unganai (1997) also examined the temperature trends in Zimbabwe between the years 1933 to 1993, where rural areas demonstrated a rise in maximum temperatures while minimum temperatures drastically decreased.

2.2.2 Climate change awareness and the role of government in Zimbabwe

Muchie and Mudombi (2011) opined that Zimbabwe has various government ministries and the one responsible for climate change is the Ministry of Environment and Natural Resources Management. Given that the country has a ministry that is responsible for climate change and other environmental issues, it means the government has the mandate to establish awareness campaigns around communities especially in rural communities. These can be conducted through agricultural extension officers or NGOs can be contracted to engage communities and provide them with the readily needed information on climate change knowledge and adaptation options. An initiative of that nature relates to the efforts made by the government of Zimbabwe when it produced a policy document, which was a blueprint for the conservation of the environment, and it was titled 'National Conservation Strategy' (Ministry of Mines, Environment and Tourism, 1998). The policy document gave birth to a plethora of environmental programmes that were executed in Zimbabwe. Another important milestone that was achieved after the policy document was the signing and ratification of the UNFCCC by Zimbabwe in Rio de Janeiro. Given that the country has already set the pace in establishing climate change awareness programs, it is important for the government through the ministry of environment and ministry of higher and tertiary education to develop and implement educational and public awareness programmes on climate change and its impact. The awareness workshops could be largely targeted at the industry, grassroots community, schools, universities, professional groups and policymakers. This will be an important step towards ensuring that the government is concerned about educating communities on the impacts of climate change (Mugambiwa & Dzomonda, 2018).

2.2.3 Climate change and the vulnerability discourse

This thesis emphasises the significance of understanding the negative effects of climate change in an effort to navigate the methods of governance. As such, it has been found that climate change has the potential to degrade and alter the chemistry and composition of the earth, which consequently affects cultures, economies and social systems (IPCC, 2007). In essence, human populations are increasingly vulnerable and the emergence of climate change seems to continue posing serious threats on the livelihoods of the communities. Tol et al. (1998) acknowledge that vulnerability to climate hazards is responsible for measuring people's knowledge of susceptibility to climate hazards and its ability to cope with, recover from, or adapt to those hazards. As such, people's ability to cope, adapt and recover from the shocks of climate hazards constitute the most important facets of climate governance. This implies that climate change vulnerability may be characterized by rapid onset as well as identifiable consequences such as storms, floods, or droughts, which results from a longer-term change in climatic variables such as precipitation or temperature (Alexander et al., 2006). Climate change vulnerability can be situated within three main functions, which are namely: exposure, sensitivity and adaptive capacity. It is imperative to note that in rural areas, climate change threatens the livelihoods of human society through its impact to basic needs such as water, energy, housing, transportation, food, natural ecosystems and health (Rankoana, 2016). Changes in temperature and seasonality are considered to have direct, immediate effects on flora and fauna as well as on human activities and health.

2.3 Climate change impacts

Climate change impacts are remarkable around the world and they are widely noticed in the developing world (IPCC, 2013). Nhamo (2009) is of the opinion that until the beginning of the 21st century, climate change was solely regarded as an environmental issue. Nonetheless, knowledge of climate change has evolved such that today it is recognised as having developmental implications as well. This suggests that climate change does not only affect the environment but rather it also affects the social, economic and political spheres, which consequently bears negative effects on the overall development of societies. Smallholder farmers are largely vulnerable to the negative effects of climate change since it plays a huge role in reducing agricultural productivity and negatively affects weather-dependent livelihood systems (Ngigi, 2009). Paradoxically, that explains the reason why the poorest countries suffer the consequence of climate change more than rich countries.

Furthermore, Africa is considered to be the most affected continent in the world and the level of vulnerability to climate hazards is intriguing (UNFCCC, 2007). The reason for this is that the continent accommodates areas that have climates that are among the most variable in the world in terms of seasonal time scales. This consequently results in a situation where floods and droughts can correspondingly occur in the same area during the same period (IPCC, 2007). Due to the constant shifts in weather conditions which result in low harvests by farmers in rural communities there is anticipated severe challenges on livelihoods. Also, food, water shortages and floods are likely to increase throughout most of Africa, whereas desertification is expected to remain a major threat in arid and semi-arid regions (Christensen et al. 2007). These consequences of climate change are a sign that there is need for sustainable methods to be employed in order to adapt to the effects of the phenomenon of climate change.

There are numerous effects that intensify the effects of climate change and variability in Africa. The factors include illiteracy, poverty, lack of skills, lack of technology and information, limited infrastructure and low levels of education and poor access to resources (Eriksen et al., 2008). Climate change poses a plethora of effects on societies in numerous ways. From the year 1906 up until 2005 global average surface temperatures have increased remarkably (IPCC, 2007). As a result of observations of global air and ocean temperatures, the IPCC resolved that it is apparent that the climate conditions have warmed (IPCC, 2007). In that regard, various impacts on physical and biological systems have been observed (IPCC, 2007). Many potential effects of this change have been presented by numerous scholars and the severity of the impacts has been projected on African countries. To that effect, Hassan (2010) conducted a study on potential impacts of climate change on agriculture in 11 African countries which discovered that global warming was harmful to crop production though the negative effects are not as much consequential to crop production sustained through irrigation. Hassan (2010) also found that livestock production seems to be at risk because of global warming. This implies that climate change has effects on the different forms of production ranging from crop production to animal husbandry.

In addition, another study that was conducted by Oseni and Bebe (2010) examined approaches and strategies that are employed to reduce vulnerability as well as constructing resilience among farmers in Kenya. The study found that severe effects of climate change were anticipated to pose extreme impacts on vulnerable pastoral communities that are involved in livestock production systems in the dry lands of Kenya. Similarly, Molua (2008) conducted a

study on the impact of climate change on agriculture in Cameroon. The findings of the study revealed that 3.5% rise in temperature, as well as 4.5 percent growth in precipitation in the absence of irrigation facilities, was expected to damage Cameroon's agriculture, and consequently lead to numerous changes in temperature amounting to about 46.7 % in output value. The loss was projected to contain negative effects on the economy of the country as a whole.

Furthermore, Mugambiwa and Tirivangasi (2017: 1) also articulate the effects of climate change on agriculture by suggesting, "...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 clearly demonstrates that poor communities are at increased risk because the impact of climate change will largely affect access to drinking water, health of the people and pose a serious threat to food security. Further, a study by Gbetibouo (2006) in the Limpopo province, South Africa demonstrated that rainfall was characterised by enormous inter-annual variability and approximately half of the farmers in the study had attuned their farming methods in order to deal with climate change effects. 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.

2.3.1 Water supply

Changes in temperature have an impact on the supply of water and precipitation due to its overall impact on drought, floods and water availability. Bates et al. (2008) suggest that freshwater resources are highly being influenced by climate change and this will have extensive consequences for both ecosystems and humans. Further, climate change will also cause extreme stress on the environment and one of the major aspects to be impacted will be water availability and quality, which implies that even though water may be available, its quality is likely to be impacted. This suggests that climate change has huge influence on water supply as a result of conditional changes in precipitation, temperature and floods. This is supported by Houghton (2004) who suggests that climate change will result in huge changes in water supplies in many places. Houghton (2004) argues that due to unpredictable rainfall and higher temperatures, more floods and droughts will be experienced.

2.3.2 Smallholder farmers

Smallholder farmers are a vital part of climate change and vulnerability discourse. This is because climate change adversely has huge effects on the ecosystem services, which smallholder farmers heavily depend on. Nhamo and Chilonda (2012) assert that many changes will be experienced in weather conditions and they will seriously affect the whole agricultural production system. Developmental programmes will also be seriously impacted since the backbone thereof in the developing world which constitute of agriculture would have been affected. The other impact of climate change will be a rise in temperature, which will cause a decrease in precipitation (Bockel & Smit, 2009). Consequently, due to rise in temperature and decrease in precipitation, the production of crops will be greatly affected and the quality of water will be compromised which will affect revenue to a great extent. Drought and flooding are some of the major challenges faced by farmers in the face of climate change and the result of this is connected to low-income generation, job losses and food insecurity. Consequently, Nhamo and Chilonda (2012) argue that farmers will likely not be in a position to maintain their infrastructure, which will eventually result in some of them moving to other areas opening up new farms which will lead to vegetation being destroyed.

2.3.4 Climate change Adaptation

Adaptation strategies to the impacts of climate change constitute actions that people take to respond to climatic stimuli and the action is meant to exploit associated beneficial opportunities. These adjustments are categorised either as responses to current occurrences in climate or planned adaptation to long-term changes in climate (Hisali et al., 2011). In essence, adaptation paves way for adjustments in a system's behaviour and allows the enhancement in its ability to cope with external stresses. If the hazards persist over time adaptation allows a system to reduce the risk associated with these hazards by reducing its social vulnerability (Brooks & Adger, 2005). Sociology and anthropological perspectives provide several lessons on human adaptation to climate change. Scientific studies in these fields of social science explored the mechanisms of adaptation to changing living conditions as a result of climate change (Yohe et al., 2005). Gyampoh et al. (2014) contend that rural communities vulnerable to climate change have immensely strong adaptive capacity, which is seen in their adaptation to drought, scarcity of rain, and decreased crop production, which has serious livelihoods challenges to their respective communities.

Abid et al. (2016) conducted a study in Pakistan and found that farmers were experiencing changes in traditional cotton variety due to heavy pest attack. One of the adaptation methods that were employed by farmers includes the use of heat-tolerant wheat varieties, which was used in response to an increase in the frequency of extreme maximum temperature events. Another traditional method that the farmers employed was the use of crop types that differed from the previously used so as to minimise the incidence of pest and insect attack. The crop change and replacement were witnessed in some areas through the replacement of cotton with maize crops. From the findings of the study, it was established that community-based adaptation has the capacity to reduce vulnerability and improve the resilience of the local people to climatic change (Abid et al., 2016). Somah (2013) suggests that despite the fact that smallholder farmers have always adopted adaptive strategies to some of these changes over the years and the methods have proven to be effective.

Furthermore, Nhemachena and Hassan (2007) are of the view that the ongoing changes in climate conditions are a signal that farmers need to employ more adaptation strategies especially in the developing world where vulnerability is high. Akoh et al. (2011) suggest that mitigation plans may be implemented but they would not be sufficient to avoid changes in the global climate hence the need for adaptation. Furthermore, Gbetibouo (2008:1) states that the “...extent to which the adverse impacts of climate change are felt depends on the extent of adaptation; without adaptation, climate change would be detrimental”. This relates to Burton et al. (1998) who opine that adaptation is not a single concept but rather it comes in different forms and action that people take in response to the external threat. As a result, adaptation can be said to be either preventive or reactive/corrective which refers to either the action is before or after the threat respectively.

The other important aspect or term that needs to be taken into consideration is the concept of adaptive capacity. According to Eriksen et al. (2008), adaptive capacity is the potential or ability of a system or community to adapt to the effects or impacts of climate change. The capacity is considered dynamic and is influenced by economic and natural resources as well as social networks, institutions, governance and technology. This suggests that in every community there are groups or categories that are considered to have larger adaptive capacity whereas others are considered to have minimal adaptive capacity. For instance, the poor may be considered as a group that has minimal adaptive capacity whereas the rich and other adaptive groups are considered to have larger adaptive capacity. Moreover, 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". It is important, therefore, to note that adaptation measures that are employed in agricultural practices include crop and livestock variation, water storage, irrigation practices, rainwater harvesting, water-conserving techniques and use of drought-resistant crop varieties among many other methods employed in different communities. Rainfall projections in Zimbabwe point to a drying trend such that adaptation strategies in the agricultural sector are made to focus on strategies to conserve moisture (MENRM, 2006).

In Ghana, it has been reported that farmers have always adopted a wide range of coping and adaptation strategies. These include permanent and seasonal migrations, crop varieties and irrigation practices, which are adopted as a result of increasing incidence of climate-related shocks and stresses (Tambo, 2016). The most common adaptation measure, which is practised by a majority of smallholder farmers, however, is the changing of planting dates (Tambo, 2016). Correspondingly, a study by Wahaa et al. (2013) on adaptation strategies revealed that most farmers from different countries in sub-Saharan Africa use changing of planting dates as an adaptation measure. Other prominent measures that are reported to be used by farmers in Ghana include the use of drought-tolerant or early maturing crop varieties, mixed cropping and crop switching and tree planting which is practised by farmers to protect their livestock during heat stress. According to Wahaa et al. (2013) traditional sequential cropping is an important strategy that is used by most farmers in sub-Saharan Africa. Farmers grow the sequential cropping system most frequently applied in their particular districts and they are composed of two short-growing crop cultivars. These constitute of single cropping system where farmers grow one long-growing cultivar of the first crop and highest-yielding sequential cropping system in which two short-growing crop types are adopted. The systems frequently applied are mostly based on groundnut and maize and a few sequential cropping systems exist with sunflower or soybean, rice and beans (Wahaa, 2013).

In Zambia, the form of adaptation taking place is in the form of creation of contour ridging and ploughing across the slope and working early in the morning before it is hot (Hachileka and Vaatainen, 2011). The other discovered methods in one of the communities are digging shallow wells along Zambezi and building strong traditional houses. Further, some almost similar strategies are found in Zimbabwe where rural smallholder farmers have adjusted their

behaviour in response to past extreme hydrological events and climate-related changes (Chikozho, 2010). Similarly, Nhemachena and Hassan (2007) contend that although farmers have low adaptive capacity they have survived and coped in various ways over time. Most of the farmers, however, are reported to be grappling with the need to adapt to altered future climatic and rainfall conditions. Gwimbi (2009) assert that a majority 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. Further, a study by Unganai and Murwira (2010) demonstrates that in Chiredzi, a farming town in Zimbabwe, most farmers have abandoned growing crops like maize, cowpeas and cassava and they are now focusing on sorghum and groundnuts which require little rains.

2.3.5 Drought

The literature reviewed thus far has demonstrated that drought is one of the major effects of climate change. It has been reported by numerous scholars that the phenomenon of climate change results from high or low rainfall, which in either case there is high likelihood of drought. Mukherjee et al. (2018) suggest that drought is an extreme climatic event that develops slowly and it is considered to be a costly hazard. Drought has numerous socioeconomic impacts, which include increased risk of wildfire, water scarcity, loss of crops and livestock, increased food prices and indirect health effects. Mukherjee et al. (2018) further demonstrate that shortage of water related to poor water management can also result in the incidence of drought. However, this cannot be blamed on climate change but rather poor management of resources by communities. In essence, causes that are related to shortage of precipitation, shortage of soil moisture, shortage of water in lakes and streams are then argued to be climate-related and they are the largest contributors (Mugambiwa & Tirivangasi, 2017). This implies that despite the existence of numerous causes of drought the aforementioned poor management of water resources is regarded to be minor and inconsequential. That presents climate change as the major cause of drought, which invites the need to investigate the various types and characteristics of drought in order to understand the nature of the phenomenon.

2.3.5.1 Types of drought

There is interconnection between the various types of drought that occur simultaneously or sequentially which makes it difficult to distinguish between one drought type from the other (Mukherjee et al., 2018). However, the different types of drought are; meteorological drought

which is caused largely by precipitation deficit, agricultural drought which is caused by soil moisture deficit and hydrological which is a result of a deficit in water storage. Metrological drought has impacts that shift prominently towards soil moisture, which can result in agricultural drought, and as a result, it further propagates to cause water storage deficits which results in hydrological drought, which is likely to go for longer durations (Mukherjee et al., 2018). This serves to demonstrate that the different types of drought might be different in name but at the end of the day, they are the same because they resemble one process that produces a common outcome.

2.3.5.2 Drought characteristic

It is also very important to understand the characteristics of drought insofar as the effects of climate change are concerned. Climate change manifests itself through different weather phenomena that produce different forms of stress and shock on the environment (Mugambiwa & Tirivangasi, 2017; Mukherjee et al., 2018). The effects thereof are in form of floods and drought, which develop from the excessive rainfall or lack of rainfall at a time when it is expected. Hence, Mukherjee et al., (2018) opine that drought events have multiple and interrelated characteristics such as severity, duration, peak intensity, and recurrence interval. Each of these characteristics may have a considerable influence on the impacts of drought. Consequently, monitoring natural and socioeconomic drought needs a joint assessment of individual drought characteristics as well as identifying the most dominant drought event specific to the impact being studied. Moreover, in arid regions that naturally receive no rainfall drought characteristics estimated in relative terms and absolute terms will be significantly different.

2.3.5.3 Drought and global warming

It has been established by numerous scholars that the impact of drought under climate change or global warming is more likely to worsen in future (Mugambiwa & Tirivangasi, 2017; Mukherjee et al., 2018). It is important to note that droughts have always been a common phenomenon around the world and the likelihood of it under the phenomenon of climate change is likely to cause more damage to the environment, which translates to even more damage to flora and fauna. Further, the damage will also impact smallholder farmers whose activities rely largely on the rains because of lack of sufficient resources to establish irrigation equipment. Over the years, the negative impacts of drought have been witnessed in many parts of the world

and its impacts cannot be overemphasised and consequently Mukherjee et al. (2018) argue that a number of drought indices have been developed to quantify a drought. Many of the indices use either precipitation only or a combination of precipitation with other meteorological variables.

Furthermore, Lee et al. (2017) provide an example of North Korea, which is said to be vulnerable to drought such that severe droughts in 1999 and 2001 caused serious food shortages. According to Lee et al (2017) recently, North Korea experienced the worst spring drought in over three decades and the drought has seen some areas experiencing the lowest rainfall levels in over 50 years. Further, drought-induced water scarcity is often accompanied by catastrophic impacts on food security and economic prosperity. The drought victims benefited immensely from the effects they endured. Most of the assistance came from the international aid, which plays a major role in sustaining the population (Lee et al., 2017).

2.3.5.4 Drought and water supply

Liu et al. (2018) are of the view that drought could bring about adverse consequences to the water supply which negatively affects food production and the environment in its entirety whole. Such consequences attached to droughts have resulted in droughts in recent years receiving wide attention. This is largely because the incidence of drought brings about numerous effect that can affect various structures of society to function well. For instance, in recent times there have been numerous occurrences of drought that regularly bring about huge impacts to their respective nations. These droughts include the Millennium drought in Southeast Australia, the once-in-a-century droughts in China, the Horn of Africa drought in Somalia and the California drought (Kiem et al., 2016).

As discussed earlier in this section, drought is a phenomenon that is common in countries around the world and the consequences are quite common and bring about severe consequences that negatively impact the livelihoods of people. Moreover, the consequence of drought in the face of climate change seems to seriously impact the livelihoods of people in the sense that the impact will be more severe and consistent than the once in a while effect that is usually experienced under normal circumstances (Ault et al., 2016). This stands to show that drought as one of the major effects of climate change is capable of bringing about huge socioeconomic consequences that greatly impacts the livelihoods of people in their respective communities.

This effect is largely felt in rural communities where a large number of community members are vulnerable from the consequence of lack of access to recent technology and poverty among other livelihoods related effects.

2.4 Climate Governance

Governance, in general, is a term that is defined by different scholars in different ways. The generic understanding of the concept of governance refers to the management of resources and policy-making by means of exercising authority (Preti, 2004). That implies the term governance often used in order to signify a complex set of structures at the public level as well as at the private level, which is commonly associated with national administration. From another angle, Rao (2008) defines governance as the exercise of political and administrative authority at all levels in the process of managing a country's affairs. The process takes into consideration all mechanisms, processes and institutions where citizens articulate their interests, exercise their rights and mediate their differences. Further, Khawaja (2011) weighs in to provide the aspect of equity, transparency, participation, responsiveness and accountability associated with the governance. All the definitions of governance suggest that governance has to do with all processes that relate to the process of the overall management of either an institution, community, organisation or country.

Furthermore, the concept refers to all processes of governing, whether undertaken by a government, a market, a network, over a social system or whether through the laws, norms and/or language of an organized society (Rao, 2008). It is related to the processes of interaction and decision-making among the actors that are involved in a collective problem that lead to the creation, reinforcement, or reproduction of social norms and institutions (Mugambiwa et al., 2015). This suggests that the problem is not therefore limited to one aspect of the community. Rather, it relates to various aspects that translate to either social, political, economic and environmental problems. Therefore, that brings the debate to the focus of this thesis, which is climate governance. In that respect, Jagers & Strippel (2003) weighs in to provide a comprehensive definition of climate governance which they referred to as the mechanisms and measures that are developed and used in steering social systems in an effort to prevent, mitigate and/or adapt to climate change risks (Jagers & Strippel, 2003). This suggests that it can be done at a local, government or institutional level and through formal or informal processes.

2.4.1 National Governments initiatives on climate governance

Governments are involved in climate governance through the implementation and adoption of adaptation policy, legislative and institutional frameworks (Bhatasara, 2016). Development of public policies to adapt to the impacts of climate change by national governments is informed by many factors, which include the risk of climate hazards and the countries' commitment to the UNFCCC (Chagutah, 2010). This is because adaptation to climate change as widely recognised by numerous scholars requires strong legislative, institutional and policy frameworks in place (Agrawal, 2008; Chagutah, 2010). The adoption of strong policy frameworks is essential because it is believed to shape and inform the national adaptive capacity. It is also imperative in the process of coordinating individual and collective approaches to climate change, which significantly informs and determines the outcome of adaptation. Also, the government will also be in a position to utilise available resources accordingly in efforts meant to adapt to the impacts of climate change.

Furthermore, Agrawal (2010) contends that despite the fact that legislation in climate change has positive effects that are development oriented, it is also important to focus on the limitations of the legislations and governmental policies that are in place. The argument was that legislation in adaptation policies can be restricting in the same manner that inflexible institutions can contribute to the failure of policy. Therefore, it is recommended that governments should employ flexibility in their efforts in dealing with the uncertainties of climate change affects. Moreover, Baird et al. (2014) contend that both public and private actors are responsible for the effects of climate change and costs are socialised at a global scale and experienced at a local scale. That implies that there is need for governments to have appropriate response measures that are aimed at addressing the increasing effects of climate change especially in the developing world.

2.4.2 A focus on the government of Zimbabwe

The Zimbabwean government has over the years made a positive stance towards addressing the impacts of climate change. This is because the government admits that climate change is a critical issue and it has the responsibility to deal with the challenges thereof. The commitment of the GoZ to the phenomenon of climate change was first noticed when it signed and ratified the United Nations Framework Convention on Climate Change (UNFCCC) in June 1992 and consented to the Kyoto Protocol on Climate Change in June 2009 (Bhatasara, 2016).

Nonetheless, it has been established that the ratification of international instruments has failed to transform into substantial climate change policies. To that effect, Zimbabwe is said to have no specified policy response to climate change. Instead, there are numerous disconnected responses and policy documents such as the ones presented by Dodman & Mitlin (2016) and Mugambiwa & Rukema (2019) which inform the government's position on climate change not necessarily the policy framework on the response strategy. The other concern is that the country does not have a national adaptation policy or programme of action. To that effect, Bhatasara (2016) notes that regardless of the fact that the GoZ does not have a comprehensive policy document for climate change adaptation, the country has however employed a draft National Climate Change Response Strategy that was only consolidated in May 2013. However, it is worrying that the progress of the policy document is very slow. To that effect Brown et al. (2012) argues that the reason for the slow progress of the of the draft response strategy is that climate change is handled as a petty issue in the policy domain such that it is not given a wider coverage and consideration by policy makers and the government at large.

Further, some scholars suggest that the reason why there is no substantive climate change policy in Zimbabwe is because there are numerous policy frameworks that are aimed at the environment and climate (Bhatasara, 2016). These are namely; the National Environmental Policy, Agriculture Policy framework, Drought Mitigation Policy and Disaster Management Policy. All these policies have one thing in common which is they address issues pertaining to climate change. They indirectly address the impacts and challenges posed by climate change. For instance, the country's Agriculture Policy acknowledges that the country's vulnerability to continued incidence of drought, a trend widely believed to be accentuated by climate change. That applies to the many other policies in the sense that even though they may not directly address the term climate change their focus is rather on the effects of climate change which in the end translates to the fact that they are aimed at addressing the impacts of climate change. In that regard one can argue that the GoZ has numerous policy documents that are aimed at climate change adaptation and awareness vis-à-vis climate governance though they do not directly address the phenomenon.

2.4.3 Climate governance initiatives by other African governments

Lemma (2016) asserts that the government of Ethiopia is committed to combat climate change. This is because the country has suitably reacted to the phenomenon of climate change by

ratifying pertinent international conventions as well as the necessary steps that are taken to implement the two categories of climate change responses that are namely; mitigation and adaptation. The country is said to have ratified the UNFCCC and its related appliance, the Kyoto Protocol. Further, Ethiopia had its first Climate Change National Adaptation Programme of Action (NAPA) in 2007 to the UNFCCC (MoFE, 2015). Furthermore, to add on the aforementioned initiatives, the government of Ethiopia has other climate change related programs that are namely the target to build carbon neutral economy by 2025, the Nationally Appropriate Mitigation Actions of 2010 and the sectoral adaptation plan of action among many other programs of action initiated by the country (lemma, 2016). Further, lemma (2016) went on to list the climate change policies that are in place in Ethiopia which are namely:

- Disaster Prevention and Preparedness National Policy,
- National Policy on Biodiversity Conservation and Research,
- National Plan for Accelerated and Sustainable Development to End Poverty (PASDEP), and
- Growth and Transformation Plan (GTP).

These policies are an indication that the government of Ethiopia has committed itself to combat climate change and positively address its impacts for sustainable development.

Furthermore, South Africa has also made positive strides in responding to the effects of climate change and formulation of response strategies. (DEA, 2010) confirms that the country has made commitments to reduce poverty and ensure enhanced development in several sectors through previous and current policy initiatives such as the Reconstruction and Development Program (RDP); Growth, Employment and Redistribution (GEAR) and Accelerated and Shared Growth Initiative of South Africa (ASGISA). In addition, the country also boasts one of the world's largest and effective disaster management policies which is putting considerable efforts into developing a National Climate Change Response policy. All these efforts are aimed at addressing the impacts of climate change and ensure that the country is on the right platform in addressing the impacts of climate change. As mentioned earlier, policy frameworks are important to the measures and response strategies because they enable the use of national resources to the cause of climate change and any other environmental hazard.

2.4.4 Climate governance initiatives by African Regional Blocks

Apart from individual countries' governments, it is important to understand how combined efforts of governments in the region have deliberated on the consequence of climate change and in response to its impacts formulated policy positions accordingly. In that regard, this section looks at the three regions that are namely the Southern African Development Community, East African Community and Economic Community of West African States. These bodies comprise of member states whose governments contribute to the existence of the bodies and they take part in the formulation of the various policy positions that are established by the organisations.

2.4.4.1 Southern Africa Development Community

Regional bodies such as the Southern Africa Development Community (SADC) have over the years made policies that are aimed at addressing disasters, which include environmental issues. SADC comprise the following member countries; Angola, Botswana, DR Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Eswatini, Tanzania, Zambia and Zimbabwe. The SADC for instance adopted the protocol on Forestry in order to ensure effective environmental protection to safeguard the interests of present and future generations. This is regardless of the fact that the region does not have a comprehensive policy document that addresses issues pertaining to climate change. Alas, the region has a protocol on Forestry, which urges member states to use similar criteria and indicators aimed at sustainable forest management so as to evaluate biodiversity in forests. The SADC Forestry Protocol was established in order to achieve sustainable utilisation of natural resources and effective protection of the environment, which is one of the key objectives of the SADC (Miller et al. 2007).

Further, the Treaty considers forests and other biodiversity as key natural resources as well as a major component of the environment that is supposed to be managed for the benefit of the SADC communities. In essence, the Protocol recognises climate change as an issues of common concern among member states of the regional body (Miller et al., 2007). To add on, in May of 2009 the SADC member states developed a regional programme of Reducing Emissions from Deforestation and Forest Degradation (REDD) (Ruppel, 2012). The programme aimed at improving the capacity of SADC Member States in managing their national programmes through regional cooperation on the international processes on REDD

and Climate Change. To that effect it can be established that even though SADC does not have a specific climate change policy, the member countries' governments have developed policies that address the causes and effects of climate change thereof. For instance, the forestry protocol which was adopted by all SADC member countries is addresses the causes of climate change and the possible remedy in the form of deforestation and afforestation accordingly.

2.4.4.2 East African Community

This section made an effort to assess the approaches initiated by countries in the East Africa Community (EAC) and the Economic Community of West African States (ECOWAS). The EAC comprise Kenya, Uganda, Tanzania, Rwanda and Burundi and the countries are projected to suffer some of the worst impacts of climate change. As such, they came up with a collective approach to address the current and anticipated effects of climate change through the East African Community Climate Change Policy, which was put together by governments of the concerned countries (Kasaija, 2004). The policy was developed to address the adverse impacts of climate change as well as to respond to the growing concerns about the threats of climate change impacts to the development of the region. Of note is the fact that the policy is consistent with the provisions of the EAC Treaty, the EAC Protocol on the Environment and Natural Resources, and the UNFCCC (Katembo, 2008).

The policy addresses issues pertaining to planning adaptation and mitigation actions that are designed to address climate change (Katembo, 2008). The high vulnerability of the region to climate change exposes the region to the increased consequence of food security to the extent that the policy makes adaptation to climate change a priority for the EAC region. The policy is also said to be aiming to strengthen meteorological services and improve early warning systems (Kasaija, 2004). The overall intention is to increase preparedness for disaster risk management, scaling up of the efficient use of energy resources, irrigation, crop and livestock production. Further, the policy also has some mitigation measures, which include reforestation, forest conservation and access to efficient and sustainable crop and livestock production systems (Kasaija, 2004). This is important because it shows that climate governance is not limited to individuals but rather the state and national institutions are involved in the process of ensuring that there is a comprehensive approach to the climate change phenomenon, which is aimed at adaptation, resilience and mitigation vis-à-vis climate governance.

2.4.4.3 Economic Community of West African States

The ECOWAS comprise countries in in the West African region. These are namely Benin, cote d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Niger, Nigeria, Senegal, Togo, Mali, and Burkina Faso. It has been established that ECOWAS does not have a climate change protocol though the Heads of State adopted of member countries adopted an environmental policy in 2008 whose aim was to address environmental issues in the sub-region (Cowell, 2011). The policy was in line with the ECOWAS treaty on 'the harmonisation and coordination of national policies and the promotion of programmes, projects and activities' (EAC climate change policy, 2010). As such, the major objective of the environmental policy was to curb the depletion of natural resources, improve the environment, and preserve biological diversity. However, climate change is not specifically addressed in the environmental policy though numerous facets of it are frequently referred to in the pillars of the policy. The pillars are namely;

- The strengthening of environmental governance and capacity building;
- Promoting the sustainable management of resources for the improvement of the sub-regional economy in an environmentally friendly manner;
- Preventing environmental pollution and nuisance, controlling urban waste and the transboundary movement of hazardous wastes; and
- Promoting information, education, and communication for a healthy environment.

Considering the fact that the policy document does not directly address climate change, it is important to take into cognisance the fact that the policy addresses the facets of climate change as well as its possible and actual effects. To that effect, climate change was addressed in the first strategic focus on environmental governance and capacity building. Apart from involving climate change in the policy, ECOWAS also issued a climate change declaration that contained numerous viable recommendations particularly on how climate change could be addressed in the region. The declaration was held in the organisation's regional conference on "protection challenges to climate change", which was organized by the United Nations in collaboration with the Government of Togo, on September 15th and 16th 2009 in Lome, Togo (Cowell, 2011). The purpose of the conference was to call for adoption and use of a human rights-based approach in addressing climate change challenges in the region.

Further, another important issue on the agenda of the conference was the adoption of a broader social dimension that was aimed at the climate change debate taking into consideration the growing and wide spreading negative impacts of climate change in West Africa (Cowell, 2011). The impacts thereof are considered to pose serious threats on the stability of the region, as well as the security and human rights of the citizens of member countries. This suggests that countries on the African continent through their governments are making efforts to fight the effects of climate change. The indication of this assessment was that in some parts of the continent, there are fully fledged policies yet in other parts there are policies that are aimed at environmental protection. Within the policies, there are climate change related concepts that should be taken into consideration such that the environmental policies will then be translated to climate change policies (Katembo, 2008). ECOWAS and EAC demonstrate an important example of cooperation among countries in the fight against climate change. This is demonstrated by the manner in which countries in the particular regions establish policy standpoints that are aimed for a common cause. However, all the response strategies employed by the governments of different countries seem to be limiting on aspects pertaining to IKS and involving rural communities who are said to suffer the most from the effects of climate change.

2.4.5 Sociology of climate governance

The field of environmental sociology provides a platform for a better understanding of climate governance from a social science perspective. This position is taken from the work of numerous scholars like Pellow and Brehm (2013) who assert that the field of environmental sociology builds on earlier research aimed to challenge erected boundaries in the midst of human society, nonhuman natures, and the built environment. The implication of this assertion is that environmental sociology creates a platform for a well-orchestrated and well informed approach to the interaction of humans and the natural environment. This also relate to aspects pertaining to management of natural resources, climate change adaptation and mitigation, which significantly informs climate governance. Further, Dunlap and Michelson (2002) acknowledge that the field of environmental sociology was developed from classical sociological theory with the aim to demonstrate its relevance on analysing environmental crises. In addition, the field also provides insights on how humans in societies respond to the environmental crises.

The environmental crises are in form of numerous climate change risks to which the concept of climate change adaptation is fundamental. In that regard, climate change adaptation is of

paramount importance in the climate change debacle. This is because it informs the state of preparedness among community members as well as the extent to which they are able to cope to the dire effects of the phenomenon (Simonet, 2010). As a result, current studies in environmental sociology and other sister fields are focusing more on the capacity of people in communities to respond to global climate change bearing in mind the notions of climate change vulnerability, risk, resilience and adaptation in order to perceive the extent of the actual and potential damage and responses (Adger et. al, 2006). In that regard, one should take into consideration the fact that the impacts-based perspective signifies the type and form or response that is required to address the impacts of climate change in order to pave way for policy articulation and formulation. As such, people and communities will be able to address climate based impacts they encounter in their communities (Pelling and High, 2005).

Furthermore, the concept of inequality also needs to be tackled within the confines of environmental sociology. This is largely because issues pertaining to equality are of paramount importance in climate governance. Boyce (2008) acknowledges that inequality has always been considered to be a fundamental concept of the sociological enterprise. In that regard, environmental sociology provides a unique way of theorizing and applying the concept. This is interesting because the main focus of many sociological contributions from classical to contemporary theorists is on the challenges of inequality in communities. Foster & Holleman (2012) contends that the focus on inequality among humans has its flaws in that scholars usually focus on the depths of the inequalities as well as the actual and possible impacts thereof. Consequently, environmental sociology provides a better understanding of the concept of since its approach to inequality is based on the relationships among humans, animals and ecosystems. This is important because it gives a wider and well informed approach to inequality that focuses on not only inequality among humans but also among animal species and the ecosystem (Bookchin, 2005; Boyce, 2008).

Further, drawing from the works of Karl Marx and Max Weber, inequality can be established to be at the heart of all sociological work. This is supported by Gibson (2009) and Foster & Holleman (2012) who acknowledges that the ecological foundations of the writings of Marx and Weber demonstrate an endorsement of environmental sociology's focus on the problems of inequality and power that is primarily rooted in capitalist economies and statecraft. Furthermore, Foster & Holleman (2012) assert that Marx and Weber were primarily concerned about modernity's detrimental effects as well as its capitalist cultures and institutions on

marginalized populations and ecosystems. This has direct impact on the problem statement of this thesis in that the efforts of the government in policy articulation on climate change has been deeply rooted in some form of inequality because in most cases the use of IKS is skipped and rural communities are left out. This is despite the fact that they constitute the largely affected populations insofar as climate change risk is concerned.

Moreover, the importance of treating climate governance from a sociological standpoint is taken from the field's recognition of the fact that physical environments have influence on human societies and behavior as acclaimed by Dunlap (1979). Environmental sociologists part ways with traditional sociologists on aspects like the role of social facts to the effect that they argue that social facts can only be explained by other social facts. For instance, communities' responses and perceptions of climate change and its impacts requires one to understand the underlying cultures and belief systems which is one of the important aspects this study intends to establish. A focus on IKS entails that apart from the general understanding of the concept under investigation, there are belief systems that should be taken into consideration which inform the community's worldviews.

Additionally, the political economy perspectives of environmental sociology are also important in climate governance. Gould et al. (2008) asserts that the major focus of political economy of environmental sociology is on the effects of modernity and capitalism on socio-ecological well-being. This is borrowed from a Marxist view point wherein struggles over the means of production favour the capitalist bourgeoisie classes yet they are responsible for the greater ecological damage and a seemingly horrendous social suffering. Hence, like Foster & Holleman's (2012) contributions on inequality in environmental sociology, the political economy of environmental sociology links inequality to ecological harm. Subsequently, Mol (2003) introduced the concept of Ecological modernization, which contends that, despite the fact that modernization and globalization results in environmental degradation, they also inform policy articulation and implementation as well as programs that are designed for the improvement of environmental quality. Ecological modernization theorists ascribe to the view that continued modernization in the face of climate change and other environmental hazards is of paramount importance for societies to achieve ecological sustainability.

Furthermore, Boström & Uggla (2016) emphasise the importance of environment and society relations as well as the importance of representation, which informs climate governance. Their

argument was that in the event of environmental injustice, the environment cannot plead its own case which implies that it needs humans to represent it and also in instances where humans strain the environment, there is need for representation on better ways to utilise the environment and adapt to environmental hazards. The issue of representation on environmental issues is fundamental because previous research on environmental representation aimed at establishing democratic deficits as well as practical challenges related to representation (Carolan 2006). In that regard, it is important to understand the fact that representation is important because it also provides alternatives for workable adaptation strategies and alternatives. This is also considering the fact that adaptation has featured in numerous recent sociological discussions and debates on global climate change. Moreover, the works of sociologist Antony Giddens (2009) recognise climate change adaptation as a significant concept in responding to climate risks though he is criticised for focusing largely on politicians, public administrators and policy makers.

Paradoxically, sociologist Delanty (2003) emphasised the significance of the community in climate change adaptation. The author contends that there is a need for the community to be placed at the centre of all climate change adaptation debates. This is because they are directly affected by the effects of the phenomenon and all measures employed by governments and policy makers are put into practice by community members. Nevertheless, despite the fact that the community is regarded important in issues pertaining to climate change adaptation, Walker (2011) stressed the need to problematise the notion of the ‘community’ inasmuch as it is understood as a homogeneous entity. This suggests that there is more to the concept of ‘community’ in the sense that communities are at different levels and their approaches to adaptation vary. For instance, the community focused on in this study is a rural African community whose traits are completely different from those of an urban community or a community in a developed country.

2.5 Indigenous Knowledge Systems and climate change

The concept of IKS plays a significant role in climate change adaptation in rural communities (McGregor, 2004). IKS is context-specific implying that every community in either the developed world or developing and underdeveloped countries, they have their own forms of IKS (Nyong et al., 2007). That, therefore, triggers the quest to understand what IKS is and what it essentially entails. IKS is defined as the wisdom, knowledge and practices of indigenous

people of a particular community and the knowledge should have been gained over time through experience or should have been orally passed on from generation to generation (Salick and Byug, 2007; Nhemachena, 2010). This knowledge only qualifies to be IKS if it has significantly helped in the solving of problems that include problems related to climate change and variability among many other socio-environmental problems. There are many ways in which indigenous people observe activities around them and in the event of threats they then employ the knowledge that they possess about the environment and all other aspects around it to adapt the environmental threats that will be surrounding them. It has been documented by some scholars that indigenous people who live in the vicinity of natural resources observe the activities around them and they identify and adapt to any changes in different ways (Nhemachena, 2010; Mugambiwa, 2018).

The changes that communities witness are associated with certain birds, mating of certain animals and flowering of certain plants (Nhemachena, 2010; Mugambiwa, 2017). These are indicators that communities use to tell that there are certain changes and also that they could be expecting certain environmental shifts that in most cases are related to climatic change. It has also been documented by Salick and Byg (2007) that indigenous people have always made use of biodiversity as a buffer against variation, change and catastrophe in the face of plague or any other form of environmental hazard. In an effort to cope with the rapidly changing environmental conditions due to excessive or low rainfall and drought, indigenous people in many parts of Africa grow different crops with different susceptibility to drought and floods and they often supplement these by hunting, fishing and gathering of wild plants (Svotwa et al., 2007; Nhemachena, 2010). In that regard, IKS is regarded as the basis for local-level decision-making in rural communities. It has value not only for the culture in which it evolves but also for scientists and planners striving to improve conditions in rural localities. This suggests that IKS is the starting point for meaningful contribution in any given form of development in any community.

Further, climate variability is regarded to have a considerable influence on the success of agricultural production in the rural communities of Zimbabwe (Svotwa et al., 2007). Communities around the world have lived with and experienced numerous climate-related disasters throughout the time of their existence. These disasters include droughts, floods, hails, thunderstorm, tsunamis and strong winds that are often reported to cause the death of people, livestock and crops (Semali, 1999; Oluoko-Odingo, 2010). These disasters should be

understood and often be prepared for in order for communities to always be in a safer place in the event that they happen. In Zimbabwe, numerous environmental hazards have been often reported and these include droughts and cyclones. Droughts in Zimbabwe are reported to have become more frequent and severe with the 1992-93 drought recorded to be the worst in recent memory considering the fact that it caused loss of 60 % of the national cattle herd in the country (Ngara & Rukobo, 1992).

Before the coming and wide use of modern scientific methods, rural communities relied entirely on IKS and in the process some animals, birds, insects and plants were considered to have capacity to detect and respond to changes in the atmospheric conditions (Svotwa et al., 2007). Human cultural development has progressed and taken different levels and stages over the years. The manner in which people use their cultural beliefs to respond to the difficulties they face has also been translated to the environment in order to cater for climate-related challenges in order to help communities adapt to the numerous climate change impacts (Oluoko-Odingo, 2010). Moreover, communities have made numerous strides, which include mastering the positions of stars, the sun and the moon (Mugambiwa, 2017). They are also reported to understand wind strength and direction as well as the cloud position and lightning patterns (First Science, 2004). All these experiences are of paramount importance in predicting future climatic changes and shifts and being able to explain it within their cultural context. In that regard, Ajibade (2003) confirms that the knowledge of past disasters and climate in Africa constitute part of the IKS based experiences that have been handed down from generation to generation in form of oral tradition. IKS is also used to describe knowledge systems that have been developed over a very long period of time by communities that are opposed to scientific knowledge (Ajibade, 2003).

The concept of IKS brings about the cultural dimension of the debate on the general perception of climate change and the presumed and actual adaptation strategies. As a result, the cultural dimension is considered by scholars such as Ajibade and Shokemi (2003) as of paramount importance to the development options on matters of national importance because they are closely related to the indigenous people of Africa. This suggests that climate change as one of the pressing environmental challenges should be dealt with within the context of cultures and should have numerous culture-based adaptation strategies in place. Consequently, Ajibade and Shokem (2003) allude that local communities in Africa have developed complex systems used in the gathering, interpreting and decision-making that is weather-related. Ajibade and

Shokemi (2003) found that in Nigerian farmers are able to use knowledge of weather systems such as rainfall, thunderstorms, windstorms and sunshine to prepare for future weather. This is done through the use of IKS and they have adopted what is known as IKS weather forecasting that is now an important part of farmers' planning and response system to disasters. In that regard, the difference between traditional and Western systems is that meteorologists use global models and satellite imagery while IKS draws its knowledge from perspectives base on lived experiences related to the aforementioned animal and plant species among many other aspects.

Roncoli et al. (2001) suggest that the elderly male farmers are responsible for the formulating of hypotheses relating to seasonal rainfall and this is done through the observation made on the natural phenomena. Further, there is also the involvement of cultural and ritual specialists to draw predictions from divination, visions or dreams. This translates to the fact that IKS has another side that does not only dwell on the lived experiences but rather it focuses on the supernatural world that translate to the role of the gods or ancestors and spirit mediums. Further, Rancoli et al. (2001) revealed that not everyone has the skill to effectively forecast the weather using IKS from either the lived experiences or from the use of supernatural powers. This suggests that there are certain individuals in every community who possess the supernatural skills needed to predict or foretell the changes that will take place or the manner in which communities should prepare relating to the types of crops that they should grow (Mugambiwa, 2017). Further, it has also been established that the most widely relied-upon indicators are the timing and duration of cold temperatures in the early part of the dry season, as well as the timing of fruiting on certain local trees, water level in streams, birds' nesting behaviour and insect behaviour (Roncoli et al., 2001).

2.5.1 Copping with the changing environment

Communities in general and smallholder farmers in African communities have always experienced and coped with environmental disaster (Salick & Byg, 2007). Through these experiences, farmers possess the knowledge that is relevant to cope with adverse environmental shock and stress that is caused by climate change (Oluoko-Odingo, 2010). This knowledge is described by scholars as what is needed and essential in the mapping out of a comprehensive national response for climate change. As discussed earlier, IKS forms that foundation and basis of climate change adaptation because they are responses that indigenous people are well versed with. Leautier (2004) asserts that enhancing and embracing IKS is of paramount importance

for inclusion in local level strategies in the development process. IKS is believed to develop in an area where people have a long history of residence and are integrated with their biophysical environment. The knowledge that is IKSS based which people usually use is related to tree species and animals among other things. The knowledge of tree and animal species gives community members the ability to understand the environment they live in to the extent that they are able to relate their behaviour to physiological changes (Leautier, 2014).

Furthermore, Patt and Gwata (2002) are of the opinion that many communities are in a position to demonstrate their richness in IKS by the practices that they take part in such as rainmaking ceremonies. The authors suggest further suggest that the richness of IKS is demonstrated by the fact that many of these processes are not uniform implying that they are diverse but they produce results that are effective and can be used successfully for climate change adaptation. To that effect Dea and Scoones (2003) concur that the processes vary significantly in different parts of the continent that is the eastern, southern or northern. Moreover, that on its own provide a wide range of opportunities for in-depth studies that reveal how the different processes are executed and how do they inform or impact the process of adaptation and national climate change policy.

It can be argued that ideas can be easily adopted if they are proven to have been tried and tested. As such, the adoption of practices that are said to have been passed from generation to generation in the name of IKS is likely to provide better opportunities in the quest to address the challenge of climate change (Patt & Gwata, 2003). This translates to imply that practices that are quick to be adopted by people, in general, are those that are already in existence. Patt and Gwata (2003) conducted a study in Zimbabwe and observed that the use of seasonal forecast in conjunction with IKS made local farmers more willing to take part in the process. That was largely because the process presented the farmers with practices that they are well versed with. Some of the IKS processes that the farmers took part in were related to natural mulching, suppression of diseases and harmful pests, and conservation of soil moisture. There was also the widespread use of IKS based plant materials that included agrochemicals to combat pests that are normally known to attack food crops by small-scale farmers (Gana, 2003). Lastly, the use of controlled bush clearance as a way of minimising the washing of soil surface by the runoff and the use of green manure and protection of riverbanks are some of the most important IKS methods that the communities employed.

2.5.2 IKS climate change interpretation

Now that the use of IKS in climate change adaptation has been presented, another important concept that ought to be established in this thesis is the concept of IKS climate change interpretation which refers to the manner in which indigenous people explain the changes that they observe from an indigenous standpoint. Ajani et al. (2013) suggest that climate change is interpreted differently in the scientific and indigenous communities. Svatwa et al. (2007) are of the opinion that there are various techniques that farmers use in their interpretation of IKS climate change. These techniques include observable interpretation of observable aspects such as levels of rainfall and river flowing patterns among many other aspects of significance in the interpretation of weather events. The other technique that has been reported is the flowering and mating patterns of plants and animals accordingly. In some sections of the African indigenous communities it has been established that climate change is a sign of the wrath of the Gods on issues that they are not particularly happy with for instance failure to observe certain cultural phenomena or practices by a wider section of the community (Svatwa et al., 2007).

Furthermore, it has been established by some scholars that there are animal species that undergo movements of varying distances depending on the prevailing rainfall patterns. Some of these animals are associated with the prevailing type of climate such that indigenous people who have studied them over time are in a position to understand and explain the movements (Kiem et al., 2016; Mukherjee et al., 2018). The study of birds' behaviours as indicated by a plethora of scholars comes in different ways and form. The birds are also said to differ on the basis of location, for instance, the common bird is the kingfisher but there is the West Africa woodland Kingfisher bird and the Southern African kingfisher bird that is associated with heavy falls within days of its appearance. This has been studied over time by indigenous people and the interpretation is that the nature of the sound the bird produces resembles banging of raindrops characteristic of a heavy downpour (Gana, 2003). It is important to note that this knowledge is a privilege of the elderly, which suggests that there is need to focus also on the importance of the elderly because they play a significant role on IKS issues insofar as interpreting the occurrences is concerned. As such, one needs to understand the fact that the elderly are the vehicle through which IKS is passed from one generation to another. Their knowledge is of paramount importance because it signifies what they possess as first-hand information.

2.6 Integrating IKS in Climate Change adaptation

The concept of integrating climate change adaptation through IKS is not a new phenomenon in Africa. Natural disasters such as droughts and floods have been on the face of the continent for a long time and over the years Africans have employed various ways to adapt to the effects of such disasters (Brooks, 1999). Communities in many African countries have as a result managed to cope with the changing environment and also along the way acquired the skills readily needed for them to cope in the face of climate change and other non-climate change-related disasters (Oluoko-Odingo, 2010). One of the major reasons why communities in most African countries have survived and overseen population growth is because over the years they have identified ways of coping with the changing environment within their cultures. It has worked well for them and it is important to note that such ways are consistently applied by many African countries in order to adapt to the effects of climate change (Gana, 2003). As such, given the documented ways in which communities have survived, one can argue that such knowledge can be applied in different contexts in academic work and by policymakers.

2.6.1 Climate change IKS adaptation and Sustainable development

The main reason for employing IKS adaptation in rural communities is reported to be a way of helping ensure the achievement of sustainable development in rural communities. Scholars confirm that little has been done to incorporate IKS into the formal climate change adaptation strategies vis-à-vis climate governance (Nhemachena; 2010; Mugambiwa & Rukema, 2019). The phenomenon of climate change cannot be dealt with outside the concept of sustainable development. This is so considering the fact that many rural communities rely largely on the natural environment, hence strategies to deal with the effects of the natural environment are needed in order for them to achieve sustainable development (Swart et al. 2003). As such, incorporating IKS into climate change policies can lead to the development of effective adaptation methods that are not only cost-effective but also participatory and sustainable. This is because they will not require more money to implement and the people around villages will be willing to take part because in then programs they will be within their cultural context (Robinson and Herbert 2001). It has however been recommended that the use of IKS should not be conducted at the expense of scientific methods but rather it should be employed in order to complement the existing scientific global knowledge systems (Robinson & Herbert, 2001).

Further, Ajani et al. (2013) argue that the significance of IKS has been noticed and acknowledged in its design and implementation that is aimed at sustainable development projects. In the same spirit, it has been established that the challenge at hand is that very little has been done to incorporate IKS into formal climate change adaptation strategies. That, therefore, calls upon policymakers and academics to find ways in which they can work towards ensuring that IKS is incorporated in the broader academic spectrum (Williams & Hardison, 2013). Despite the fact that IKS has been passed from one generation to the other by word of mouth, its significance should not be overemphasised. This is because IKS is considered to form the basis of local-level decision-making in many rural communities on the continent, as such it will be difficult for communities to do without it (Adger, 2012). It has also been established that IKS is transferable to the extent that it provides relationships that connect people directly to the environments in order to assist them find ways of adapting to the effects of climate change.

The arguments that have been made thus far demonstrate that it is difficult to deal with climate change outside the context of sustainable development. Robinson & Herbert (2001) acknowledge the fact that climate change cannot be separated from sustainable development since sustainable development is the most effective way through which communities can frame the adaptation and mitigation question. The process of integrating IKS into climate change policies require the development of competitively effective adaptation strategies that are cost-effective and sustainable (Leonard et al., 2013). In that regard, it can be argued that IKS brings about simple and user-friendly strategies that communities can easily employ to cope with or adjust to the impacts of the climate in rural communities.

Furthermore, it has been documented that local farmers in sub-Saharan Africa have over the years developed a number of adaptation strategies that have constantly enabled them to reduce vulnerability to climate change and variability (Adger, 2012). Some ways that are constantly employed in many African countries include the development of early warning systems for the prediction of events. Predicting weather and climate is one aspect many rural communities are credited for because IKS gives them the capacity to understand the current weather conditions and to predict future weather conditions and disasters (Williams & Hardison, 2013; Mugambiwa, 2018). That suggests that predicting weather conditions is the strength of farmers in most parts of sub-Saharan Africa rural communities. It is reported that these farmers have developed complex systems that they use in gathering, prediction and interpretation weather-

related aspects and information using IKS (Adger, 2012). The systems they employ with the use of IKS have been very immensely significant to the farmers as a way of managing their vulnerability to the effects of climate change in a very important way.

2.7 Water and land resources usage as indigenous adaptation measures

Climate change and variability in sub-Saharan Africa is expected to have overwhelming impacts on agriculture and land use, ecosystem, human settlements, health and water resources (Luseno et al., 2003). That being the case, communities in sub-Saharan Africa are expected to brace themselves by enhancing their adaptive capacity. However, with respect to agriculture, water and land use, climate change is set to affect the significant change in agricultural production both in terms of the quantum of products as well as the location or area of production (Mano & Nhemachena, 2006). The change in Sub-Saharan Africa is expected to significantly affect crop production since agriculture is largely rain-fed. The other challenge that is likely to affect communities will be temperature increases and decline in rainfall (Mogotsi et al, 2011). It is also important to note that the effects of climate change are not only going to be seen on the agricultural or productive side but rather it will also be experienced through the displacements of individuals and families since it is likely anticipated that people will be forced to move to marginal lands.

Another important aspect that will be seriously impacted by climate change is water resources (Moeletsi et al., 2013). The availability and quality of water are highly affected largely because climate change can either result in less precipitation or cyclone that both result in drought. In the event that there is less precipitation there will be less water for agricultural activities and in instances where there are floods, the quality of water available is likely to be largely contaminated and crops are destroyed which results in hunger and food insecurity. Both effects can be argued to have serious impacts on agricultural activities since rural communities rely heavily on agriculture as the basis of their subsistence economy (Joshua et al., 2011). It has also been revealed that water is considered to be critical for agriculture across the semi-arid tropics despite the fact that rainfall predictions are said to be uncertain. In that regard, scientists concur that climate change will reduce the availability and storage of water and warmer temperatures will increase water quantity and quality that is needed to water crops (Mogotsi et al. 2011; Moeletsi et al. 2013). The improvement of crop production is largely reliant on crop

production which suggests that water availability is of paramount importance insofar as crop production and sustainable development is concerned.

Numerous adaptation strategies that are related to agriculture have positive impacts on water resources and management (Nkoana et al., 2018). That is most important because there is no form of agriculture that takes place without water resources and farmers make various efforts to supplement water resources in the event that they are faced with the effects of climate change that strain water resources (Anguelovski et al., 2014). In that regard, one needs to make mention of the fact that most of the water-related adaptation strategies include the different types of irrigation that many people take part in. These include syphoning water from the rivers or wells or boreholes. However, despite the different types of irrigation that people are involved in, they all serve the same purpose, which is to provide supplementary sources of water (Cooper et al., 2016). It has also been argued that improved cropland and grazing management plays an important role in water storage and infiltration in an effort to reduce loss through runoff and resulting in greater water availability in the soil and enhancing ecosystem water balance. This also plays an important role in manure application and generally for other approaches that are responsible for maintaining or increase soil organic matter.

Further, conservation agriculture is said to be important in the reduction of evaporation from the soil in drier environments (Nkomwa et al., 2014). This comes as a result of the combined water loss that takes place through runoff and evaporation which often leaves less than half of the rainfall available for crops. It has also been established that terraces and contour ridge farming also have huge impacts on water, providing for storage of rainfall and discharging excess runoff through a drainage system (Nkoana et al., 2017). Nonetheless, in places where water management is aimed at drainage to lower water tables for crop production, there will be the risk of exposing soil organic matter and promotion of substantial losses of soil carbon. The arguments provided by scholars reveal that much of the concern over water resources in agriculture stems from a lack of moisture needed to maintain crop or forage production at optimal levels.

Moreover, it has been argued that this issue is particularly critical in dryland agricultural systems (Abbas et al., 2016). As a result, irrigation is considered to be the most common and direct way for producers to reduce water stress to crops and forage grasses through improved

cropland and grazing management are also some viable alternative strategies that can be used to improve soil water regimes. Nkomwa et al. (2014) established that in semi-arid areas of sub-Saharan Africa, small-scale farmers make use of planting pits to harvest rainwater as well as rehabilitate degraded land for cultivation of millet and sorghum. This form of technology is known to improve infiltration and increases nutrients that are found or are available on sandy and loamy soils which leads to significant increases in yields and improved soil cover. In the same places, farmers are also involved in water harvesting from rooftops and they also divert water from natural springs into tanks (Anguelovski et al., 2014). This helps to ensure that they have a substantial amount of water stored up for future use. This suggests that when they experience drought, the stored water will sustain them for a much longer period of time, which will make it possible for them to continue with their agricultural activities.

Further, it has also been found that water is important for supplementary irrigation of vegetables and crops (Cooper et al., 2008). In some locations, it was argued that the weather becomes dry, as in the case of a short period of rains then, as a result, the water infiltrates underground and it is used by the plants such that farmers continue with their farming activities (Abbas et al., 2016). Also, crops are said to likely grow to maturity making use of the conserved moisture. The experiences of farmers demonstrate that no matter the fewer numbers of days that are available for farmers in a season, they will be in a position to harvest water in the pits (Nkoana et al., 2018). Of uttermost importance is the fact that these processes are made possible by the combined use of IKS and scientific techniques both of which have potentialities of contributing to productivity and also sustaining the farming system.

2.7.1 Climate-proof crops adaptation

Land-based adaptation also has what is referred to as climate-proof crops adaptation. The International Crops Research Institute for the Semi-Arid Tropics⁸ (ICRISAT) has developed pearl millet hybrids that cope with temperatures of 40 degrees Celsius and deliver normal yields with limited water (Abbas et al., 2016). That is what is referred to as climate-proof crops. It is very important to note that such crops are of paramount importance when it comes to climate change adaptation. Similarly, the Kenyan Ministry of Agriculture also established high-yielding drought and disease-resistant varieties of maize, sugarcane and wheat (Nyariki et al.,

⁸ The International Crops Research Institute for the Semi-Arid Tropics is an international organization which conducts agricultural research for rural development.

2009). Even though this form of crop is not the same as the one developed by the ICRISAT the idea remains the same that of climate-proof crops (Lwoga et al., 2010). Other countries that have introduced the same crop include Congo, Sudan, Tanzania and Uganda all of which fall under arid and semi-arid regions. In that regard, one can argue that the climate-proof crops are considered to be of paramount importance when it comes to climate change adaption (Oluo-Odingo, 2010). The process adds on the many other forms of adaptation that have been established in this section

2.7.2 Pest control methods

Pest control methods in many studies are not regarded to be adaptation measures but in essence, they play a huge role as adaptation measures considering the fact that most of the pests that farmers encounter are a result of climate change (Nkoana, 2018). Pests have always been one of the many challenges that farmers face in their activities even outside the context of climate change. This suggests that in the face of climate change the incidence of pests becomes more severe considering the actual and expected impacts of climate change which are numerous and diverse (Nyariri et al., 2009). As such, scholars suggest that the development of technologies that help farmers to control pests is of paramount importance. These methods are both in form of scientific and IKS methods because what remains of paramount importance is getting rid of the pests. It has also been found that climate change has numerous challenges on the development of pests but the truth is that not all pests are a result of climate change (Lwoga et al., 2010). This suggests that there are some natural plant-related pests as well as climate change-induced pests. Given the circumstances around pests, one can argue that the effects are all the same in that they all have huge impacts on the productivity of agricultural produce, which is, in essence, a huge challenge for farmers.

2.8 Conclusion

This chapter has discussed numerous aspects that need to be taken into consideration in the study on climate governance through the use of IKS. Those aspects include an understanding of what climate change certainly is as articulated by other scholars. The concept of climate change was therefore found to refer to long-term variations in the earth's climate, which has been found to be caused by the release of greenhouse gases that trap heat in the atmosphere resulting in the planet becoming hotter than normal. In essence, that was the first objective of the chapter, which was followed by an inquiry into the socio-economic effects of the

phenomenon of climate change. The chapter also made an important contribution that even though rural communities are less likely to contribute to the effects of climate change due to their location and lack of use of modern technology, they suffer the most from the effects of climate change.

Numerous adaptation strategies were presented in the chapter and these refer to activities such as crop change, irrigation and natural mulching among many others. This was important because it is a fundamental expectation to inquire into matters pertaining to climate change adaptation on any work that focuses on climate governance because the concept of adaptation plays an important role in climate governance. Also, the use of IKS and how it is relevant in climate change adaptation was documented with reference to a plethora of scholars in the field. Having understood the various aspects around the concept of climate change, the chapter also focused on the concept of governance which was introduced as the general concept as it is applied in the field of politics then it was narrowed down to climate governance specifically. Then lastly the chapter addressed one of the less likely forms of adaptation which is known as pest control.

CHAPTER THREE: THEORETICAL FRAMEWORK

3.0 Introduction

The previous chapter dug into the conceptual underpinnings around climate change, IKS and adaptation vis-à-vis envisioning IKS climate governance, which is the fundamental objective of this thesis. However, it is essential to place the study within relevant theoretical specs in order to retain its academic relevance. As such, this chapter presents a triangulation of grounded theory, sustainable livelihoods approach and Afrocentricity. The major reason for the adoption of grounded theory was that the concept of IKS climate governance is seemingly new and situating it within existing theoretical paradigms was considered problematic and limiting. Hence, the researcher saw it fit to use the closely related theoretical perspectives namely sustainable livelihoods approach and Afrocentricity as supporting paradigms. The combination of the theories is of paramount importance to a study of this nature because it provides a foundation for the knowledge that is passed from generation to generation and its applicability to modern-day climate change management, adaptation, mitigation and the general climate governance narrative for sustainable development.

Grounded theory entertains theoretical saturation that evolves from data collection. As such, following the dictates of grounded theory, this thesis developed a conceptual model of IKS climate governance (see. figure 7.2). The reason for employing a triangulation of the aforementioned theories was to support the formulated conceptual model because it is profoundly informed by traits of Afrocentricity and sustainable livelihoods approach. This is supported by Bryant (2002) and Clarke (2005) who contend that the basic grounded theory guidelines can be adopted in line with twenty-first-century theoretical and methodological approaches. This is fundamental in giving life to a newly formulated conceptual model since it has to borrow some facets from the existing theoretical perspectives in order to gain prominence within academic circles.

3.1 Understanding Grounded theory

Grounded theory was propounded by sociologists Barney Glaser and Anselm Strauss. The creation of the theory was informed by the high levels of displeasure Glaser and Strauss had with the existing theories that dominated sociological research (Glaser, 1992). The fundamental argument was that there is a need for researchers to be in a position to formulate theories from

the findings of social research rather than rely entirely on the existing theoretical perspectives. This was considered instrumental because it gives rise to the formation of new social theories that are social bound and context-specific. Glaser and Strauss (1967) assert that such theories are essential in understanding the specific detailed features of any area or aspect of social research. This is because the theory would be grounded in the data from which they had emerged rather than relying on analytical constructs and variables from pre-existing theories. As a result, grounded theory was established to open space for the development of new contextualized theories.

Furthermore, Glaser (1992) asserts that grounded theory should be employed as a general methodology of analysis that is closely associated with data collection that makes use of the data to formulate a theory using systematically applied set of methods. Glaser and Strauss (1967) opined that the other importance of grounded theory is to help forestall the opportunistic use of theories that hold a dubious fit. Their argument was that there is a tendency among researcher to produce highly empirical research whose conclusion has a tacked-on explanation borrowed from a logically deduced theory. In so doing, the author will be trying to furnish the data with a more general sociological meaning and to account for and interpret the findings. Glaser and Strauss (1967) present what is termed logico-deductive theorizing. This is whereby the sociologist makes use of selective examples systematically and allows them to have theoretical control over his formulations. This is largely because the adequacy of theory in sociology comes from the premise that it cannot be divorced from the process through which it is generated (Babbie & Mouton, 2011). As such, one of the ways of judging the usefulness of a theory is by assessing how it was generated. It is also argued that in order for a theory to gain prominence it should possess the following facets; logical consistency, clarity, parsimony, scope and integration (Babbie & Mouton, 2011).

Further, the generation of theory from data is not entirely a result of the data that is collated for the study. Rather, it is a product of a combination of systematically worked out data and other ideas that emerged from the research (Babbie & Mouton, 2011). The source of certain ideas can also come from sources other than the data. Grounded theory guidelines provide steps through which the researcher should follow in order to reach the conclusions of a theoretical perspective. The reason for the adoption of grounded theory is to do away with the dominance of hypothetico-deductive theory-testing approaches. Against this background, Glaser and Strauss suggested the adoption of grounded theory as a way of systematically building a theory

making use of data obtained from social research. As such, the steps and guidelines followed in formulating the conceptual model presented in this study through grounded theory are as follows:

3.1.1 Identifying Categories

In the formulation of theory, there is a need for the researcher to group together instances such as events, processes or occurrences that possess the central commonalities and features. Strauss and Corbin (1990: 61) are of the view that "...categories can be at a low level of abstraction, in which case they function as descriptive labels. For example, references to 'anxiety', 'anger' and 'pity' can be grouped together under the category heading of 'emotions'." In that regard, categories are considered to be more analytic rather than descriptive. Their role is to interpret instead of simply labelling instances of phenomena. As such the development of the conceptual model in chapter seven (see. Figure 7.2) began by identifying the different categories that are essential in IKS climate governance. The major categories that were identified are Key stakeholders, spirit mediums, smallholder farmers and traditional leadership. The categories were essential at a low level of abstraction because as independent actors they would not have positively contributed to the development of the model. This implies that the combination of different organs to make a category was essential. For instance, key stakeholders as a category were developed from the different institutions namely the government, NGOs and the media. The other categories are the traditional leaders who comprise the village headmen and chiefs and the smallholder farmers, a category that comprise individual families that are involved in farming activities. Given the nature of the aforementioned categories one can ascertain that the identifying of categories was the first significant step in the development of the conceptual model.

3.1.2 The Coding process

After identifying the categories, the step that followed was coding which is largely descriptive as it gives a chance to the researcher to identify higher-level categories that systematically integrate low-level categories into meaningful units (Glaser, 1992). This implies that analytical categories are introduced. This is essentially because grounded theory focuses on the development of new context-specific theories hence, category labels are not supposed to be derived from existing theoretical formulations. It is highly recommended that category labels be *in vivo* which implies that they should constantly make of words or phrases used by the

participants in the study. That significantly assists the researcher to avoid borrowing traits of existing theories into the analysis. The development of a conceptual model witnessed the integration of high level and low-level categories in order to establish meaningful units.

The high-level categories that exist in the study include the government, which was largely referred to by participants as *kuvakuru ikoko/ vakuru vakuru/ vakuru vehurumende*, which means the most powerful authorities. The category was regarded as a high-level category because it is treated with respect and fear based on the role the government plays in the provision of free agricultural inputs and rendering general support to the farmers. Whereas fear is created by the manner in which the governing party ZANU-PF is known to silence opponents. The other high-level category was the traditional leaders who comprise the chief and the village head who are equally respected in their communities. These high-level categories were systematically linked with low-level categories of Smallholder farmers and spirit mediums. The two are considered to be low-level categories because they comprise of ordinary community members. Coding then established a linkage among the different categories despite their differences in status. That was important because the process of climate governance through IKS could only be complete through the existence of the aforementioned link.

3.1.3 Negative case analysis

Negative case analysis is important in ensuring that the researcher consistently develops the emerging theory within the confines of the evidence (Glaser, 1992). This is accomplished by ensuring that after identifying a category as well as a linkage between categories, the researcher needs to look for ‘negative cases’ which refers to instances that do not fit (Glaser and Strauss, 1967). That is important because it allows the researcher to qualify and elaborate on the emerging theory by adding depth and density to it. The development of the conceptual model was reached at taking into consideration the evidence at hand which is the empirical data acquired from fieldwork. Negative cases were established in form of the elimination of a category that comprised traditional healers as an independent actor. The elimination was replaced and accommodated by the establishment of the most fitting category that was named ‘spirit mediums’. This is because there are also traditional healers who are not spirit mediums and the process of climate governance through IKS acknowledges more specifically spirit mediums compared to just traditional healers who are also referred to as traditional medical

practitioners. From the findings of the study in chapter five and six participants acknowledged the role of spirit mediums on different occasions. That then established the importance of spirit mediums in climate governance and as a result, they qualified to be part of the developed conceptual model.

3.1.4 Theoretical sensitivity and sampling

In theoretical sensitivity, the researcher makes a shift from a descriptive to an analytic level. Whereas theoretical sampling is dominated by the collection of further data in the light of categories that would have emerged from earlier stages of data analysis (Glaser and Strauss, 1967). In essence, the process refers to the checking of emerging theory as opposed to reality through the sampling incidents that have the potential to challenge its developing claims. In grounded theory, the researcher immerses self with the data such that he or she will be in a position to ask questions of the data and produce answers systematically (Babbie & Mouton, 2011). In that regard, the deep understanding of the data made it possible for the researcher to be in a position to ask questions like how is IKS climate government achieved in an era where Scientific Knowledge is dominant? This was a critical question that significantly informed the construction of the conceptual model.

However, the researcher managed to answer the question because of the deep understanding of the data achieved through the entire process of the study. Throughout the study it was established that it is difficult to make use of IKS without acknowledging SK. It has also emerged that most innovative ideas that are SK in nature borrow a lot from IKS. For instance, one of the participants in the study established that the syphoning of water from the river waterhole through solar-powered irrigation was just a new version of the indigenous system. This was because since time immemorial the community used to draw water from the river waterhole through the use of buckets and that method of irrigation forms part of their indigenous adaptation (in-depth interviews July 2019). As such, that kind of knowledge drawn from the data led to the establishment of the concept of IKS-SK nexus, which then witnessed the incorporation of SK in the IKS climate governance model.

3.1.5 Theoretical saturation

In grounded theory, the process of data collection and data analysis continues until theoretical saturation has been achieved (Glaser and Strauss, 1967). This implies that the researcher continues

to sample and code data to an extent where new categories emerge. However, it is important to note that theoretical saturation is not realistic hence, it functions as a goal rather than a reality (Babbie & Mouton, 2011). In that regard, the formulation of the conceptual model on IKS becomes the goal of this thesis and it ought to be improved in future studies.

3.2 Sustainable Livelihoods Approach

Sustainable livelihoods approach was of paramount importance in the formulation of the IKS conceptual model. Ideally, the theory informs the study and the conceptual model specifically. The Sustainable Livelihood Approach (SLA) emerged in the late 1990s when it formed a central concept of the Department for International Development's (DFID) strategy during the early years of the Labour government in the United Kingdom (UK). The concept was aimed at refocusing the international development efforts in order to eliminate poverty and encouragement of economic growth in order to empower the poor (Chambers & Conway, 1992). The main contribution of the theory was that a livelihood is complete if it constitutes the capabilities, assets and activities that are essentially required for a means of living.

Chambers and Conway (1992) further established that a livelihood is only considered to be sustainable if it has capacity to cope with and recover from stress and shocks. Also, it should be able to maintain its capabilities and assets in order to provide sustainable livelihoods opportunities for future generations (Chambers & Conway, 1992). In that regard, the formulation of the conceptual model was informed by the fact that the community at large should be in a position to cope and recover from the stress and shock that was produced by disasters such as climate change induced hazards. In essence, the capabilities and asserts maintained were, in fact, the relationship that exists between the community and the organs that are represented in the model. This relationship comes in form of the inputs that the community is strategically positioned to receive. These inputs come in form of several forms of assistance from the organs in the model in order to help the community achieve its outputs that are namely sustainable development, improved livelihoods, poverty alleviation and food security (see. Figure 7.2).

The effects of climate change bring about shock and stress that communities are expected to deal with. Their ability to overcome the shock and various forms of stress demonstrates the likelihood of them providing sustainable livelihood opportunities for the next generation. The

fact that in the model the inputs are channelled into the aforementioned outputs demonstrates that IKS climate governance is essential in taking care of future generations just like the Sustainable Livelihoods Approach. Further, Sustainable Livelihoods Adaptation is also conceived using the Sustainable Livelihoods Framework (SLF). The SLF is cognisant of the manner in which people develop livelihood strategies in order to attain certain livelihood outcomes in response to a specific vulnerability context. Of particular importance to this study is Muchie and Mudombi's (2011) analysis of the nexus between knowledge and adaptation that was arrived at through the use of the SLF. The conceptual framework, suggests that information communication technologies are assets that play an important role by facilitating communication between rural communities and outside groups. This includes the transferring of information relating to climate change from key institutions and individuals to smallholder farmers and rural communities in general and vice versa.

3.2.1 The Scoones Paradigm

The concept of 'sustainable livelihoods' (SL) is considered to be an analytical framework that developed from existing studies on rural livelihoods systems, agrarian change, and community development that dates back to the works of William Cobbett, Karl Marx, Amartya Sen and several other classical theorists (Chambers & Conway, 1992). Ian Scoones is one of the key figures in the SL. His contributions are drawn from a short working paper that he wrote setting out a succinct approach to the understanding of livelihoods. To put this into perspective, Scoones established that the sustainability of rural livelihoods should form the basis for improved rural development and poverty alleviation. Scoones' argument has numerous similarities with the model developed in this thesis because it also emphasised the importance of sustainability and poverty alleviation which comes through a coordinated process of cooperation among the agents represented in the study. This process gave birth to what the model terms inputs and outputs of which issues of sustainability and development are represented in the outputs whereas the inputs are the various efforts made by various institutions to ensure that society achieves its ultimate goals of achieving improved livelihoods, eradicate poverty, ensure food security and ascertain sustainable development (see. Figure 7.2).

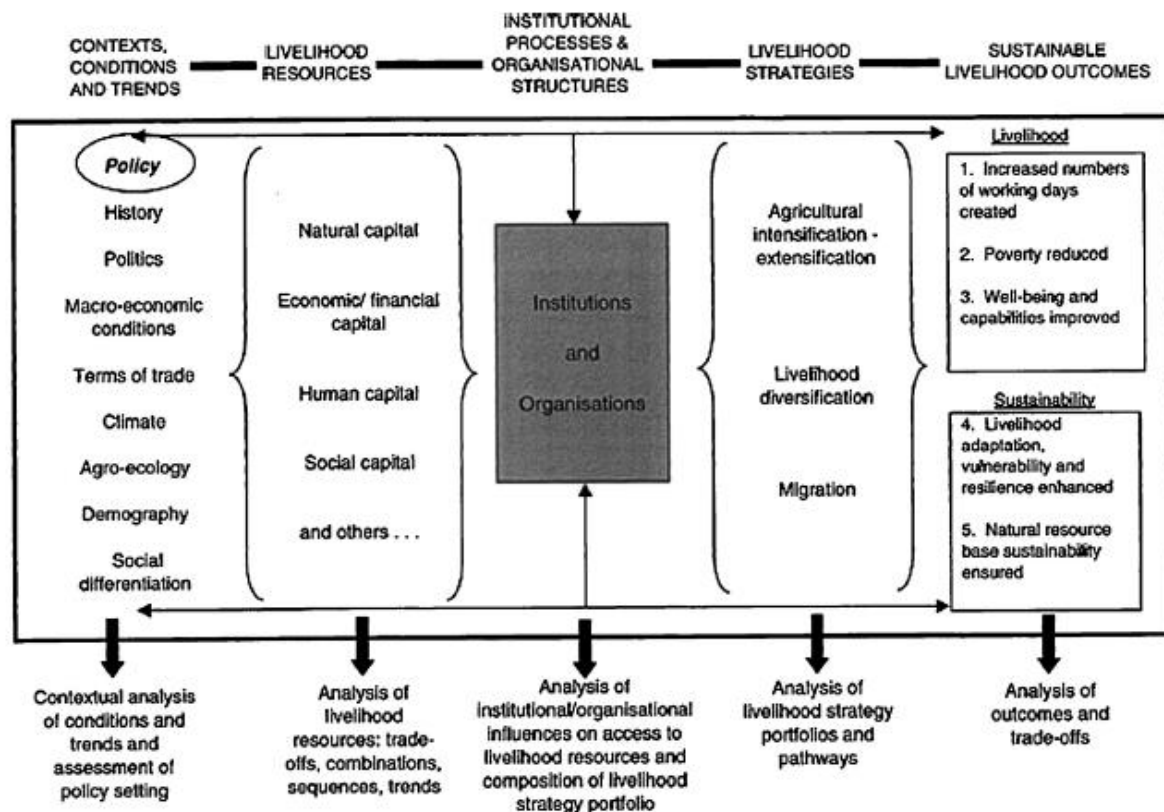


Figure 3.1: The Scoones' Sustainable Livelihoods Framework

Source: Adapted from Scoones (2015)

The major contribution of Scoones was the holistic dimension of knowledge of rural communities and livelihoods approaches. Figure 3.1 demonstrates how the role of contexts, conditions and trends relate to livelihood resources and institutional processes as well as organisational structure. This is also closely linked to livelihood strategies in order to cater for the ultimate goal, which is sustainable livelihoods outcome. In that regard, one of the major contributions of Scoones model and the model developed in this thesis is that the two models observe common facets, which are namely context, institutions, livelihoods strategies and the fact that achieving sustainable livelihoods is the ultimate goal of the whole process. Further, Scoones's (2015) work provides a detailed understanding of how rural communities make informed decisions to improve their livelihoods and ensure sustainable development. Scoones' extended livelihood framework also encompasses the real political economy of livelihoods in which he combines some ideas traced back to Henry Bernstein with his own in an effort to formulate questions that are fundamental in understanding the trends in rural livelihoods such as; Who owns what? Who does what? Who gets what? and What do they do with it?

3.2.1.1 Sustainability

The central focus of the Scoones paradigm was on sustainability, which largely dealt with assessments of the success, effectiveness and consequences of diverse adaptive strategies vis-à-vis sustainability. However, Gwimbi and Mundonga (2010) assert that the adaptation strategies used by farmers to deal with the negative effects of climate change are selective and protective, such that they are not sustainable in the long term. Similarly, Bola et al. (2014) are of the opinion that coping strategies adopted by households in Mbire district were ill-fitted in adapting to floods and droughts. An indication of the findings of numerous studies demonstrate that sustainability is a huge risk insofar as climate change adaptation is concerned.

3.3 Afrocentricity

Afrocentricity also significantly informed the formulation of the IKS climate governance model. Afrocentricity emerged as a theoretical perspective in the 1980s. The theory was propounded by Molefi Asante as a systematic challenge to Western ontology and epistemology (Mkabela, 2005). The Afrocentric theory emerged from the Afrocentric paradigm, which deals with African identity from the perspective of African people. The Afrocentric perspective is considered to be a revolutionary paradigm shift in scholarship whose emphasis is on the adjustment to black disorientation and lack of agency. The main objective of the theoretical perspective was to answer the question “What would African people do if there were no white people?” This implies that, had there not been any intervention of colonialism or enslavement, what indigenous responses would occur in the relationships and attitudes toward the environment and kinship patterns among other aspects of life for African people? (Asante, 1999). In that light, Afrocentricity advocates for the fundamental role of the African people within the context of African history in a way that eliminates Europe from the heart of the African ontology.

Moreover, it can be established that Afrocentricity plays an important role in the establishment of the model in this study. This is because the ultimate goal of the conceptual model was to locate Africans in their contexts on matters pertaining to climate governance. This was achieved through the emphasis on the importance of IKS in all areas of climate governance. Also, it was established in the model that the success of SK is within IKS since it is IKS that gives all SK components a springboard from which to leap forward. This presents itself in most of the IKS methods that were presented by the participants and it resulted in the proposal of an

SK-IKS nexus climate change adaptation and governance. The nexus is largely represented in the model through the combination of SK and IKS based institutions and processes. The success of the model is also attributed to this articulately coordinated and well-structured relationship which produces a sustainable outcome in the form of ‘outputs’ as presented in the model.

3.3.1 Tenets of Afrocentricity

Asante (1999) asserts that the adoption of Afrocentricity requires one to have an understanding of the important tenets that are found within the Afrocentricity theory. The tenets are of paramount importance because they significantly inform the manner in which Afrocentricity should be applied to different fields. This is because Afrocentricity over the years has been employed in various social science fields such as History, Anthropology, Political Science and Sociology. Hence, when employing it one needs to take into consideration the specific tenets that are suitable for the study underway. The major tenets identified for this study are; location of phenomenon, dynamics of phenomenon and analytic Afrocentricity.

3.3.1.1 Location of phenomenon

Afrocentricity recommends the importance of locating any research phenomenon in order to adequately understand it. In that regard, the general premise is that a phenomenon should be carefully studied and analysed to enable the researcher to have a clear understanding of its patterns (Kershaw, 1990). This, as a result, will be important in the provision of knowledge on the complex interrelationships of “science and art, design and execution, creation and maintenance, generation and tradition, and other areas bypassed by theory” (Kershaw, 1990:40). This implies that the study of a particular society will only be fully achieved if the researcher has information about the society through understanding the patterns of life.

Furthermore, location of the phenomenon significantly informed the development of the conceptual model because the IKS climate governance model was context-specific and social bound. This means that all aspects presented in the model are a product of what transpired in the field and an analysis of the conclusions that were drawn by the researcher. In that regard, the model becomes a highly informative structure that presents the specific occurrences in the various circumstances the community goes through on a daily basis. This was of particular importance because a study of this nature significantly required to be informed by a theoretical

perspective that is embedded in indigenous values and also not all indigenous values are the same, most of the IK values are context-specific. As a result, the adoption of Afrocentricity and grounded theory was of paramount importance in establishing this unique theoretical contribution to IKS climate governance.

3.3.1.2 Analytic Afrocentricity

Analytic Afrocentricity refers to the application of the values of the Afrocentric textual analysis (Kershaw, 1990). This implies that there is a need for the researcher to have knowledge of the principles of Afrocentricity so as to use them as a guide in the process of analysis and discourse. As a result, one can establish that inasmuch as locating the phenomena is important the chronology of the phenomenon is also significant in some situations (Kershaw, 1990). Analytic Afrocentricity was of paramount importance in the adoption of the grounded theory to formulate a conceptual model for this study. The general understanding of textual analysis, which was achieved through the careful analysis of the discourse provided by participants in chapter five and six was immensely significant because it gave the researcher, background information of the general perceptions of IK in the study. In addition, it is important to note that it is the knowledge of this textual discourse that gave the researcher the ideas on the further structuring of the conceptual model.

3.3.2 Afrocentricity and climate change knowledge

Climate change knowledge in an African perspective is translated to 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) is of the opinion that the civilization of African communities failed to separate religion and philosophy such that their contributions to literature and science are openly linked to the principles of ancient wisdom also known as IKS. Apart from possessing knowledge of climate change, Africans are expected to play a significant role in adapting to the impacts of climate change in order to safeguard their communities. The inclusion of spirit mediums in the conceptual model developed in this thesis was a sign of the importance of spirituality on matters pertaining to climate governance in African indigenous communities.

3.3.3 Culture-based climate change adaptation

Asante (1980) is of the view that Afrocentricity acknowledges the history and culture of the people under investigation. As such, it is argued that Afrocentricity would be meaningless without the existence of African history and method. 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 provide meaning to the history of the African subject and consequently offers a sense of place in the world arena. Afrocentricity is theoretically grounded within the quest of human knowledge from a culturally and historically based standpoint of the subject. This thesis made reference to culture based climate change adaptation as it is considered instrumental in the establishment of IKS climate governance. The conceptual model also emphasised the importance of culture-based climate change adaptation by its inclusion of traditional leaders and spirit mediums in the conceptual model. These custodians of culture were strategically positioned in order for them to provide culture-based inputs to smallholder farmers and to the community at large in an effort to ensure better outputs that are channelled within the context of sustainable development.

3.4 Conclusion

In conclusion, this chapter presented a triangulation of grounded theory, sustainable livelihoods approach and Afrocentricity. This was systematically adopted in order to situate the study of IKS climate governance within the most befitting theoretical perspective. It was also established that even though Sustainable Livelihood Approach and Afrocentricity theoretical perspectives are strikingly related to the focus of this thesis, it was not theoretically probable to situate the study within their theoretical confines. This is because of the fact that IKS climate governance is considered to be a new phenomenon that requires a context-specific theoretical and conceptual paradigm and considering that fact would imply that the existing perspectives would be highly limiting.

As a result, this thesis adopted grounded theory to establish a context-specific theoretical model nevertheless with the aid of Afrocentricity and Sustainable Livelihood Approach. The researcher saw it fit to use these closely related theoretical perspectives namely sustainable livelihoods approach and Afrocentricity because their founding traits and characteristics are designed to inform issues related to the fundamental aspects of this study which are namely the role of IKS, livelihood approaches, and sustainable development. The combination of the

theories is of paramount importance for this study. This is because it provided a foundation for the knowledge that is passed from generation to generation vis-à-vis IKS. In addition, it is equally important to take into consideration its applicability to modern-day climate change management, adaptation, mitigation (Climate governance) and the general outputs which are namely sustainable development, improved livelihoods, food security and sustainability (an outcome of the well-orchestrated IKS governance structure). This was done through careful consideration of the fact that grounded theory entertains the theoretical saturation that evolves from data collection.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.0 Introduction

The previous chapter presented the theoretical framework of the thesis, which situates the study within the grounded theory paradigm. As such, this chapter builds from the previous and deals with the research methodology of the study. The chapter begins with the description of the study area in which a narrative of the state of Mutoko district was presented. The chapter then goes on to present the methods and materials of the study where fundamental methodological aspects are unpacked. These include population and sampling, data collection and data analysis. Lastly, the chapter presents ethical considerations and the limitations of the study.

4.1 Description of Study Area

Afrocentricity dictates that in the process of studying a phenomenon there is a need to locate its origin and background in order for one to adequately understand it (Kershaw, 1990). This implies that having knowledge of the economy of Mutoko district is of paramount importance for the researcher because it helps in understanding the state in which the study area is on issues pertaining to climate change. Mutoko district lies within Mashonaland East province (MEP) of Zimbabwe. The district covers 4,092.5 square kilometres (Mvumi et al., 1988). The 2012 population census revealed that the district has 146 127 people (Moyo, 2016). Mutoko was established as an administrative station in 1911 and it lies within 143 km from Harare, the capital city of Zimbabwe. The district was named after the local Chief Mutoko and the area is occupied by the *Buja* people. The district constitutes of a growth point, communal areas, resettlement farms and small scale commercial farms. The growth point is populated at 198 people per square kilometre, while the communal areas are at 46, resettlement farms at 23 and small-scale commercial farms at 10 (Bhatasara, 2016). Mutoko Rural District (MRD) constitutes of twenty-nine (29) wards of which each consists of six (6) villages that accommodate about one thousand (1000) people per village or eighty (80) to one hundred and twenty (120) families. Some villages have Village Development Committee (ViDCos) which report to the Ward Development Committee (WaDCos) and all villages have a village headman who is responsible for the day to day running of the villages. At ward level, the district is represented by an elected councillor and the council is headed by a Chief Executive Officer (CEO) (Mvumi et al. 1998).

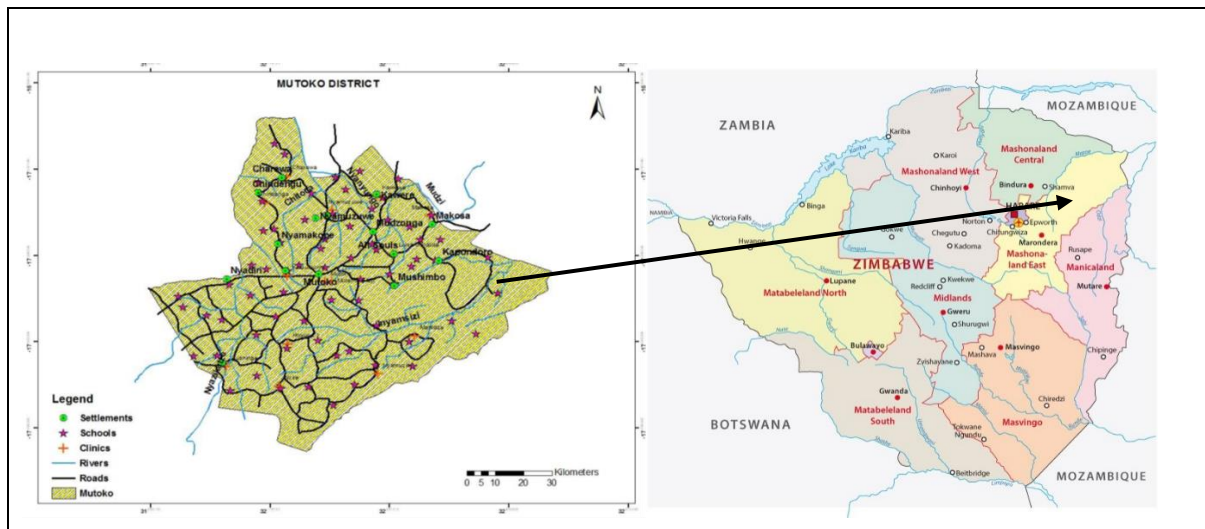


Figure 4.1: Map of Mutoko District

Source: Adapted from Bhatasara (2016) and google maps.

4.1.1 Economy

Conservation farming is at the core of subsistence farming in Mutoko. Conservation farming takes the form of the use of natural ecological processes that are used to conserve moisture, enhance soil fertility, improve soil structure and reduce soil erosion and the presence of diseases. Fanelli and Dumba (2011) assert that conservation farming has three ways in which it improves soil structure and reduces erosion. These are namely minimal soil disturbance, retention of crop residues and crop rotation. Rain fed crop production dominates the district and the crops that are mainly grown in the area are small grains (sorghum and millet), maize, groundnuts, sunflower and cotton production on a small scale. In most villages crops are grown at a small scale for consumption though in some instances excesses are sold to supplement household income considering the fact that lately, cotton production has been waning as a result of lower prices impacted by economic hardships and inflation. When there is adequate rainfall in the area, one of the most significant sources of income is the sale of dryland crops which smallholder farmers have resorted to and these include tobacco production and horticulture. Horticulture is a common form of agriculture practised in the area and the farmers involved specialise in tomatoes, onions, leafy vegetables, butternut and cucumbers. Due to the high temperature in the area, crop production is not viable in most of the areas unless one has irrigation. Hence, the second common practice in the area is livestock rearing where farmers specialise in cattle, sheep, goats and poultry (Moyo, 2016). Those who use irrigation for

farming syphon water from major rivers, seasonal pools and shallow wells, which provide them with sources of water for their livestock.

Furthermore, at the growth point, there are diverse economic activities, which include formal and informal trade. Farmers from the village and resettlement farms regularly go to the growth point to sell their produce at the market place. Government departments, Non-Governmental Organisations (NGOs) and private business enterprises are also responsible for the provision of most formal forms of employment at the growth point. Some families that are not actively involved in the aforementioned economic activities due to circumstances like old age rely on relatives working in big cities. Shumba et al. (2012) acknowledge the role played by relatives who work in towns and cities in the provision of remittances to relatives in rural communities as fundamental. Moreover, gold panning is one of the attractive economic activities in the area. Mining activities are conducted in a village called Makaha along the Nyadire River and it is done mainly during the dry season (Shumba et al., 2012). Gold mining is also important in the area because since the area is located in the semi-arid region, crop production is regularly affected by the lack of sufficient rainfall, which often results in poor harvests. Hence, in instances when the production of crops is at its lowest, gold panning sustains communities economically.

Furthermore, Bhatasara (2016) acknowledges the importance of black granite minerals as an important economic resource in Mutoko. The district is considered to be the largest producer of the black granite minerals in the country. It is reported that the black granite mines in the district provide employment to over 600 people. The income that comes from the granite is considerably competitive because it is mined mainly for export purposes. However, Bhatasara (2016) reveals that there have been conflicts and contestations among the community, the Rural District Council (RDC) and the Environmental Management Agency (EMA) for the failure to invest in the district yet the community provides a lot of granite stones which conversely causes tremendous environmental degradation.

4.1.2 Climate

The climate in Mutoko district is mild and generally warm and temperate (Fanelli & Dumba, 2011). The area receives much less rainfall in winter compared to summer and the average temperature in the region is between 19.4 °C to 22.0 °C. Metero365 (2017) reveals that

precipitation averages 713 mm and it is the lowest in July, with an average of 1 mm. Most precipitation happens in January where it averages at 179 mm whereas the average temperatures vary during the year by 7.3 °C. A large part of Mutoko district is located within the agro-ecological region IV which receives only 450-600 mm of rainfall per year which makes the entire region susceptible to regular seasonal droughts. Precipitation occurs between November and March just like in most parts of the country and it is followed by approximately seven months of dry conditions. The area is characterised by fairly high temperatures which in summer average temperatures are fairly high with daily summer averages ranging from 27 °C to 32 °C whereas winter temperatures are moderate at a minimum of 14 °C (Metero365, 2017).

The district has in the past years experienced numerous successive droughts which is a result of the fact that rainfall is becoming more and more uncertain and rain seasons are becoming shorter which has adverse effects on crop production and animal husbandry (in-depth interviews July 2019). Region IV in which Mutoko district is situated is marginal for agricultural production, which is attributable to unfavourable climatic circumstances characterised by erratic rainfall patterns, high temperatures and low soil fertility. Despite the fact that the region is characterised with low productivity, smallholder farmers are still involved in crop production even without irrigation. Moreover, it is also important to note that the vegetation in the district is dominated by sluggish growing tree species which are mostly in form of thorn trees and there is also a variety of *Musasa & Munhondo* (acarcia) and *miwuyu* (baobab) trees randomly distributed in the district.

4.2 Research Design

This thesis employed a cross-sectional design and an exploratory research design. Rahman (2016) asserts that a qualitative method is conducted to produce findings that are not arrived at by statistical procedures or other means of quantification. The focus in a qualitative study is to explore people's lives, lived experiences, behaviours, emotions, social movements and cultural phenomena. Shields & Rangarjan (2013) assert that exploratory research is conducted for a research problem that has not been clearly studied. Climate governance is not a new phenomenon but the study of it through IKS unleashes a new approach to the field. The employment of exploratory design is meant to establish priorities and develop operational definitions. The adoption of an exploratory design in this study paved way for the development of a conceptual model of climate governance based on IKS which took into consideration

indigenous people's lived experiences, cultural phenomenon and emotions. Moreover, it is also important to note that the research problem of the study indicates that little has been done in the field of climate governance and IKS hence the need for an exploratory inquiry into IKS climate governance. As a result, the exploratory inquiry brought about a review of certain trends that have not been clearly explored in previous studies.

This study was conducted to understand how climate governance takes place within the parameters or context of IKS. The focus was first on the perceptions of climate change among indigenous people, second the methods of adaptation they have in place and lastly, the study formulated an IKS based climate governance conceptual model. As a result, the study generated primary data through gathering of information from a wide sector that involved rural households, smallholder farmers, Key Informants and government staff that were working at local levels. One of the major objectives of this study was to examine climate change perceptions and adaptation strategies employed by community members and smallholder farmers. This information was gathered among community members, smallholder farmers and government staff such as AGRITEX officers and cotton depot employees. As such, the process of acquiring information from the aforementioned individuals was reached at by the use of a cross-sectional research design. A cross-sectional research design advocates for the collection of data on numerous cases at a single point in time so as to gather a body of the data in connection with the relevant variables which will then be examined in order to find out patterns or associations (Bryman, 2001). To put this into perspective, community members or household variables were used to gauge and analyse knowledge of climate change, climate change vulnerability and adaptation mechanisms employed by communities. Hence, to achieve the objectives of this study, adoption of the two designs was fundamental because when cross sectional design was responsible for collection of data from numerous cases, exploratory design was fundamental in digging deep into the relationship between climate change adaptation and IKS.

4.2.1 Population and sampling

The population of this study constituted of all smallholder farmers, households and institutions that are involved in climate change. Criterion purposive sampling was employed to select research participants from the villages in the district. According to Bryman (2012) criterion purposive sampling comprise of sample units that are selected because they possess particular

characteristics that enhance the exploration and understanding of the aims and objectives of the study. Hence, criterion purposive sampling was used to select thirteen (13) participants for in-depth interviews, ten (10) participants for a Focus Group Discussion (FGD) and two key informants from different government departments that are namely Department of agriculture and the Cotton Company of Zimbabwe. Hence, the total number of participants who took part in the study were twenty-five (25). The thirteen participants who took part in in-depth interviews constituted of adult residents of the community whose daily work activities are directly affected by the effects of climate change because all of them were smallholder farmers and that applies to the FGD as well. The reason for thirteen in-depth interviews was to enable the researcher to immerse himself with the data as recommended in a qualitative study.

Moreover, each interview took approximately one hour five minutes which demonstrates the need to make the overall number reasonable so that justice would prevail in the transcription, analysis and presentation of the data so as to enable data saturation. FGDs were conducted to allow community members to reflect on the role IKS plays in climate change. The role of IKS is not individual based which implies that it concerns the whole community where every member has some knowledge because IKS constitutes knowledge that has been passed from one generation to another. This suggests that it was important to have a group of community members together to share their knowledge because it is not a matter of confidentiality and having the group together was helpful because they concurred on many issues, which worked as confirmation of the authenticity of the information.

4.2.1.1 Selection of Mutoko district

Criterion purposive sampling was also used to select Mutoko district as the study location. This was done in order to suit the overall objective of the study and various factors were put into consideration. These are; firstly, Mutoko district is located in a semi-arid region, which favours drought-resistant crops and livestock production. Secondly, communities around the area depend largely on agriculture which points to the fact that their livelihoods are highly climate-dependent. A consideration of these factors calls for the need to understand the IKS governance structure of climate change in the area. Village selection was influenced by the desire to have a sample that is representative of all the villages in the districts. The representativeness was aimed at the presence of the similar fundamental attributes, which include livelihood activities such as communal subsistence farming characterised by maize, groundnuts, cotton and millet

production, and horticulture, which are common in all the villages. Other attributes include malaria-prone, poor road networks and living conditions, which makes the communities remote. As such, the three selected villages namely Matedza, Nyamuzizi and Chibeta constituted almost all the aforementioned characteristics. the aforementioned attributes are demonstrate the socio-economic challenges faced by people in Mutoko district hence, climate change impacts coupled with the already existing challenges makes the community immensely vulnerable. In addition, the community is more susceptible to the effects of climate change compared to communities with better socio-economic conditions.

4.2.1.2 Selection of Organisational workers/ representatives

Some of the Key Informants (KI) for the study were individuals who work for the organisations whose operations are directly or indirectly involved with environmental and climate change issues. These include the Environment Management Agency⁹ (EMA), Mutoko Rural District Council (MRDC), Agricultural Research and Extension (AGRITEX) and the Cotton Company of Zimbabwe (COTTCO). The intention of the researcher was to get insights from at least one representative from each organisation but only two representing COTTCO and AGRITEX were available and accordingly they took part in the study. The two representatives contributed fundamental insights to the current study because they work with farmers in communities on a daily basis.

4.2.1.3 Pilot study

Before the proposed interviews of the study were done, the researcher conducted a pilot study that was meant to test if the data collection technique and tools would work in an actual research setting. Kim (2010) asserts that a pilot study is a test conducted at a small-scale in preparation for the main study. As such, piloting for the study was done with tree farmers that the researcher met upon arrival in Nyamuzizi village on 13 May 2019, a month before the actual data collection process commenced. The intention of the researcher was to test the data collection method and tools to check if the proposed research methods would produce the intended findings as well as to test the data analysis techniques. The researcher also discovered that there were some commonalities on responses pertaining to IKS and some farmers were not so sure

⁹ The Environmental Management Agency is a statutory body responsible for ensuring the sustainable management of natural resources and protection the environment, the prevention of pollution and environmental degradation, the preparation of environmental plans for the management and protection of the environment.

about some IKS activities. This motivated the researcher to then employ a FGD on IKS related questions, which proved to effectively work as mentioned earlier in this chapter. Also, piloting on the use of in-depth interviews was effectively conducted with two farmers and produced the anticipated outcome which gave the researcher the go ahead to employ the proposed data collection tools. From the interviews, the researcher discovered that they were speaking to the objectives of the study and this orchestrated the use of grounded theory to develop an IKS climate governance model because most of the narratives were in line with both the objectives of the study and the intended theoretical perspective.

4.2.2 Fieldwork

The fieldwork for this thesis was conducted for a period of thirty days from 29 June to 27 July 2019. During this period, the researcher was based at Nyamuzizi primary school where he was accommodated by the deputy headmaster at the school. For the whole period of fieldwork, the researcher would commute on a daily basis to the different villages where the study was conducted. During the same period, the researcher also made use of observations on agro-ecological conditions, land use systems, livelihood activities, natural resource base and development activities that were implemented in the context of climate change. This was of paramount importance in the overall analysis of the findings of the key data collection tools that were used in the thesis. The major data collection tools that were employed were in-depth interviews and FGDs. Ochieng et al. (2018) assert that a FGD is a qualitative approach used to gain an in-depth understanding of social issues. The method obtains data from a purposely selected group of individuals. The in-depth interview technique is generally used when detailed information is needed from individuals in the study (Walter, 2006).

Furthermore, 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 and allows the researcher to immerse self with the research process and the data. In-depth interviews also help the researcher to achieve the same level of knowledge and understanding as the study respondent. Data collection was informed by factors such as age of the respondents, period of stay in the area and general understanding of climate change, climate change adaptation programmes and indigenous practices used to adapt to the effects of climate change. The FGD took one hour twenty minutes and the in-depth interviews took approximately one hour five minutes each. The FGD was conducted at the

cotton depot to cater for farmers who had come to sell their cotton. Appointment with the farmers was made two days prior to the day of the FGD and ten out of twelve farmers who had confirmed to take part in the FGD showed up. Household In-depth interviews were conducted at the participants' homesteads and the two KIs interviews were conducted at a cotton depot in Nyamuzizi village. For all the interviews both in-depth and FGD a tape recorder was used to capture the responses.

Further, all data collection was conducted with careful consideration of the dictates of grounded theory because the conceptual framework that was developed in the study was informed primarily by the data that was collected. Data that was collected through in-depth interviews, and FGDs enabled the researcher to explore the findings through initial open coding such that the researcher was able to establish tentative linkages between themes that emerged. In essence, data collection was informed by the emerging theory which explains the main attributes and characteristics of the formulated conceptual framework. To put into perspective, the main attributes of the formulated conceptual model in chapter 7 speaks to the traditional leaders, spirit mediums, key stakeholders and smallholder farmers as the key contributors to the development of the community in general inasmuch as climate change is concerned. In the conceptual model, the community is the major benefactor in that if inputs are well coordinated, the outputs will be favourable. The general outlook and presentation of the conceptual model demonstrate the importance of original data that was found in the study.

4.2.2.1 Household Interviews

The household interview guide was designed in accordance with the stated objectives of the study and research questions. It includes issues of an orientation nature to the general understanding of climate change. The issues discussed include socio-economic attributes, perceptions of climate change, knowledge of impact of climate change on their livelihoods, and strategies adopted to adapt to the effects of climate change (see. Appendix D). Gillham (2000) emphasised the importance of embarking on an extensive literature review before setting questions for a research study. This was adhered to because the researcher embarked on an extensive literature search before drafting the questions. That was found to be important because the questions were aligned to the objectives of the study, research gap and some issue found to be missing in the literature explored especially the role of IKS in climate governance. The interview guide was divided into five sections namely; 1. Biographical information, 2. Life

history, 3. Climate change perceptions and impacts, 4. IKS climate change adaptation, 5. Communal approach to climate change adaptation and 6. Traditional leaders' role in climate governance. The issues treated in these sections aimed to bring the general outlook of climate change by smallholder farmers and households with regards to general perceptions and adaptation strategies.

Life history interviews were considered to be of particular importance because it provided the underlying factors that inspired decision that participants had made over the years. Some of the life history interviews were extracted and given coverage in chapter five and six because they informed some of the most important themes that evolved from the findings of the study. Life history interviews were also in line with the key theoretical paradigms of the study in that the personal histories of the participants were fundamental in the formulation of the grounded theory and they revealed the shocks that are documented in the livelihoods approach. Kothari and Hulme (2004) assert that life histories are fundamental in the provision of wealth of data concerning people and their experiences compared to the provision of aggregated classifications and characteristics of adaptive strategies. Personal experiences of people are important because they give a realistic overview of the actual effects of climate change and the socio-economic scenario that prevailed at the time the experiences were encountered. Furthermore, the researcher did not use the actual names of the participants, rather pseudonyms were used in order to protect the identities of the participants.

PARTICIPANT ¹⁰	AGE	GENDER	PERIOD OF STAY IN MUTOKO DISTRICT
1. <i>Jacob</i>	88	Male	Since birth
2. <i>Tilda</i>	N/A	Female	32 years
3. <i>Melania</i>	N/A	Female	Since birth
4. <i>Richmond</i>	52	Male	Since birth
5. <i>Derick</i>	56	Male	20 years
6. <i>Peter</i>	N/A	Male	Since birth
7. <i>Jeremiah</i>	60	Male	26 years
8. <i>Melody</i>	75	Female	36 years
9. <i>Stella</i>	72	Female	Since birth
10. <i>Paul</i>	53	Male	Since birth
11. <i>Henry</i>	49	Male	Since birth
12. <i>Richard</i>	66	Male	Since birth
13. <i>Eliot</i>	47	Male	Since birth

¹⁰ Not their real names

Table 4.1: In-depth interviews participants

Source: Author (Fieldwork July 2019).

Table 4.1 presents the demographic information of participants who took part in in-depth interviews. These were largely smallholder farmers who had been in the area for a long time. They were all above 45 years of age and three participants did not know their age because they never had birth certificates though they seemed to be in their 80s. Age was an important factor because people in the age groups covered in the study were expected to provide a comparative explanation of weather conditions from the time they were young and the time of fieldwork. Another fundamental factor was the period of stay in the area. The age could denote to general understanding of the changes over time but period of stay in the area highly informed the changes that have taken place because a majority of the participants were born in the area and four had been staying in the area for over twenty years. Gender of participants was also considered to be a fundamental factor to present a balanced analysis of how both male and female participants were reacting to the effects of climate change. Findings from the in-depth interviews are presented in all the empirical chapters of the study.

4.2.2.2 Focus Group Discussion

One focus group discussion was conducted. The main reason for a FGD was to answer the objective on the role of traditional and spiritual leaders on climate governance. The structure of the FGD constitutes of biographical information of the participants and five questions which are predominantly covering the role of spirituality and spirit mediums in climate governance (Appendix F). Ten (10) participants took part in the discussion and they were all participation effectively and the researcher was coordinating and probing to acquire more information on the issues raised. All the participants who took part in the study were smallholder farmers who were approached at the Nyamuzizi Cotton depot when they had come to sell their produce.

Participant Name ¹¹	Age	Gender	Occupation
1. Chihera	62	Female	Smallholder farmer
2. Muchenje	54	Male	Smallholder farmer
3. Nyashanu	39	Male	Smallholder farmer
4. Melody	75	Female	Smallholder farmer
5. Stella	72	Female	Smallholder farmer
6. Jacob	88	Male	Smallholder farmer
7. Charles	49	Male	Smallholder farmer
8. Mujuru	35	Male	Smallholder farmer
9. Hwende	37	Male	Smallholder farmer
10. Munemo	51	Male	Smallholder farmer

Table 4.2: Focus group discussion participants.

Source: Author (Fieldwork July 2019)

Table 4.2 presents the Focus group discussion participants. The focus group discussion was held at a cotton depot in one of the villages. All participants were smallholder farmers and both male and female participants took part in the FGD. They were three female participants and seven male participants. The ages of participants varied from 35 to 88 years, which was a good representation of different generations. The representation was important because it brought about different generational perspectives on climate change. Findings from the FGD are presented in chapter six where indigenous climate change adaptation and governance is covered.

4.2.2.3 Key Informant Interviews

Key informant interviews were divided into two categories namely; organisational key informants and traditional leaders as key informants. Two key informants were selected from organisations and a separate interview guide was designed for them (Appendix H). The total number of key informants was four, that is, two organisational and two traditional leaders. For traditional leaders, the in-depth interview guide was used (Appendix D) and theme number

¹¹ Not their real names

four titled Traditional leaders' roles in climate governance was meant for these key informants. Also, these key informants are part of the in-depth interviews in table 4.1. Diccico-Bloom and Crabtree (2006) assert that key informants are selected because they possess knowledge on important issues and they are often used as translators, teachers or commentators for the researcher. For instance, key informants in this study were individuals who served the generality of the community in different capacities and their roles were treasured because they shed light on the understanding of certain complex issues pertaining to climate change and adaptation vis-à-vis climate governance.

4.3 Data analysis

Data was analysed through Thematic Content Analysis (TCA) and grounded theory was further employed in order to develop a conceptual model. Grounded theory is widely used as a way of building theory systematically using data obtained from social research (Babbie & Mouton, 2011). As such, one of the major objectives of this study was to develop a conceptual model and this was achieved through consistently following the steps prescribed in Grounded theory. These are as follows; theoretical sampling, data collection, data analysis and theoretical saturation. Moreover, 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 then coded and classified them into different categories that were used to analyse climate governance and the use of IKS for sustainable development in Mutoko district. Braun and Clarke (2006) suggest steps that should be considered in TCA. These will be in five phases namely;

Phase 1: Familiarising with the data

Familiarising oneself with data is the initial stage which involves a careful reading of transcripts numerous times. In accordance with this stage, the researcher went through all texts in the data by listening to the recorded texts more than once. This was important because it helped the researcher immerse with the data and pick up all the relevant themes and aspects that were worth noting.

Phase 2: Generating initial codes

Generating initial codes is the second stage whose aim is identifying trends and patterns that would have developed from the data. After listening to the recordings repeatedly, the researcher picked up the trends and patterns thereof and coded and classified them into different categories.

Phase 3: Searching and reviewing themes

The third phase is the searching and reviewing of themes which conversely took a top-down approach where the researcher made use of readily made categories and identified instances fitting into those categories. The aim was to formulate concise phrases that interpreted the use of IKS in climate governance and together with the use of Grounded theory the researcher was able to develop the conceptual model.

Phase 4: Searching, defining and naming themes

The third stage was the searching, defining and naming of themes which consisted of transforming notes into possible emerging themes. In this phase the researcher identified common themes that emerged from the data. This was done following the recommended procedure by Braun and Clarke (2006) in which the researcher looked for connections between emerging themes and grouped them together in accordance with their conceptual similarities.

Phase 5: interpreting and compiling information.

Phase five which is the final step enabled the researcher to compile interpretations in a written account. This stage involved the interpretation and analysis of the data, which was guided by the dictates of Grounded theory, Afrocentricity and SLA to oversee the development of a conceptual model for IKS climate governance. Accordingly, data from FGD and in-depth interviews was analysed using the same method. Hence, the two analysis methods, TCA and Grounded theory were used interchangeably in order to comprehensively achieve the overall objectives of the study.

Following the tenets of Grounded theory, the first step was to code the data collected accordingly which was done following the dictates of both TCA and Grounded theory. The coding was conducted through consistent observation of the trends and themes that emerged from the study, which later played an important role in the theoretical formulation, which is termed theoretical saturation in Grounded theory terms. Strauss and Corbin (1990:56) assert that "...categories designate the grouping together of instances such as events, processes,

occurrences that have common central features with one another”. This was demonstrated by the conceptual model that was developed through theoretical saturation in that, all the components in the model are related to one another because they work together in order to provide the community with best alternatives aimed at sustainable development (see. Figure 7.2).

4.4 Qualitative research reflexivity

In the reflexive process, the researcher is regarded to be an active participant who is actively involved in the construction of knowledge (Patnaik, 2013). In that regard, the researcher established that reflexive engagement was of paramount importance in order to validate credibility and validity of research findings. Further, it is important to note that the concept reflexivity is significant because if it is not dealt with carefully it might be a threat for research outcomes. This is because the uneven power relations that exist between the researcher and participants should not be taken for granted. This suggests that the researcher should at all costs respect the participants and avoid oppressing them. Consequently, a consideration of reflexivity and its different forms was highly necessary taking into consideration the major objective of this study, which was to develop a conceptual model for IKS climate governance. Nevertheless, in this study, the researcher focuses on introspective, methodological and epistemological reflexivity.

4.4.1 Introspective reflexivity

Introspective reflexivity has to do with self-consciousness of the researcher. In that regard, the researcher is considered to be the creator of events who is aware of the process from the beginning to the end. This calls for full engagement with the participants and the major aim of introspective reflexivity is to maintain the focus of the research through a careful consideration of the biases and attitudes of the researcher in order to minimise their impacts on the research (Patnaik, 2013). In this thesis, the researcher upheld introspective reflexivity and ensured that he was in control of the process from the beginning to the end of the research process.

4.4.2 Methodological and epistemological reflexivity

The researcher took into consideration methodological reflexivity which Patnaik (2013) suggest it ensures the following of predetermined procedures in the research process. The process involves the testing of research instruments and provision of solutions to assumptions

used by the researcher to establish reality from the perspectives of the research participants. Moreover, epistemological reflexivity is closely related to methodological reflexivity in that the area of research knowledge is fixed in social constructions that are based upon different theoretical perspectives and background of the researcher (Patnaik, 2013). The current study focuses on climate governance through the use of IKS for sustainable development. To achieve the objectives of the study, the researcher carefully followed the predetermined procedures of the research process from the selection of the study area, getting permission to conduct the study up until the last stage of the study which was the write up of the thesis. Also, it is important to mention that the researcher had good knowledge of the social constructions that are based upon different theoretical perspectives and background of the researcher. For instance, the researcher employed Grounded theory accompanied with Afrocentricity and SLA. These are fundamental sociological perspectives that the researcher was well versed with and they were accordingly employed in the data collection and analysis process.

4.5 Quality criteria

The researcher treasured quality assurance therefore he ensured that the collected data was accurate and all omissions were avoided. This was done by enhancing credibility, dependability, conformability, trustworthiness and transferability. Trochim (2010) contends that trustworthiness involves making sure that the findings of the study are believable at all costs. As such, the trustworthiness of the findings of this thesis was achieved by triangulating the data collection sources that is in-depth interviews and a focus group discussion.

Further, credibility was also treasured. According to Denscombe (2007) credibility is an alternative to internal validity where the goal is to demonstrate that the research will be conducted in a manner that ensures that the subject is accurately identified and also information the researcher intends to acquire will be accurately described. As such, when the researcher got to the study area, he approached community leaders i.e. village headmen from the concerned villages in order to identify participants who met the criteria of the study as well as those who were willing to take part.

Moreover, another concept that was treasured by the researcher was the concept of transferability, which refers to the degree to which research findings can be generalised or transferred to other contexts or settings (Trochim, 2010). As such, the researcher ensured

transferability through the structuring of the research interviews. The manner in which the interviews were structured was in such a way that the questions and findings obtained from them could be applicable in similar investigations in the future. Lastly, the researcher also considered dependability, which ensures that the findings of the study are consistent and could be repeated (Mikes, 2011). Hence, the researcher ensured this by audio-recording the in-depth interviews and the focus group discussion as well as taking down field notes during the data collection process.

4.6 Ethical considerations

The researcher observed all ethical issues relevant to the study. The purpose and significance of the study and data collection procedure were all well explained to the participants. The participants were assured that participation is voluntary and that they had the right to withdraw from the study at any point without penalty. The researcher ensured that all information shared during the interactions was treated as strictly confidential. To ensure the participants' anonymity, the researcher did not ask for their names, instead the researcher used pseudo names. All participants were asked to give their written informed consent and sign before the interviews commenced. Gatekeepers that included the District Administrator and village heads permitted entry into the Mutoko district. In the study, the researcher made use of pictures captured during fieldwork from observed landscape aspects such as fields, gardens and streams. Where there is use of pictures of participants, consent was sought and granted. In order to give voice to the participants, the researcher used numerous quotations from participants that were transcribed verbatim in the presentation of findings. However, not everything that was captured on tape was used and recorded because some parts were left out because they were not of particular importance to the objectives of the study.

4.7 Limitations of the study

Access to the study participants was a major drawback because Mutoko is a highly politicised district where the majority of people support the ruling Zimbabwe African National Union-Patriotic Front (ZANU-PF) party. Any person in the area who come from the towns is usually mistaken to be a supporter of the opposition Movement for Democratic Change (MDC) party hence, most people would not want to associate with them. This resulted from a period where anyone suspected to be a member of the opposition would face harsh punishment such as torture or murder by ZANU-PF youths and militia in the run-up to the 2002 and 2008

presidential elections. Hence, the culture of fear has been deeply inculcated in the community. As such, upon arrival in the villages, the researcher had to get assistance from the village headman to convince community members to take part in the study. This is because most potential participants had refused to participate. There was also a group of participants who assumed that there were financial or material benefits for taking part in the study despite having emphasised that the research was for academic purposes no financial benefit was attached. The other limitation was that most of the participants refused to sign the consent form and requested that they provided verbal consent because they were told by their leaders not to sign documents they are not so sure about. In that case, the researcher resorted to putting an X on the signature of participants to show that consent was granted.

4.8 Conclusion

The chapter presented the research methodology of the study observing the underpinnings of the grounded theory in order to necessitate the formulation of a conceptual model on IKS climate governance. The chapter began by presenting the description of the study area, which constitutes the climate, economy and political set up. Cross-sectional and exploratory research designs were adopted and criterion purposive sampling was used to select participants of the study sample. Data was collected through in-depth interviews and a FGD. The methods employed such as the exploratory and cross-sectional research design and the aforementioned data collection tools effectively enhanced the process of this qualitative inquiry to achieve its objectives.

CHAPTER FIVE: CLIMATE CHANGE AND VARIABILITY DISCOURSE AMONG COMMUNITY MEMBERS AND SMALLHOLDER FARMERS

5.0 Introduction

The previous chapter presented the methodology of the study, which provided the fundamental methodological aspects of the study. Building from that, this chapter interrogates climate change and variability discourse among community members and smallholder farmers, which play a pivotal role in paving a way for sustainable climate governance. The chapter presents empirical findings on climate change and variability perceptions. The focus was on the understanding of climate change, the challenges that smallholder farmers and community in general are facing due to climate change, indicators of climate change, cultural activities hindered by climate change and methods used to ensure better harvests. This empirical chapter dwells on the narratives and experiences of the farmers and community members insofar as climate change is concerned. These narratives are important in envisioning the nature, structure and composition of climate governance for Mutoko district. The major focus of the chapter was on four key aspects, which are namely; knowledge of climate change, challenges triggered by climate change, indicators of climate change and cultural activities that were affected by the incidence of climate change.

The four aspects were considered instrumental in determining the community's perceptions of climate change. This was so considering the fact that knowledge of climate change was considered to be fundamental in the crafting of adaptive capacity because one cannot adapt to something they have no idea about. Apart from the knowledge, the chapter also established the importance of understanding the challenges that are perpetuated by climate change. Understanding the challenges was considered to be imperative because it helps in measuring the magnitude of damage caused by climate change which was also considered to be fundamental in the crafting of adaptation strategies. The strategies are readily needed because livelihoods in the area are dependent on agriculture such that failure to materialise the community would be greatly affected. Further, awareness of the indicators of climate change was also considered to be fundamental because it helps to predict imminent changes in weather conditions to which farmers would act accordingly in their agricultural activities. Lastly, knowledge of cultural activities and how they have been affected by climate change was explored as a fundamental component of the general perceptions covered in this chapter.

5.1 Climate change knowledge

Knowledge of climate change was fundamental in the study because all methods of adaptation and governance are informed by the community's level of understanding climate change and variability. Hence, the interviews were in *shona* and the researcher referred to climate change as *shanduko yemamiro ekunze*, which is loosely translated as changes in the weather conditions. The study reviews that community members are aware of the numerous changes that have occurred over time. The changes hinted include temperature shifts, unpredictable rainfall and early drying of rivers. These are important observations inasmuch as climate change is concerned. This is because the observations demonstrate that the community is aware of climate change and variability.

5.1.1 Change in temperatures

Change in temperature is an interesting observation that was hinted by many participants. The temperatures are reported to have shifted remarkably over the years. The most notable changes that were hinted are hot days, which are said to be extending into the winter and perpetuating in summer. Summer in the Southern hemisphere begins in December and ends in March. This is the period most farmers in the area plant their crops. However, given lack of sufficient rains supposedly due to climate change, the continued hot days are seriously affecting the community. It is important to note that Mutoko is located in a semi-arid region, which already puts it at a disadvantage inasmuch as agriculture is concerned. As such, changes in temperatures have severe effects on communities in the district also given that agriculture forms the backbone of the community. To comprehend this finding, one of the participants indicated the following:

...there are a lot of changes that we are currently noticing for example in the old days the temperatures were not as hot as they are currently. Summer is hotter than it used to be and in the event that we have fewer rains as is common these days, our crops often suffer

[Jacob: In-depth interview July 2019]

The participants demonstrated that there is a relationship between the changes in temperatures and the less rainfall they now experience. These aspects were translated to be a serious concern for smallholder farmers because a combination of the two would mean that the productivity by

farmers is at risk. Further, another participant concurred that there are now more hot days compared to previous years and this is what he had to say:

...we are overwhelmed by the changes in temperatures because there is a huge difference if I may say. Sometimes I wonder if we are going to survive in this heat because we are farmers here and we depend on farming for our survival so if the temperatures are hot and rains are not sufficient how will we make it? I even wonder if it is a sign that the ancestors have turned their back on us.

[Richard: In-depth interview July 2019]

Despite the fact that the participant presumed that the changes were a result of the wrath of the ancestors, the major concern was the future of the community considering the fact that the temperatures are high and farmer production was at risk. The emphasis on whether they would survive demonstrated that the community is aware of the extent to which climate change affects their survival. In addition, it is this understanding that helps community members in crafting adaptation strategies that are sustainable. Furthermore, another smallholder farmer who concurred with Richard brought in the fact that the effects of climate change are likely to be enormous since already the district is in the semi-arid region. Here is what the participant had to say:

...the hot conditions we face now are actually a new phenomenon. This is however despite the fact that Mutoko has always been a hot area but the level of heat in summer is intensifying.

[Tilda: In-depth interview July 2019]

The indications of the participants show that the huge change in temperatures is a serious issue that is affecting smallholder farmers in Mutoko district. This finding is in line with Bakuwa (2015) whose study investigated public understanding of global climate change in Malawi and found that a majority of people in Malawi believe that changes in temperature are a result of climate change and the changes have severe negative effects on farming activities among smallholder farmers. The finding is also consistent with (Egan & Mullin, 2012; Capstick & Pidgeon, 2014) who emphasised on the correlation between local weather patterns and experiences of community members especially farmers in the sense that due to changes in weather patterns their activities are significantly affected. Other challenges reported in this

thesis include lack of sufficient rains. As highlighted by one of the participants, a combination of lack of sufficient rains and hot temperatures is remarkably puzzling for smallholder farmers and the community as a whole. This is because their livelihoods vis-à-vis sustainability is in their agricultural success. Hence, one can argue that the consequence of hot days, as other scholars would put it, is seriously affecting livelihoods and consequently brings sustainability to question.

5.1.2 Erratic rainfall patterns

Unpredictable rainfall is one of the effects of climate change that was presented by the participants. A plethora of participants indicated that rainfall is no longer as predictable as it used to be. This suggests that there are no strict time frames that people can rely on insofar as rainfall is concerned. The fact that rainfall is no longer predictable demonstrates the huge challenge faced by farmers in their agricultural activities. This implies that planning is affected because no farmer would be in a position to know when the rains come and goes. Given the nature of rainfall unpredictability, many farmers face numerous losses because at times rains come months after they have sowed their seed and in other instances the rains go when their crops are still in need of watering. All this is a hint on the effects of unpredictable rainfall on smallholder farmers and the huge impact thereof on sustainability. To elaborate this finding, some participants had this to say:

...there is a change in weather conditions, this change is what we have noticed over the years, and we actually got used to it. If I remember very well for many years now the trend is like some years we get enough rains and some we don't. However, compared to now I can say some years back when we were young we used to receive more sufficient rain than we currently receive. Our plants and crops were fully fed and we never experienced many of the challenges that we currently face. Now even if the seasons alternate it is just an alternation of low rainfall which has severe negative effects on our work as farmers.

[Tilda: In-depth interview July 2019]

Another participant indicated that:

...there is a huge difference in the patters of rainfall between now and the time we were young. No the rains we receive are not sufficient enough to sustain the crops and domestic animals we keep.

[Richard: In-depth interview July 2019]

Another participant had this to say:

...long ago we used to know that by October we would begin to receive rains but now the seasons have significantly shifted such that in some instances we receive first rains in January or February. So it is now difficult to understand which month exactly should we begin to receive the rains such that we are now unaware of which period exactly should we begin to plant our crops because at times we might receive rains very early and plant our crops but the rains would eventually disappear for a month or two.

[Richmond: In-depth interview July 2019]

Another smallholder farmer by the name Jeremiah also hinted that their crops are often unable to reach fruition because of the lack of sufficient rain. This is posing a serious challenge to him as a farmer because he is often unable to reap his targets and expectations. This is what Jeremiah had to say:

In terms of farming, we now have a situation whereby our crops often die before we reap because they will be receiving insufficient rain. This is mostly the case with maize which we usually plant after the first rains but it has become a norm that the rains are not sufficient and sustainable enough. Such that in most cases we do not reap the amount of maize we used to reap years back because some portions will die entirely and others will partially survive.

[Jeremiah: In-depth interview July 2019]

Further, it has been confirmed by numerous farmers that October was the month in which first rains were expected in previous years. Some further explained that the rains were not sufficient enough to kick-start ploughing but they were just a hint that the farmers should get ready. They were referred to the rains as *Bumharutsva* or *gukurahundi* in the Shona language. After

receiving these rains farmers would begin to prepare for the season. To adequately explain this, one of the participants had this to say:

...also, October was the month we knew without fail that the rains would start falling. But please not that this was not rains to start serious farming, it was mvura yekutokonya murimi (rains to awaken the farmer) and we called it gukurahundi or bumharutsva. Now this has changed it is no longer predictable such that in some cases we receive bumharutsva/gukurahundi in December or beginning of January. So imagine what that means to me as a farmer, it is a huge challenge.

[Jacob: In-depth interview July 2019]

Another smallholder farmer Melania concurred with Jacob and had this to say:

...the manner in which we receive rains these days has completely changed from previous years. This is because some time back when we were young we used to receive more and sufficient rainfall than we receive now and even the harvests were satisfactory. The first rains we received known as Gukurahundi would come in October and that was a sign that we should get started as farmers.

[Melania: In-depth interview July 2019]

From the narratives of the participants, it can be argued that the unpredictable rainfall is one of the major changes noticed by participants to be a result of climate change. This is important because it gives a hint on the nature of change and how the farmers perceive it such that they will be in a better position to craft their adaptation strategies. Consistent with this finding is a study by Gbetibouo (2009) that was conducted in the Limpopo river basin of South Africa with 794 smallholder farmers to investigate perceptions and adaptation to climate change. The study revealed that among other related challenges rainfall patterns have become consistently unpredictable and also that the amount of rainfall has declined. Also, a study by Noah (2015) conducted in Tanzania confirmed that rainfall patterns are increasingly becoming unpredictable, inconsistent and patchy which is a huge challenge for small holder farmers.

5.1.3 Early drying of rivers

The drying up of rivers has been widely considered to be an effect of climate change by numerous participants. The narrative on the change in weather conditions was backed by the fact that many rivers are drying before their time to dry comes. A plethora of participants concurred that what they witness currently in terms of the rivers is a new phenomenon. The argument was that in the 1990s going back rivers could flow up to the next rain season but now they dry around June. One of the participants revealed that the changes in weather conditions they are witnessing are devastating and they are real. The participant made a comparison between the time he moved to Mutoko and now. The comparison revealed that the rains they receive now are very low compared to the rains they used to receive in previous years. The participant confirmed that they started noticing the change around the early 1990s. In giving the comparison, the participant also made mention of the rivers with specific emphasis on the local Nyamuzizi river (see. Image 5.1) which they heavily rely on for a number of domestic and agricultural activities. This is what the participant had to say:

“There is a huge change in weather conditions because by the time we started staying in this place we used to receive more and sufficient rainfall. This change we face now I can say we started noticing it around the early 1990s. So since then, our produce began to fall and you can imagine there is a time you have to depend solely on agriculture such that after selling our produce we would have sufficient money for children’s school fees and other basic needs at home. However, now we are unable to take our children to school because of such challenges and the seasons are changing rapidly. If you look at it now for the past two or three years, the rivers around us have not had enough water to sustain us throughout the year like it used to be many years ago.”

[Richmond: In-depth interview July 2019]

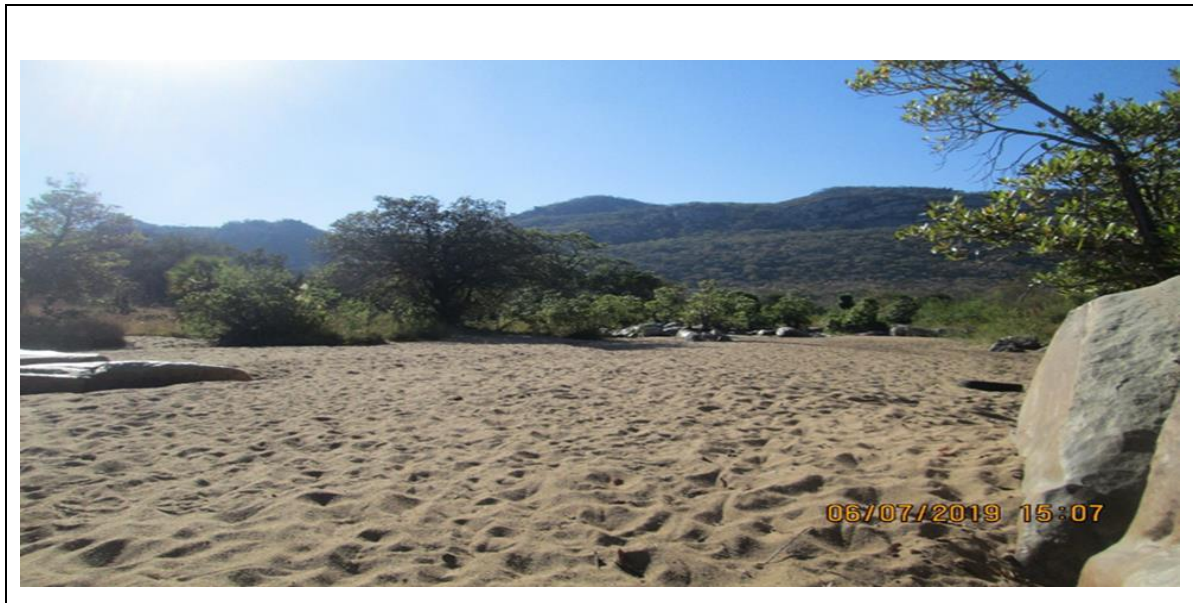


Figure 5.1: Nyamuzizi River

Source: Author (Fieldwork: July 2019)

Figure 5.1 shows the state of the Nyamuzizi River in July of 2019, a time widely reported by participants the river should still be flowing if it were in the old days. The fact that the rivers are drying early is also supported by another participant by the name of Jeremiah. Here is what he had to say:

“Around the years 1982 going backwards, we used to receive sufficient rains. Then Around the early 2000s we began to experience a change in weather conditions such that we were no longer receiving sufficient rains. The changes that we are noticing largely are pertaining to the rivers for instance by August we knew that the river would be still flowing but now it’s rare. In the previous years the river would flow up to May or June and from July on it will be dry.”

[Jeremiah: In-depth interview July 2019]

The early drying of rivers has severe effects on the livelihoods of the community because they heavily depend on river water for most of their domestic activities. In support of this another participant who is a smallholder farmer had this to say:

...we face challenges of lack of sufficient rains such that the wells, rivers and dams we depend on are no longer sufficient enough because most of them dry before the next rain season and this poses serious challenges on us as smallholder farmers.

[Richmond: In-depth interview July 2019]

The consequence of rivers drying up early is becoming a common feature in most rural communities in Zimbabwe. It is one of the commonly reported effects of climate change. This is because the rivers are filled by the rains, which imply that if the rains are sufficient and consistent the rivers are also likely to go for longer periods flowing. However, the lack of sufficient rains has often resulted in the early drying of rivers. This is consistent with Noah's (2015) findings that rivers in Tanzania are an important source of irrigation water but the fact that rivers are now drying up early shows that farmers are significantly affected. Also, in support of the finding that consistent rains and sufficient river flows were last noticed in the early 1990s, Fox (2004) revealed that the Ruaha River in Tanzania used to be constant in flowing. However, since around the year 1993 there have been gradually long dry periods, which have seen the river drying completely. This also negatively affects farmers such that they are now involved in water harvesting from the rains and groundwater wells.

5.2 Challenges caused by climate change

Climate change has triggered many challenges on the lives of community members in Mutoko district. The major means of survival in the area is agriculture and the farmers depend largely on rainfall for their crops, hence climate change becomes a serious issue on their farming activities. Livelihoods in the area are dependent on agriculture such that failure to materialise the community would be greatly affected. A plethora of participants indicated that there are numerous effects that climate change is posing on their livelihoods. It has also been echoed that agriculture forms the backbone of the community and its dearth would mean tragedy to the people.

5.2.1 Food security

One of the commonly reported challenges imposed by climate change is food security. There is a high level of uncertainties posed by the lack of sufficient rains. This is because agricultural produce is becoming low such that families cannot survive to the next season with their produce. This is particularly important considering the fact that the community is made up of

smallholder farmers who do not have other side jobs to sustain them in the event that the rains are not sufficient enough and agricultural production is low. Hence, food security has been considered to be a major challenge insofar as climate change is concerned. To elaborate further on food security as a challenge imposed by climate change, one of the participants had this to say:

...The most obvious challenges that we face due to climate change is uncertainties as to where we are going to get food upon completion of the few that we have. Now every year that comes and passes, we are not certain as to whether the food we produced will sustain us till the year ends or not. This is because it is now a common phenomenon that we receive low rainfall and the production level is also seriously impacted.

[Tilda: In-depth interview July 2019]

Another participant who concurred with Tilda on food security had this to say:

One of the major challenges we face is lack of sufficient food such that after we harvest we are not so sure if we are going to survive through to the next season. So now we are forced to strictly budget in preparation of the unknown.

[Jacob: In-depth interview July 2019]

Participants' narratives hinted that ensuring food security is a major challenge that communities are facing as a result of climate change. As small holder farmers they rely on what they produce for survival. Hence, they tend to worry about how they will survive in the event that their produce is not enough. The participants revealed the insecurities and fears they have resulting from the little amount of rain in some cases when they expect normal rains because it results in failure to receive good harvests.

The story of Jacob

The researcher met Jacob at the cotton depot in Nyamuzizi village where he had come to sell cotton. According to his narrative, he is involved in horticulture where he grows vegetables and tomatoes. The cotton that he had brought belonged to his wife who is a cotton farmer. Jacob narrated that it is a challenge now to grow maize in the area due to low rainfall and severe hot days. He stopped growing maize after suffering a huge loss in 2014. During this period, Jacob had grown 3 hectares of maize but before it became ripe, the rains stopped and the conditions were extremely hot such that he did not reap anything. So since then Jacob has been practicing horticulture and involved in growing ground nuts (Nyimo, Nzungu and Nyemba). Jacob also emphasised that there is a challenge insofar as food security is concerned a majority of the community grows cotton/tobacco which puts maize which is the staple food is at stake.

Table 5.1: The story of Jacob¹²

Source: Author (In-depth interviews July 2019)

Drawing from the story of Jacob it has been established that food security is a major challenge in many communities in Mutoko district. This also brings about the debate on food insecurity largely because narratives about food security are accompanied with issues around food insecurity. FAO (Food and Agriculture Organisation, 2008) defines food security as instances when people in communities in their entirety have economic access to sufficient and nutrient food that also meets their food preferences and dietary requirements in order of them to live an active and health lifestyle. From the narratives of the participants thereof, it was clearly established that there is no food security in the community. The villagers and smallholder farmers are uncertain as to how they will survive on the next day despite the fact that they already face food shortages hence, food insecurity. The root cause of all this is the lack of sufficient rainfall and unfavourable weather conditions such that the amount of harvests does not meet the demands of the families in the community. The aforementioned challenges of food security are supported by Babu and Sanyal (2009) who concur that a plethora of climate model scenarios demonstrate that the Sub-Saharan Africa region is heading towards the most severe challenges related to food security as a result of climate change and incidents related to global change.

¹² Not his real name

Furthermore, to shed light on issues pertaining to food security in Africa, Tweeten (1997) suggests that the concept of food security has three dimensions. The dimensions are namely; food availability, food access and food utilization. These dimensions are of paramount importance because they determine the nature and depth of food security. Food availability relates to the supply of foodstuffs in a country from production or imports and in the case of communities in the study, production is the focus. Food access relates to the ability to acquire food for consumption through purchase, production or public assistance. This is fundamental because in the communities in Mutoko and many other rural communities in Zimbabwe household production of food is the major source of food on which local communities rely on then there is also public assistance which usually comes in form of government or non-governmental donations and relief programs which is covered in chapter six. Lastly, food utilisation refers to concerns related to the physical use of food derived from human distribution. The nature of food security established in this chapter demonstrates that food availability is at risk which is also a hindrance to food access and in such instance, it will be difficult to discuss food utilisation which is the third dimension because there will not be any food to utilize.

5.2.2 Hunger

One of the researcher's memorable encounters during data collection was an incident that occurred when he was stationed at Nyamuzizi primary school conducting interviews with farmers who had come to sell their cotton produce. It happened that later that day four primary school learners came where the researcher was and reported that one of their classmates had collapsed. Immediately, the researcher rushed to the class and together with one of the teachers at the school they took the young boy to the clinic which was about a kilometre away. Upon their arrival at the clinic, the nurses attended to the boy and found no major issue on him then they inquired if he had eaten anything all day and the boy indicated that he had not eaten anything the whole day and he had just brought water from home, which was the only thing he had consumed that day. According to the young boy, at home, they only eat one meal a day, that is, at night most of the time and on a few occasions, they do have breakfast in the morning.

The above encounter at Nyamuzizi primary school was an indication of the state of hunger in many households in that community. Hunger is a major challenge that is associated with climate change. It comes about because families cannot produce enough food that is sufficient

for them. It should be noted that most communities in the area rely heavily on agriculture and they do not have other forms of employment to rely on in the event that the rains are not sufficient. To that effect, hunger becomes the order of the day if the farmers fail to produce sufficient crops that make them survive to the next season. Other farmers have embarked on cash crops such that when they run out of their budget they sell their produce to get some income. Nevertheless, given the economic situation in the country, cash crops are not doing well because when they sell the produce the money is heavily affected by inflation.¹³ Further, to elaborate on the challenge of hunger one of the participants had this to say:

...the most pressing challenge that I can mention is hunger which has become severe in this area. This has been precipitated by the fact that in this community we are farmers and our livelihood is supported by the farming activities that we embark on. Hence, now that there is lack of sufficient rains what it means is that we cannot afford to produce enough food for our families and at the same time we cannot afford to have more produce to sell so that we get money to take care of other basic commodities.

[Richmond: In-depth interview July 2019]

Hunger has been established to be a serious challenge that the community is facing in Mutoko district. Another participant confirmed that due to climate change, one of the pressing challenges that they are facing is hunger. The participant had this to say:

...the most pressing challenge faced by the communities is hunger. People are suffering because they are no longer producing sufficient crops that will sustain them throughout the year. What they produce in most cases would have been provided on contract by the government such that they are mandated to sell their produce to the government. Hence, after selling the money we get is not sufficient plus inflation is also seriously affecting us. You sell your products today and get a certain amount the following day that amount won't buy you anything because prices are rising every day.

[Jeremiah: In-depth interview July 2019]

The narrative of the participant demonstrates that the incidence of hunger is a direct result of lack of sufficient rains, which is a direct result of climate change. This is synonymous with the

¹³ The challenges relating to cash crops such as cotton was covered in detail in chapter seven.

narratives of all the other participants who revealed that hunger is a common threat to their livelihoods. The challenges of poor harvests are making it difficult for families to have decent meals. A plethora of participants revealed that poverty is perpetuated by the fact that even if they sell the cash crops they produce they still cannot get enough money to survive as they ought to. This suggests that with or without cash crops, it is difficult to conquer hunger and the economic situation in the country is the greatest threat that the community faces. Even though most incidences of hunger in the study are attributed to climate change, Gutsa (2017) takes a strikingly different perspective and argues that not all episodes of hunger in rural communities are a result of weather variations and climate change. The argument was that hunger could also be related to issues such as the challenges of insects and depredation of crops by wild animals, which greatly affects productivity. However, the findings of this thesis can reveal that such episodes of hunger are not a major threat because they are manageable considering the fact that insects can be dealt with through insecticides and animal depredation can be prevented. This, therefore, leaves climate change as the most outstanding cause of hunger in the communities.

5.2.3 Health effects of climate change

Climate change has severe effects on the health of communities. The major health hazards reported by the participants were related to the scramble for water from the limited water sources, which expose them to various weather hazard, which include cholera and typhoid among other water-borne diseases. To elaborate on this point one of the participants had this to say:

...Since most of the dams and rivers are drying up we are left with a few that still have water but at the same time, the water is not sufficient enough to take us to the next season. Due to this situation, we also face challenges related to health. Imagine a situation whereby we scramble for sources of water and in most cases some of them are not so clean but since they are the only ones available we are left with no option than to utilise the water.

[Derick: In-depth interview July 2019]

From the narratives of the participants, the community largely relies on rivers and dams, which are often running dry. For example, as mentioned earlier, rivers like Nyamuzizi are drying earlier than before. Apart from rivers, there are also dams for example in Matedza they have

Matedza dam and in the other part of Matedza & Chibeta area they have Sinyerere River. By July 2019 Sinyerere dam had dried up and people from the area were travelling about 10 km to Matedza dam to utilise the water. Hence, the argument by the participants was that there are too many people relying on a dam that is almost dry and in the same dam domestic animals are also getting water. To that effect, participants raised serious health concerns which Boko et al. (2007) concur with by suggesting that the impacts of climate change go beyond agriculture, water, ecosystems and human settlements because there are also human health issues attached to climate change. The argument was strengthened by the fact that in most case the focus of scholars on climate change is limited to water shortages and impacts on agriculture among many other common effects of climate change. This implies that health impacts are largely overlooked.

5.2.4 Water shortages

Water shortages presented a huge challenge that is posed by climate change. The early drying of the available sources, which are dams and rivers, causes these shortages. Earlier, the researcher presented the early drying of rivers which is a becoming a common phenomenon and it is also a cause for the water shortages the community is facing. Nonetheless, the crisis is not only on rivers but also on dams. By July 2019 one of the major dams in Matedza (Sinyerere) had completely dried such that the community was now scrambling for water from Matedza dam which is also almost completely dry. To comprehend this one of the participants had this to say:

Due to lack of rains we face serious water shortages such that we even face challenges insofar as drinking water and water for our domestic animals such as cows is now hugely insufficient. The main problem is that the demand for water is high and the supply is low it's a kind of situation whereby too many farmers are competing on a single insufficient source of water like Sinyerere dam whereby all sorts of farming activities are reliant on. For instance, some farmers insert their pipes for irrigation others bring their cows and goats and the water in the dam is already not enough. Hence, by July the dam would be dry and right now we are now utilising a dam from a nearby village (Matedza dam) which is also getting dry because demand is overweighing supply.

[Derick: In-depth interview July 2019]

From the narrative of the participants, it has come clear that water shortage is a huge challenge. One can argue that water forms the backbone of all agricultural activities that are embarked upon by smallholder farmers. This suggests that lack of it becomes a huge blow to their agricultural activities and overall livelihoods. The community has two main sources of water namely rivers and dams. However, there are a few privileged community members who have managed to drill boreholes but this cannot be considered to be a common source of water since among the pool of my participants only two farmers had boreholes.



Figure 5.2: Matedza dam

Source: Author (Fieldwork July 2019)

The images in Figure 5.2 show the worrying water levels Matedza dam had reached as of July 2019. Previously, the dam had never been dry according to participants, it only reached low

levels which came around October/November but could not last long because by that time the rains come and the dam would be filled again. Nonetheless, in recent years approximately the last five years the dam had been so unpredictable on the longevity of full water levels. Some of the reasons leading to the quick depletion of water in the dam is the fact that there are numerous activities that rely on the dam. The researcher also learnt that the community is involved in horticulture and they have come to build their gardens around the dam for easier access to water. To make the situation worse, smallholder farmers from Sinyerere where the dam had completely dried up had also come to Matedza dam to build their gardens in order to benefit from the water.

This clearly demonstrates the pressure that the dam suffers because some of the farmers have irrigation pumps that draw large volumes of water which is another major reason contributing to the quick depletion of the dam. In essence, water shortages in Mutoko district are a sequential challenge that can be traced from climate change to drying of rivers and depletion of dams which brings about unprecedented competition on the remaining few sources of water. Dessai et al. (2005) emphasise that water availability is immensely important for farmers and irrigation adjustments are a necessity to accommodate water shortages. However, the irrigation adjustments considered by community members were limiting the use of pump syphoning of water from the river since it draws large volumes of water and quickly depletes water levels just like what happened to Sinyerere dam. The proposed adjustments were positive but the execution was poor because it was reported that some farmers did not abide by the instruction.

5.3 Indicators of climate change

The current study sought to enquire if there are indicators of climate change known to the community. These indicators refer to the signals they currently use or have used over the years in order to predict imminent changes in weather conditions. This forms an important aspect of climate governance since knowledge of what is to come informs action on how to manage and prevent the anticipated calamity. The signals were framed in three distinct categories namely; tree species signals, animal species signals, cloud signals and African indigenous weather forecasting.

5.3.1 Tree species signals

Tree species signals are a common indicator of impending weather conditions in the community. It has been reported by numerous participants that there are a variety of trees that are used to foretell the impending changes in weather conditions. Most of these trees show by failure to bear fruits when they are expected to. To clarify on this, one of the participants had this to say:

...There are trees that we have around here that at time do not bear fruits because of poor conditions. But it is not a permanent condition because some seasons we have trees that bear fruits and yet other years they do not.

[Melody: In-depth interview July 2019]

In support of Melody's narrative, another participant by the name Paul had this to say:

...There are so many indicators available to us. These include trees that might stop bearing fruits. When that happens we know that there is a problem implying we might not get sufficient rains or the rains might not be sufficient enough that particular year.

[Paul: In-depth interview July 2019]

To support Melody's narrative, Stella, who was another respondent echoed that there are specific trees that they have known over the years to signal bad rains or harvests. She opined that they have studied the behaviour of trees over time and some of the behaviour they notice is a product of knowledge that has been passed to them from generation to generation. The specific trees that Stella mentioned include *Thespesia garckeana* known as *mitohwe* and *Syzygium cordatum* known as *mihute*. According to Stella the behaviour of these trees are largely associated with signalling shifts in weather conditions. To adequately comprehend the manner in which the trees signal changes in weather conditions, Stella opined:

*...There are certain wild fruit trees that usually showed us that there would be more rains if they produce in abundant. The wild fruit trees include Mitohwe (*Thespesia garckeana*) tree which produces Matohwe (Snot apple/ African chewing gum) and Muhute (*Syzygium cordatum*) tree which produces fruits known as Hute (oval berries) among others. The tree is found usually near streams or swampy spots. So what we knew is that whenever the tree produces fruits abundantly, it meant that there would be*

more rains. However, this has often been not the case in recent times because we now notice that at times the Hute trees often produces flowers and fail to produce the actual fruits which is a sign of impending weather catastrophes

[Stella: In-depth interview July 2019]

The narratives of the participants demonstrate the importance of trees in forecasting weather conditions. This has been the case for many years but the difference is that it was not as regular as it is now. The participants reported that they used to receive bad season once in a while, a period which some have fixed to after approximately every ten years. The bad weather usually came in form of excessive rains that would be followed by a drought. In that regard, they would notice the mentioned behaviour in trees before the calamities come. However, in recent times the behaviour has become more frequent and the subsequent calamities would be immensely evident.

5.3.2 Animal species signals

The previous section indicated the tree species that are used by community members to forecast changes in weather conditions. It seems these tree species are not the only non-meteorological/scientific indicators available to the community. To that effect, it was also pointed out that there are animal species that community members use to predict changes in weather conditions. These are in form of birds and butterflies. To clearly present the role of these animal species, Paul had this to say:

... other indicators comprise birds and butterflies. If butterflies go to the East or to the West, it signifies certain weather related disasters. This wisdom was passed to us by our great grandfathers and we still use it if needs be though it is no longer common.

[Paul: In-depth interview July 2019]

Paul's narrative highlights that even though the method of studying the behaviour and patterns of birds and butterflies is one of the indicators they use, it is no longer common in the community. This is because the method was treasured by the old generations and now it is difficult because many cultural practices are infiltrated by scientific methods and Christian beliefs.

5.3.3 Clouds signals

The current study has found that clouds are considered to be an important indicator of the impending weather conditions. It can be interpreted in scientific ways because clouds are an impeccable scientific signal of the imminent changes in weather conditions especially when it is about to rain. However, the explanation of participants on the role of clouds indicated that they are a unique African indigenous indicator. This is considering the fact that the role of clouds is not just about them setting but it goes beyond setting to the movement and direction. One participant emphasised that the movement of clouds to the East is a sign that there is going to be heavy rains. To clearly comprehend the narrative, this is what the participant had to say:

...the other indicator was that if the clouds set from the East we would know that there is going to be rains and the rains will be heavy. However, in recent times we have observed that the clouds may set from the East but that cannot guarantee us heavy rains as was the case in the old days. Now the clouds can set even for three days and nothing will happen, that is one of the major changes that we are noticing.

[Paul: In-depth interview July 2019]

Community members' narratives on the role of clouds as indicators of impending weather conditions was fundamental in juxtaposing scientific and African indigenous methods of predicting the shifts and changes in weather conditions. In essence, the methods are uniquely African indigenous peculiar to the community in question in that the focus is not only on the setting of clouds but rather on the direction and longevity of the setting period. This is unlike the scientific method whose focus is largely on the setting of clouds to predict the impending rains.

5.3.4 African Indigenous weather forecasting

Indigenous weather forecasting came into being through cultural methods presented by the participants on how they predict the changes in weather conditions. These methods have always been used by Shona people from ancient times. The methods presented in this study as African Indigenous weather forecasting include a study on cloud patterns, tree species patterns and animal species patterns. In this section, the researcher interpreted a blend of the various methods of African indigenous indicators of climate change, which he termed African Indigenous Weather Forecasting. Apart from the methods mentioned earlier on, there are other

uniquely African methods that were revealed in this study. These include fire on mountains as communication from the ancestors that there would be heavy rains. One participant had this to say:

...there also used to be fire on a one the nearby mountains which was a sign of imminent heavy rains. To our knowledge, the fire was a signal from the ancestors that we are going to receive heavy rains. However, these days it no longer happen the same way.

[Stella: In-depth interview July 2019]

Stella's narrative together with the previously mentioned methods are a clear indication that African Indigenous weather forecasting is an important component that should be adopted to provide a better understanding of the trends in African communities insofar as weather forecasting is concerned. To argue further, one needs to observe the fact that in most African communities the use of modern scientific methods or simply the understanding of it is still unfamiliar. However, due to the lack of sufficient knowledge on the use and interpretation of scientific knowledge such as climate change materials, meteorological documents and daily meteorological updates on weather forecasting smallholder farmers in rural communities should not be left behind. Hence, the adoption of African Indigenous Weather Forecasting provides a competent method of forecasting that is equally important and useful. In support of indigenous indicators to climate change as found in this thesis, Ajibade and Shokemi (2003) revealed that Nigerian farmers use knowledge of weather systems such as rainfall, thunderstorms, windstorms and sunshine to prepare for future weather. This is attributed to the fact that the cultural dimension to climate change indicators is culture context since individuals from different cultural backgrounds use their cultural explanations to interpret weather conditions. This is supported by the fact that without the use of scientific methods, local communities in Africa have over the years developed and employed intricate systems of gathering information, interpreting observations, predicting weather conditions and decision-making on weather related issues.

Svotwa et al. (2007) weighs in to support the indigenous weather forecasting found in this thesis. The authors' argument was that indigenous weather forecasting complement farmers' planning and response to disasters. This is considered to be more workable and relevant in rural settings compared to Western meteorological knowledge because traditional perspectives are

based on lived experiences. Consequently, Svotwa et al. (2007) found that in the Eastern high lands of Zimbabwe community members and small scale farmers are able to predict the impending weather conditions using their lived experiences of changes in wind flow patterns and behaviours of animal and plant species as found in this thesis. This also relates to a study conducted in Burkina Faso by Roncoli et al. (2001) who found that farmers' forecasting knowledge encompasses shared experiences where the elderly male farmers formulate hypotheses around seasonal rainfall based on their observation of natural phenomena. Further, Roncoli et al. (2001) also revealed that the most widely relied-upon indicators of climate change are the timing of fruiting of certain local trees, water level in streams, nesting behaviour of some birds and certain insect behaviour, which signifies an impending change in weather conditions.

5.4 Culture and climate change

The current study has unequivocally demonstrated that cultural activities are under a serious threat due to climate change. Cultural activities are an important component of the Shona people because it helps them to trace their origin and observe their ancestors who play an important role in the African religion as mediators between people (*Vanhu*) and Musikavanhu referred as God. In that regard, the ancestors are referred to as *Midzimu* or *Vadzimu*. Their role is also very important insofar as climate change is concerned. It has always been part of the traditions and customs of the *Buja* people in Mutoko that before the rain season comes they would go and consult the ancestors and embark on ceremonies to appease the ancestors to provide them with rains. This section focuses on the cultural activities that relate to or are affected by climate change. The specific focus of the chapter will be on rainmaking ceremonies, Christianity versus culture and the role of spirit mediums.

5.4.1 Rainmaking ceremonies

Rainmaking ceremonies are a common practice in many African societies. In Mutoko, the Buja people practice what they term Mafuwe. Mafuwe is a cultural ceremony that is practiced in order to appease the ancestors in the event that there is no sign of rains or when rains have come and gone early than usual. According to participants, Mafuwe was practised during years that could usually lead to droughts implying it is not something that was practised every year. However, given the nature of a cultural practice that it is, climate change has seriously affected the practice. Participants concurred that there are two ways in which climate change is affecting

the practicing of Mafuwe. The first way is that it is not possible to do the practice year after year whereas the current situation calls for a continuous and regular practice. Hence, there will be a problem. The other challenge highlighted was that people now mix cultural practices and Christianity such that by the time the community through community leaders go before the spirit mediums to do the rituals the ancestors will not be happy because of the mixture of ways of worship. To best explain this, one of the participants had this to say:

...cultural activities might not have changed but there is lack of seriousness and consistence among community members on the practice of cultural activities such as Mafuwe (rain making ceremony) which has always been one of the major activities in this area. I think some of the reasons for this is the forms of religions that our people are now subscribing to which are not considerate of the many cultural activities. These religious institutions include Pentecostal churches and the African traditional churches.

[Henry: In-depth interview July 2019]

In support of Henry's narrative, another participant indicated the importance of Mafuwe and this is what he had to say:

...in our culture it has always been the norm that in the event that we have little rains we would conduct ceremonies such as Mafuwe (rain making ceremony) where the spirit mediums were consulted. So from there the spirit mediums would positively respond to the request of the communities through provision of rains.

[Richard: In-depth interview July 2019]

Further, Derick, a smallholder farmer based in Chibeta village concurred with Henry and Richard on the importance of Mafuwe but went further to indicate that the major challenge now is that a majority of community members are no longer consistent when it comes to the practice of Mafuwe and other traditional rituals. This is what he had to say:

...way back we used to practice ceremonies known as Mafuwe/ Ngoma (Rainmaking ceremony) which were done in the event that there were no rains. Now there are people who try to perform such ceremonies but they are not consistent. Hence, their lack of

consistency angers the spirit mediums such that after performing the ceremony there are no results. They only go back to spirit mediums after experiencing challenges.

[Derick: In-depth interview July 2019]

The narratives of community members in this section demonstrate that there is huge disregard of ancestors and spirit mediums. This is largely blamed on the changes in weather conditions that is making people to go and seek help from other modern and Western sources such as Christianity and belief in scientific methods. A plethora of community members indicated that the challenges that they are facing are that they now have people who are inconsiderate of the Buja and Shona cultural practices. The argument was that the community as a whole used to gather up and do ceremonies consulting spirit mediums (*Mhondoro*) but now there are a lot of changes that they are noticing. The changes are largely because people no longer observe the influence and power of spirit mediums. In some cases, they disown and discredit their existence. A majority of participants as indicated in this section used to conduct ceremonies regularly and the spirit mediums would communicate and tell them what to do at the right time. That was important because during times when there was no sufficient rainfall they would go to consult through the ceremonies and by the time they leave the sanctuary of the spirit mediums suddenly there will be rainfall. This usually happened when people faced consecutively extremely hot days in summer at a time when their crops were in the ground and they were expecting rains. As such, it can be unequivocally argued that the climate change has impacted numerous cultural activities previously practiced in the community.

5.4.2 Christianity and culture in the face of climate change

Christianity and culture have provided numerous contradictory elements as revealed by participants in the previous section. The challenge that communities face is that cultural beliefs are gradually being abandoned in favour of Christian beliefs. As such, the findings of the current study review that climate change can also be considered to be a factor in the change that is noticed in cultural activities and performance of rituals. This can then be considered to be a negative effect of climate change on cultural rituals. The blame on most of these changes is considered to be Christianity by most participants. As such, some participants attribute the change in climate conditions to the wrath of the ancestors and God because people have abandoned their cultural practices. To better comprehend this, one of the participants had this to say:

...in our culture we used to practice rituals such as what we call kutvaira madzimbahwe (Sweeping the house of stones). However, now you cannot tell anyone to go and take part in such activities because most people these days now believe in praying to God. So this massive disobedience of the spirit mediums and ancestors can be considered as a huge cause for the change we currently experience in climate. As a result, now we do not follow and cultural rituals the belief among many is that we pray for rains and that is that. Long back we used to know that people would prepare traditional beer and play a ritual that was called hwahwa hwengoma but now there is no such thing anymore.

[Eliot: In-depth interview July 2019]

Further, Paul, another smallholder farmer based in Chibeta village concurred with Eliot but went on to put the blame on churches, specifically Pentecostal churches and African Apostolic churches that discredits the existence and worship of God through the ancestors. Here is what Paul had to say:

...we used to consult spirit mediums in the event that we experience little rains. But now it seems everyone focuses on churches especial Pentecostal churches and the African Apostolic churches that are mushrooming at an alarming rate in the neighbourhoods. So now it is widely speculated that the reason for the current situation is the fact that people in the area are now disobeying the spirit mediums in a way that they overlook them and focus more on churches and the bible.

[Paul: In-depth interview July 2019]

Christianity and culture in the face of climate change is a fundamental aspect to be considered insofar as the effects of climate change on culture are concerned. This concept also plays an important role in acknowledging the community's understanding of climate change and variability. This is essentially because if people can identify the negative impacts or 'perceived' impacts of climate change then they do have knowledge of the phenomenon. The major challenge that was reported was the interference of Christian beliefs on cultural practices, which is diverting the attention of many community members and in the end it angers the ancestors and God. The argument was that when the whole community would come together in worship the ancestors used to listen and provide them with rains and other needs but the

emergence of Christianity has seen the rise of the wrath of the ancestors because they are no longer observed. This concept was borrowed from the ancient times when rituals like *Mafuwe* were practices after there have not been rains when they were expected and the belief was that the reason for the lack of rains was the anger of the ancestors. As such, if the ancestors could demonstrate their wrath through sanctioning rains back then it means the continued dry spells currently experienced could be the wrath of the ancestors as well.

In support of the findings of this thesis on the cultural contact of climate change, Ajani et al. (2013) acknowledge the role played by culture in all aspects related to climate change. To that effect, the authors further go on to argue that there are numerous developmental projects that have been crafted, funded and managed by outside resources and introduced into rural communities aiming to use them as a channel through which the lives of rural people were going to be improved. However, the major backdrop on initiatives of this nature is that they fail to acknowledge the culture of indigenous people, which resulted in their low success rates. This then inspires the growing interest in the incorporation of indigenous knowledge and traditions to increase project participation rate. This takes into consideration aspects presented in this thesis such as the significance of rainmaking ceremonies and other cultural activities that are aimed at adapting to climate change. This is important because it entails implementing local knowledge to deal with local challenges, unlike the aforementioned scenario where knowledge and practices from outside were brought in to deal with the impacts of the phenomenon of climate change to no avail.

5.5 Conclusion

This chapter presented the climate change and variability discourse among community members in Mutoko district. Knowledge of climate change is of paramount importance because it gives a hint on what is happening in the community and the knowledge of what is transpiring is equally important in equipping the community on relevant adaptation strategies. As such, climate change and variability discourse among community members and smallholder farmers is of paramount importance in paving a way for sustainable climate governance. The chapter found that community members are knowledgeable about climate change and variability. This was translated from their narratives on direct and indirect climate change-related aspects. First, the researcher inquired if the community was aware of climate change and the findings revealed that even if some participants could not have heard the term climate change they actually were

aware that there are changes happening in weather conditions. Second, having established the knowledge of the general changes in weather conditions the researcher then had to dig into other related aspects of climate change, which helps in the understanding of the intensity and depth of the damage that climate change has on the community. These indirect aspects, which translate to the knowledge of climate change were knowledge of the indicators of climate change, challenges caused by climate change and cultural activities related to climate change. The vast knowledge that the community revealed on the aforementioned aspects shows that they are indeed knowledgeable about climate change as well as its possible and actual impacts. The narratives were however important in envisioning the nature, structure and composition of climate governance for Mutoko district which was one of the major objectives of this thesis.

CHAPTER SIX: INDIGENOUS CLIMATE CHANGE ADAPTATION AND GOVERNANCE

6.0 Introduction

The previous chapter focused on climate change and variability discourse among community members and smallholder farmers. Based on the knowledge gathered on climate change and variability discourse, this chapter presents Climate change adaptation and governance, which are considered to be fundamental aspects inasmuch as sustainable development is concerned. In this chapter, the researcher brought in the concept of indigenous climate change adaptation and governance which appeared to be a broad and diverse concept. IKS is often mistaken with ancient ways of doing things. This is partially correct but in essence, it goes beyond ancient ways to a combination of modern ways and ancient ways of doing things. Various scholars concurred that IKS refers to knowledge, wisdom and activities that have been passed from generation to generation for the purpose of survival (Orlove et al., 2010; Jiri et al., 2011; Ajani et al., 2013; Mapfumo et al., 2015; Mugambiwa, 2018). In that regard, IKS can emerge in many different ways.

Further, the chapter presents the manner in which knowledge passed from one generation to another is helping smallholder farmers to adapt to climate change. One of these IKS based adaptation methods found in the study includes irrigation methods from river waterholes, variety and crop change, the role of spirit mediums and the role of traditional leaders in climate change adaptation vis-à-vis climate governance. Indigenous management of resources was found to be an essential aspect of climate governance. The chapter further goes on to unravel the IKS that is hidden within the use of scientific methods in climate change adaptation and governance. This was largely indicated in the irrigation methods that are widely practised in various villages in Mutoko district. A plethora of these methods resemble the methods that have always been practised and have been passed from generation to generation and the connotations thereof are unequivocally essential for sustainable development.

6.1 Climate change adaptation

Climate change adaptation is of paramount importance in climate governance and sustainable development. Climate change has severe effects on the livelihoods of communities such that if there are no adaptive strategies that are sustainable, communities could face serious challenges

in their livelihoods. This section presents climate change adaptation strategies that are employed by farmers in Mutoko district. These include cotton farming, irrigation, crop change, traditional mulching and crop variety. Regardless of the fact that there are numerous ways of adaptation reported in this study some participants could not clearly spell out if some of the methods they are using are actually forms of adaption. For instance, one of the farmers had this to say after being asked if they had any strategies that they were using to adapt to the effects of climate change:

...I can say it's difficult to identify a specific way due to the fact that there is no sufficient rainfall. In cases where we had sufficient rains, you would know that there are many activities such as gardening which we embarked on. There is also no way in which we can store our agricultural produce because the way to go now is to consume what we have because it will not be sufficient to store. Hence, storage is completely ruled out.

[Stella: In-depth interviews July 2019]

The above narratives demonstrate the various approaches and perceptions on adaptation by various farmers in Mutoko district. The indication from that juncture was that adaptation should not be treated as a universal aspect. This implies that even though there are numerous adaptation measures employed by farmers some of these measures are not specifically meant to be adaptation measures but rather a common activity borrowed from others around the community. In support of this Jiri et al. (2016) acknowledged that there are numerous adaptation measures that are employed by farmers in rural communities. The authors further assert that the adaptation measures differ because they largely depend on climatic stimuli or non-climatic stimuli, which influences the sensitivity of a particular system as well as the nature of adjustment required. Therefore, every adaptation measure takes into consideration socio-economic and institutional arrangements in a particular community. This is because the impacts of climate change are not the same in different communities.

Further, the depth and magnitude of the damage caused by climate change differ based on different circumstances around communities. As such, when adaptation measures are crafted, they are not universally applicable since circumstances in different communities significantly differ. In some places adaptation is influenced by indigenous knowledge yet other places use scientific knowledge to craft their set of adaptation measures. In that regard, Jiri et al. (2016) reveal that there are two approaches employed on all adaptation processes. The approaches are

namely; one that advocates for actions meant to reduce existing vulnerability and one that prioritises the use of early warning systems. These can be simply summarised as pre and post-disaster adaptation strategies. The findings of this thesis reveal that both early warning systems and measures to reduce existing vulnerability are all important as climate change adaptation strategies. In that regard the priority of farmers should be aimed at increasing resilience, coping and adaptive capacity of natural and human systems. This is imperative because it prepares them for future climate change vulnerability and extreme events. Hence, in this thesis the researcher began by inquiring the various approaches the farmers were using in their day to day farming activities and then made a conclusion if the methods qualified to be adaptation strategies given their nature and capacity to keep the farmers going vis-à-vis sustainable development. Also, the approaches were qualified by their close link to the aforementioned two approaches by Jiri et al. (2016). Hence, from the farmers' narratives and the researcher's observations, the following adaptation measures were formulated.

6.1.1 Cotton farming

The severe effects of climate change pose serious threats to the growing of traditional crops such as maize. It has frequently been reported by participants that the growing of maize is now a risk considering the fact that the community receives insufficient rains. Participants' narratives confirm that a plethora of smallholder farmers in the area have often run loss after growing maize. As a result, many smallholder farmers in Nyamuzizi and Chibeta villages have resorted to tobacco and cotton farming. Cotton farming has become more popular for a variety of reasons. These include, the fact that it is a cash crop, farmers receive inputs from the government and the crop does not require more water compared to crops like maize. Given the circumstances around the growing of cotton, the researcher has considered it to be one of the effective adaptation strategies employed by smallholder farmers in Mutoko district. One of the key informants, Mr Muchaneta who was an accounting officer at the Nyamuzizi COTCCO depot described the climate in the area as unfavourable for crops like maize due to very high temperatures in the area. He indicated that smallholder farmers also benefited from the government's command agriculture program in which the government provided agricultural inputs for farmers. This is what he had to say:

...Cotton has become one of the most grown crops in this area because it has market plus it's easy to grow. The other benefit is that the crop does not need a lot of water so

given the high temperatures in this area coupled with lack of sufficient rains you find that the growing of cotton is a good investment. The farmers tend to opt for the crop also because they get inputs from us and when they reap we go to them to buy the cotton just like we are doing now. So it is more of a win-win situation for the farmer.

[Mr Muchaneta: Key informant interviews July 2019]

The growing of cotton is also considered to be an adaptive strategy because of the similarities it has with the indigenous ways of crop change in the area. Mugambiwa (2018) contends that communities in Mutoko used to change crop types at the instruction of their ancestors. For instance, if there is an impending dry spell or drought, the ancestors would recommend a change of crops mostly to sorghum and millet since they are drought resistant. As such, the concept of growing cotton may not be ancestor induced but it has similar connotations. The connotations are manifest in that there is a change of crops in order to suit the change in weather patterns and this is despite the fact that there are no ancestors involved.

6.1.1.1 Decline in the production of cotton

Despite the fact that the growing of cotton is considered in this study as an adaptation strategy, it is worrying to note that there is a decline in the production of cotton in the area. According to one of the key informants Mr Muchaneta, the storage area for cotton indicates that there is a decline in the production of cotton by farmers. It has been established that three years back the storage house by July would be full but as of July 2019 it was not even in half (See. Figure 5). There are numerous factors that can be considered for the decline in the production of cotton. First, one needs to consider the fact that the selling price of cotton has declined due to hyperinflation facing the country's economy. As of 02 July 2019 the cost of 1 KG of cotton was ZW\$1.90 which was equivalent to USD\$ 0.60. In essence, the price defeats the whole purpose of adaptation since the farmers ought to get some money to survive on upon selling their produce. However, inflation makes it difficult because the money they receive would be sufficient for a month compared to almost the whole year as it was when the country had adopted the US dollar as legal tender. One participant expressed the challenges in that regard and had this to say:

...After a successive attempt to grow maize and ground nuts failing to reap due to poor rains I eventually resorted to cotton. The decision was informed by the fact that all you

need in cotton farming is your labour since you receive inputs from the cotton company of Zimbabwe and Southern Cotton (the major buyers of cotton in the area). ...So in the previous years we had motivation that if you grow more cotton you would get reasonable money from selling especially considering that the money was in US dollars. Now it is difficult because the local bond notes that we are using are not sufficient enough and the prices of everything are going up on a daily basis.

[Jeremiah: In-depth interview July 2019]

Jeremiah's narrative indicates one of the challenges a plethora of smallholder farmers are facing. One of the reliable adaptation strategies has come under attack due to the melting economy. To clearly illustrate the state of the Zimbabwe economy, a background check would be of uttermost importance. The current ordeal among cotton farmers was ignited by a number of factors relating to the economic meltdown in Zimbabwe. The factors include hyperinflation and lack of production, which puts the demand for cotton at risk. Another huge blow was the ban of the use of foreign currency as legal tender by the Zimbabwean government on 24 June 2019. This was after 10 years of using a basket of currencies, which include the United States of America Dollar (USD), British pound, Botswana Pula and South African Rand among others as legal tender. The use of foreign currency came into being as a result of the Global Political Agreement (GPA) that gave birth to the Government of National Unity (GNU) between ZANU PF led by Robert Mugabe and MDC led by Morgan Tsvangirai. The arrangement came into being after the disputed general elections of 29 March 2008. The reintroduction of the Zimbabwean dollar in the name of the bond note saw the re-emergence of inflation in Zimbabwe. As such, this has serious consequences on the productivity of farmers. The other challenge that farmers face is that the buying and selling of cotton has been monopolised by the COTCCO, which is a government parastatal. Hence, the price pegged is what they get. This is unlike crops such as groundnuts, which can be sold to private players at a favourable price. In addition, in the event that the government price is not favourable one could consider keeping the produce for personal consumption.



Figure 6.1: Cotton depot at Nyamuzizi shopping centre

Source: Author (Field work)

Figure 6.1 gives a hint on some of the major challenges cotton farmers are facing. The indication is that there is a decline in the amount of cotton grown in the area. One of the key informants at the Nyamuzizi cotton depot clearly pointed out the changes in the amount of cotton from the previous years. There is now a combined economic and climatic blow, which makes it difficult for farmers to achieve their agricultural endeavours. This ordeal has become a common narrative among many smallholder farmers in the area. Further, to better understand the challenges cotton farmers are facing the researcher captured the story of Mr Muchenje which gives a clear picture of the aforementioned challenges.

The story of Muchenje

I came to Mutoko in 1993 together with my family and we first settled in a place called Charehwa and in the year 2000 we relocated to Nyamuzizi where we currently reside and do farming. Before we came to Mutoko we were living in the Uzumba area in Uzumba-Maramba-Pfungwe district. The main reason for coming to this place was in search of greener pastures in form of a reasonably larger farm area and the dream was fulfilled when we came to Nyamuzizi. When we first settled in this area the main crops that we grew were maize and cotton. That was simply because that is what we found many people growing and the reason was those were the crops suitable for the soil in the area as well as the fact that cotton paid better and maize provided staple food. However, as time went by many changes happened and they were numerous changes in crop types. Some were communicated at village level but others were a result of trial. The communicated crop shift was on crops like cotton because all we needed was labour since all the inputs were provided for by COTCCO. Hence, we only enlisted with the village head (taiyenda kunonyoresa kwaSabuku) and when the inputs came we would go and collect. Between the years 2002 and 2010 cotton became so famous in the area such that there is a point when I just focused on growing cotton because when you sold it you could get enough money to survive and pay fees for the children and even buy luxuries. Between the years 2010 and 2016 we continued growing cotton but regardless of low harvests due to poor seasons we managed to get some money because by then the money was buying mainly because we were using maUSA (US dollars). From the year 2017 to date, it's difficult. Of course we get free inputs but the seasons are not predictable and the economy is in shambles such that most often when we sell our agricultural produce, the money we get won't be enough for just our survival as a family until the next season. So given the challenges we face due to unpredictable seasons, we engage other farmers to learn how they are managing, for example, there is now a trend of gardening which is also hampered by lack of sufficient water for irrigation. We also frequently receive tips and coaching from 'vanamudhumeni' (AGRITEX officers) on how to manage regular crops in the face of unpredictable seasons. So overall it's difficult our hope is dwindling on a daily basis.

Table 6.1: The story of Muchenje¹⁴

Source: Author (Life history in-depth interviews: July 2019)

¹⁴ Not his real name

6.1.2 Irrigation

Lack of sufficient rains, which has become a common phenomenon over the years in Mutoko and many other places, has seen irrigation becoming an effective adaptation strategy. There are many forms of irrigation that are practised in the area. The most economic and indigenous form of irrigation in the area is the use of buckets to fetch water from the river to water riverside gardens. This has been a common practice that was passed from generation to generation in many villages of Mutoko. Moreover, this method has been improved to meet modern standards. This was done by embracing modern scientific methods, which include the use of solar panel powered pumps to draw water from the river. To better comprehend this, one of the participants had this to say:

...the rivers have dried prematurely and it is very worrying because we depend heavily on them. It is part of our indigenous agricultural system that when the rains go we use water from riverside wells to irrigate our plants. That has always been the system and it sustained our forefathers and it has been passed from one generation to the other. Today we use the same system but merging it with scientific ways that comprise the use of solar panel induced irrigation.

[Chihera: focus group discussion July 2019]

River waterholes seem to be playing an important role in this form of irrigation. However, another challenge that the community is facing relates to the aforementioned early drying of rivers and dams. One of the participants had this to say:

...The local rivers such as Nyamuzizi River have dried so early. In previous years the river used to go up to October with water flowing. However, due to early drying of the river, we now rely on the use of wells and boreholes. We have inspired one another to divert to the use of this system of irrigation.

[Muchenje: focus group discussion July 2019]

The researcher encountered five smallholder farmers who now use this method in three different communities namely Nyamuzizi, Matedza and Chibeta village. It was indicated that a smallholder farmer in Matedza who had successfully employed the system and was doing very well inspired the farmer in Nyamuzizi village. In support of this finding, Lemma (2016) emphasised the importance of copying and adopting skills from others as an important strategy

of adaptation. The author termed the process as ongoing learning, analysis, planning and adjustment, which should be employed in order to adapt to current and future disasters.



Figure 6.2: A submersible solar-powered borehole irrigation system in Matedza

Source: Author (Fieldwork: July 2019)

Figure 6.2 shows a submersible solar-powered borehole used to syphon water for irrigation purposes. This is one of the most effective ways which is used by a few smallholder farmers. There are a few farmers who are using the system because it is expensive. The farmer in images in figure 6.2 above revealed that he rotates various crops throughout the year. These crops include potatoes, maize, beans, tomatoes and onions. There is also another system in which farmers draw water from river waterholes, which remain after the rivers have dried, or hand-dug wells. The system is much cheaper compared to the borehole system. Images in Figure 6.3 demonstrates one such system in Matedza. The researcher encountered two farmers who were using the system and they acknowledged that the system is effective and every serious farmer ought to employ it.

Moreover, the manner in which the use of the system is wide spreading is a result of social networking among farmers who are adopting the system in the area. Ellis and Bahiigwa (2003) support the use of social networks in climate adaptation as instrumental. The argument was that social networks are responsible for increasing awareness and use of adaptation options. This is what social scientists refer to as social capital, which is highly accredited to be a public good meant to enhance the exchange of resources and information among individuals. In the process, there is a facilitation of innovation and capacity to learn that is channelled by farmers

involved in the process. During the data collection process for this thesis, the researcher visited a farm where the system was most efficient and the farmer had just adopted the system. The innovation at the farm was impressive and the farmer was free to demonstrate how the system was operating. Similarly, Adger (2003) is of the opinion that social capital is a fundamental asset that is used to build a comprehensive climate change adaptive capacity. This form of networking is not facilitated by governments or other authoritative bodies but by ordinary community members who are involved in the day to day farming activities. The form of engagement carried out by the farmers can be interpreted as self-organized facilitation that is more sustainable and effective compared to those with adaptation mechanisms imposed by external entities.



Figure 6.3: A submersible solar-powered river waterhole and hand-dug well irrigation system in Matedza village

Source: Author (Fieldwork: July 2019)

Figure 6.3 demonstrates a submersible solar-powered river waterhole irrigation system in Matedza. The farmer makes use of the river waterhole that he keeps digging off to harvest

water for irrigation purposes. The system requires the farmer to insert a submersible solar pump in the river waterhole or hand-dug well in order to syphon water. When the water levels decrease in the river waterhole, the farmer digs off much deeper as indicated in one of the pictures in Figure 6.3. The process is an effective adaptation strategy employed by the farmer because this is done when the rains are long gone and the river has dried. This is usually a time wherein most communities farming activities would have ceased completely while farmers are preparing for the next rain season in order to resume farming.

The story of Nyashanu

I came to Matedza in the year 2014 and before I came here I owned a plot in Macheke which is located in Marondera District. So because I wanted to expand my farming I sold the plot which was about 60ha and bought a 246ha farm. At the farm I do agriculture and cattle rearing. The area is semi-arid and we receive very poor rains hence, I decided to install a solar-powered borehole which I use for irrigation and drinking water for the cows. So far I can say with the use of solar-powered irrigation all is going well because we manage to produce tomatoes and maize two times a year and we are planning to start growing potatoes as well. The farming is still on a small scale but we hope to continue making efforts to expand. The irrigation system we use here is becoming common in the area, I first learnt about it in 2011 but I actually first implemented it in 2015. When I walk around I gain insights from other farmers all the time and I develop new skill to enhance my farming. There are three farmers in this area whom I know are using the same system and they are successful so we continue to learn from each other on how to enhance this system.

Table 6.2: The Story of Nyashanu¹⁵

Source: Author (Life history in-depth interviews: July 2019)

The story of Nyashanu is one of the many success stories of adaptation through the use of irrigation encountered in the study. Most of the methods employed by the farmers are modern SK practices but they are highly influenced by the IK and in some cases, the methods are employed as SK and IK nexus. Ajani et al., (2013) asserts that in many rural communities, IK plays an important role in informing decision making related to climate change adaptation. Ajani et al. (2013) further go on to acknowledge that the IK-SK nexus is not only important

¹⁵ Not his real name

for adaptation but it is used by planners and intellectuals in their efforts to improve rural communities. The argument was that the integration of IK into policy frameworks for climate change is essential for the development of effective adaptation strategies. This is also important as part of the efforts made by community members and responsible authorities in their efforts to withstand the changing environments.

6.1.3 Crop change

Another important form of adaptation is crop change. This form of adaptation has been practised by many African communities over the years. The change of crops is communicated by agricultural extension officers or community leaders at the ward or village levels. For instance, in Chibeta and Nyamuzizi, agricultural extension officers have for long advised smallholder farmers to consider drought-resistant crops given the nature of soil and temperature changes as well as erratic rainfall patterns the community is experiencing. One of the participants had this to say:

...We have always been told by agriculture extension officers and other experts that we are likely to receive very low rainfall. Hence, their advice for years now is that we should try to focus more on the growing of drought-resistant crops such as sorghum. So some took the advice and those with good soil are managing to produce good harvests while others are struggling.

[Melody: Focus Group Discussion July 2019]

Further, the communication on crop change has been also related to the ancestors. Some participants reported that it has always been a custom that when the season is dry the community would consult from the ancestors through a rain-making ceremony known as Mafuwe and after the ceremony, rains would come or the ancestors would advise the community to grow certain crops. One of the participants indicated that:

...long back we knew that at a time when we receive low rainfall the spirit mediums would advise us to grow crops such as sorghum or millet. So now because of climate change, we now retain most of the knowledge and practices of our ancestors.

[Stella: Focus Group Discussion July 2019]

Another participant emphasised the change to growing sorghum and millet without clarifying who was behind the change or shift. The only important aspect to note was that lack of sufficient rains impacts negatively the growing of crops like maize which consume a lot of water. Here is what the participant had to say:

...Now due to lack of sufficient rains, we now focus on drought-resistant crops such as sorghum and millet. These are crops traditionally known for doing very well even in times of drought. So now since we regularly experience droughts or lack of sufficient rains it means that we are now left with one option that is considering sorghum and millet.

[Jacob: Focus Group Discussion July 2019]

From the narratives of participants, change of crops is either communicated by authorities or it is inspired by perennial wisdom which forms an important part of IKS. The major change is that the community no longer rely more on the dictates of the ancestors for agriculture-based decisions but practices such as crop change are indirectly informed by what is previously known as the role of ancestors. Generally, the change of crops is a common practice among African smallholder farmers. In light of this, Kurukulasuriya and Mendelsohn (2006) revealed that the process of crop change has always been part of the African farming culture. In African societies, crops could usually be changed during times when there is a lack of sufficient rains that usually result in drought. The process was used as an adaptation strategy to climate change in Africa for example, in the cooler regions farmers could select sorghum and maize-millet varieties and in the moderately warm regions maize and groundnut could be grown interchangeably. In very dry regions like Mutoko district, farmers rotate sorghum and millet-groundnut when conditions are dry and cowpea, sorghum and maize in medium-wet conditions.

6.1.4 Crop variety

Crop variety is an important form of adaptation among farmers in the communities. Farmers in Matedza reported that they rotate crops not because of soil fertility but rather because they will be minimising their chances of losses. The major crops grown in the area are maize and sugar beans which are usually grown from the time the rain season begins around November and December. Farmers indicated that the crops take about three months to ripe and as soon as it is ready they will already be sowing a different crop. The process is made easy by the fact that

they do have irrigation such that even if the rains are insufficient they use irrigation on those occasions when the rain will be gone. This is because the crop consumes a lot of water and in the absence of sufficient rains there are high chances of reaping an impressive harvest.

Furthermore, the other crop that is commonly grown in the area is onions. One of the farmers indicated that they chose onions because they do not require a lot of water and it has a good market. The farmer highlighted that just like sugar beans, onions have an all year round market and what might differ is the market price not the demand of the product. The farmer indicated that after harvest the crop is sold at *Mbare Musika* (A market place located in Harare the capital city of Zimbabwe). The major challenge at the market place is that as farmers they do not determine the price of their agricultural produce, rather the buyers peg the prices. In the event that the price is not favourable, the farmer will have no option than just to sell because they cannot incur travel costs back to the farmland with the product. Further, the farmer also pointed out that they also grow maize but in small quantities for family consumption because it does not have a well-established market in Zimbabwe. Butternut is another crop which the farmer grows and he acknowledged that the crop responds very well to the soil and conditions in this area. Further, vegetables and tomatoes are some of crops grown in the area and the farmer indicated that the crops are not so reliable considering the fact that their market fluctuates year by year and as fresh products they quickly go bad which puts them at a disadvantage especially when demand is low. To put this into perspective, one of the farmers had this to say:

...Our major crops include sugar beans which we usually grow from the time the rain season begins around November and December. The crop usually takes three months meaning that around March we will be harvesting so that we can start sowing a different crop. The advantage that we usually have is that if we have water as we do now sugar beans grow very well and we harvest successfully but if we do not have water storage the challenge we face is that this area has a lot of dry spells and it is a semi-arid area. Well, apart from sugar beans we also grow tomatoes, onions, butternut and maize.

[Eliot: In-depth interview July 2019]

Given the various circumstances attached to the crops mentioned by the farmer, crop variety becomes an effective and reliable adaptive measure. One needs to consider the fact that the ultimate goal of farming is to get a harvest that supports livelihoods. In essence, farming is a

form of employment for smallholder farmers because their families and overall livelihoods depend on it. As such, given the complexities and dynamics in weather conditions, an awareness of the circumstances around various crops and adopting different crops put the farmers at an advantage. As a result, crop variety stands out to be an effective adaptive measure that farmers in Mutoko are using in order to always stay safe in the event of unexpected outcomes from one crop. Adaptation through crop variety which is strikingly similar to crop change is another important strategy employed by smallholder farmers in Mutoko district. Similarly, Smith and Pilifosova (2003) are of the view that adaptation to climate change is influenced by adaptive capacity and availability of the means through which communities can embark on successful adaptation processes amount to adaptive capacity. In that regard, the availability of the various crops involved in the process is a demonstration of adaptive capacity.

Further, IPCC (2011) suggests that adaptive capacity is of paramount importance in the process of climate change adaptation in rural communities. However, adaptive capacity is necessitated by access to diverse resources which include technology, skills, knowledge, stability, infrastructure and management capability. Also, socio-economic characteristics of a community are taken into consideration in determining the community's adaptive capacity. This is because the capacity to adapt to climate change is not universal which implies that it varies across regions and wealth groups, for instance, some of the adaptation strategies reported in this thesis such as the growing of cotton are peculiar to Mutoko district because of the region preferences. Also, within the same climatic region, there also exist certain adaptation strategies that are employed by groups that fall within a certain class of wealth, for instance, the use of solar-powered boreholes is usually adopted by wealthy farmers because of the cost of drilling the boreholes and the required types of equipment.

Further, this thesis has revealed that the vulnerability of communities to climate change is not caused by the depth of climate change impacts but rather by access to adaptive capacity. The most vulnerable communities and individuals are the ones that do not have the adaptive capacity that is sufficient to deal with the nature of impacts they will be experiencing. In that regard, it can be argued that the most vulnerable communities are those that have limited adaptive capacity. Below (2010) argues that countries that have poor levels of technology, weak information transmission, poor skills, poor infrastructure, weak institutions and limited access to resources also have little capacity to adapt and their level of vulnerability is high.

6.2 Relief measures

Relief measures are of paramount importance when communities are hopeless and livelihoods are at risk. This study has identified relief programs that communities in Mutoko are relying on for survival. There are government facilitated relief programs and community-based relief programs. A good example of a government-supported relief program is the government subsidised maize program, which is a source of survival for many. An impeccable example of a community-based relief program identified in this study is the indigenous management of resources.

6.2.1 Government-subsidised maize program

Due to shortages of maize resulting from the low number of farmers involved in maize farming the government of Zimbabwe prohibited the selling of maize to private players. Through Statutory Instrument (SI) 145 of 2019, it is a criminal offence for a farmer to sell maize to private individuals. According to the statutory instrument, selling of maize is only restricted to the Grain Marketing Board (GMB) a government parastatal responsible for buying, marketing and selling of crops. S I 145 of 2019 stipulates that; 5 (1) No person or statutory body or company or entity shall sell or otherwise dispose of any maize except to a contractor or to the GMB; 5 (3) No person who is not a producer of maize or who is not a contractor shall sell maize to the GMB (GoZ, 2019). The shortage of maize has made the Government of Zimbabwe (GoZ) embark on a maize relief program where maize is sold to rural communities at a low price. The other reason why the SI was issued was that there is low production of maize. Some farmers have given up growing maize due to the fact that the rains they receive are not enough to support their crops. This study revealed that they have frequently tried but were often disappointed because their crops could often dry before harvest.

The government-subsidised maize relief program is at the heart of IKS climate governance in the sense that it borrows the traits of indigenous based resource management in a rural setup. It is common knowledge in rural communities that the distribution of maize or other products is done by the village headman or any other responsible authorities. In communities like Matedza where there are no village headmen due to the fact that it is composed of farms, the process is administered by an elected chairperson who plays the role of a village headman. The process of distribution is often turned political in the interests of the ruling ZANU-PF party. However, despite it being diverted to be a political project, the fact remains it is part of the

indigenous management of resources where the responsible authority organises their people and ensure that they all receive products equally and accordingly. Figure 6.4 shows villages in Chibeta village receiving the government subsidised maize which they were asked to pay a small amount and each individual was restricted to two bags.



Figure 6.4: Villagers receiving government subsidised maize in Chibeta village

Source: Author (Fieldwork July 2019)

The provision of relief programs by governments and other stakeholders is an important way of adapting to the effects of climate change. In support of the use of relief as a method of adaptation, Mandleni (2011) presents a system of agricultural disaster insurance in the Eastern Cape province of South Africa where farmers are compensated for losses experienced due to climate change-related disasters and other general disasters experienced in the area. In the study, Mandleni (2011) presents a drought and wind management system that includes relief activities designed for the welfare of communities that are impoverished and those that cannot afford to take disaster insurance. Zhong et al. (2010) suggest that relief programs make an important form of climate change resilience, which is regarded to be the ability of a system or society to adapt to fluctuation in an effort to maintain acceptable levels of functioning. Resilience cannot be possible without social, institutional and informational resources to enable the community to respond effectively to a hazard effect. There are two forms of resources needed for relief programs and these are social and institutional resources. Social resources

constitute social networks that help in building capacity of communities to work together in adapting to climate change. Whereas institutional resources involve governmental, non-governmental and community-based organisations that interfere to assist communities with different forms of resilience and adaptation strategies. For instance, in this thesis the form of relief provided is championed by the government to improve the lives of the people. Generally, there is also another form of relief known as community-based relief which Tompkins and Adger (2004) argued that it enhances adaptive capacity by strengthening networks that are important for coping with extreme events.

6.2.2 Indigenous Management of Resources

Indigenous management of resources is a relief program that is administered at the village or ward level. In most of these programs, the village headman is responsible for resource management in his village. This thesis has indicated that the village headman has records of people in his area of control such that when there are resources that the village ought to benefit from, he puts together the names of the community members and if there is a subsidised payment he also collects the payment on behalf of the supplier. Farmers in Mutoko communities have often received agricultural inputs from the government and other contractors such as Southern cotton and COTCCO. In the event that there are such resources that need to be distributed, the village headman is responsible for the distribution of government inputs among many other roles.

According to a village headman in Nyamuzizi village, climate change has seriously impacted the agricultural activities of smallholder farmers in the area. Of course, farmers are contracted by COTCCO and the Southern Cotton but prices are not sufficient enough. Also, the fertilisers that they receive from their contractors are not sufficient. Hence, they have to budget and the process of budgeting fertilisers severely impacts production. According to the village headman, instead of 6-8 bags per hector they receive 2 which is a serious concern. Further, a large number of farmers face serious challenges pertaining to insects that are climate-related. The village headman had a manual which he uses to identify the insects and how to fumigate them. He indicated that it is clear that insects are a product of climate change. This is because since the period he started cotton farming around the early 2000s most of the insects encountered now were not visible.

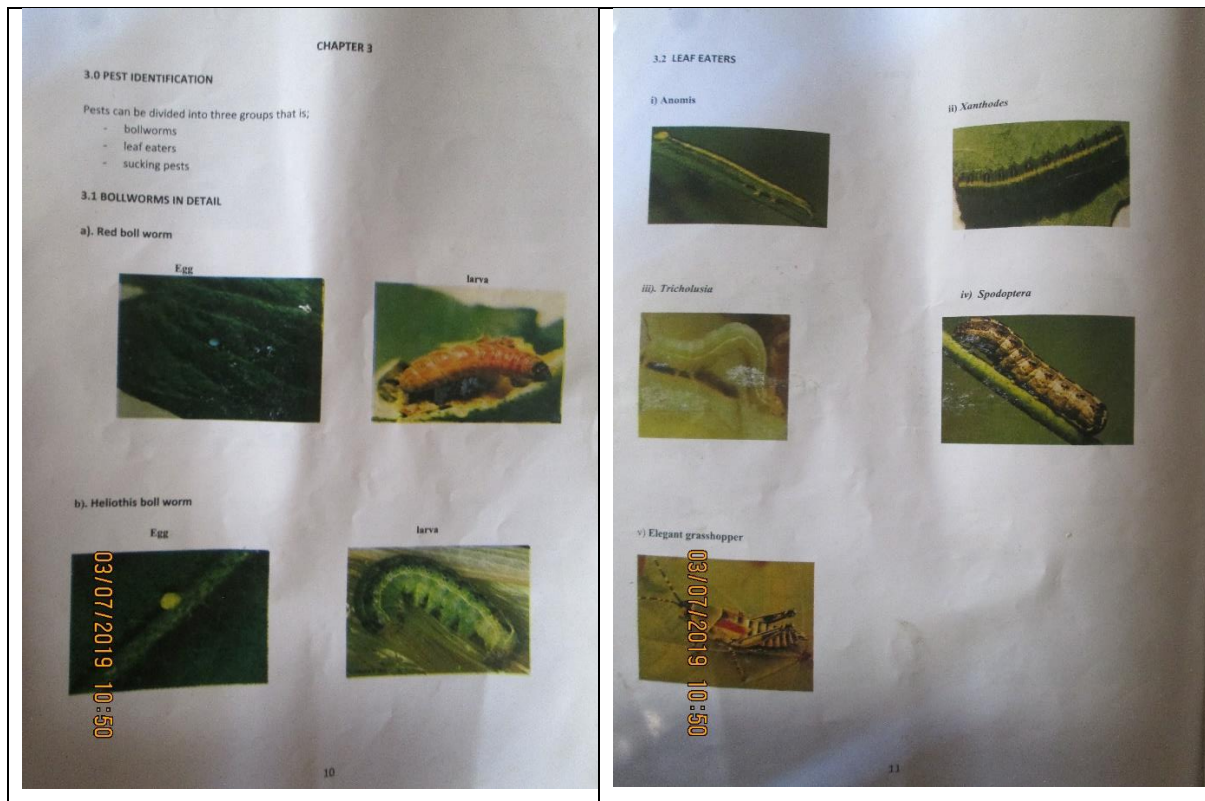


Figure 6.5: Extracts from the headman's manual for cotton farmers

Source: Author (Fieldwork July 2019)

Figure 6.5 shows extracts that were captured from a village headman's manual which he uses to help smallholder farmers to manage their crops. In the manual, there are images that identify the types of pests prone to the cotton crop, types of soil and fertilisers required. This was found to be helpful because the farmers improve their harvests by being aware of the circumstances around the crop. The headman's role in this regard significantly complements the role of AGRITEX officers who work in the area to help farmers with initiatives aimed at improving their farming activities. The role of the headman in this regard is also of paramount importance in indigenous resource management. The knowledge from the manual helps the village headman to assist the farmers to produce good harvests because they would have succeeded in overcoming pests and selecting good soil and fertilisers for the cotton crop.

6.3 Indigenous and Scientific Knowledge Nexus

It has emerged from the findings of the thesis that crops like cotton now suffer significantly from the effects of pests as indicated earlier on. Hence, as a result of these pests, the village headman has the responsibility to bring his community together with the indigenous way but

the meeting will be dominated with scientific methods of dealing with the challenges that farmers are facing as a result of climate-induced pests. Hence, at that juncture both indigenous and scientific methods are at play. As a result, it can be argued that indigenous adaptation strategies can be used effectively in conjunction with conventional strategies through the participation of local community members.

6.3.1 Questioning IKS

Is it possible to use IKS without SK? The findings of the current study have proven that IKS alone is not viable in the modern scientific world. At the same time, SK alone is not viable in some parts of the world because of long-standing cultural beliefs that ought to be observed for example in the Mutoko district where spirit mediums need to be consulted in many processes and activities that the community is involved in. Participants mentioned the instances where dams under construction continuously collapse due to failure to acknowledge or seek permission from the spirit mediums. This would only stop and construction resumes after rituals to acknowledge the spirit mediums are done. IKS is inseparable with African people because it forms the basis or roots of the African people.

6.3.2 Irrigation through IKS & SK Nexus

The current study found that farmers in Mutoko make use of irrigation from river waterhole and boreholes for their farming activities. This kind of irrigation amounts to IKS because it has been passed from generation to generation. However, it has been observed that the method is now used with aid from scientific methods. Drawing water from the river waterhole is still the same method that has been practised by smallholder farmers for years. However, the magnitude at which it is practised now appreciates the role and existence of SK. In that regard, SK comes into play in that, the syphoning of water from the common river sources is done not by buckets but through the use of diesel/solar-powered irrigation pumps. One of the farmers revealed the use of irrigation through syphoning from the rivers and also acknowledged that this way of irrigation is very important because it borrows a lot of traits from their indigenous way of syphoning. Here is what he had to say:

I heard about the solar system of drawing water from the borehole from fellow farmers around this community. I then embarked on my research going around villages seeing how those using the system are doing it. I then realised that most of the people using the system were drawing water from boreholes. Then given the current circumstances

that I cannot afford a borehole now I then came up with a plan that it's not only a borehole that can be a source of water but even in the river we can draw water. I then took a submersible borehole pump and used it in a riverside well. Before we got the pump we used buckets to fetch water from down the river up to the garden which is a tiring exercise. That also compromised the piece of land we covered. At some point we decided to use a petrol water pump but it was very expensive due to the high costs of petrol. The method we currently use is new but the process is immensely similar to what we have always been doing over the years. We have always drawn water through buckets and that is what we inherited from our fore fathers. The current system however saves time and it's more effective because we irrigate a large portion.

[Charles: Focus Group Discussion July 2019]

The use of IK-SK nexus in irrigation has revealed that IKS is still acknowledged and recommended by the community for sustainable development. The success of the method is drawn from the way it has always been part of the community's agricultural activities over time. Similar to this finding, Ajani et al. (2013) assert that indigenous knowledge is still considered valuable not only within the culture it evolves but also for scientists and planners making efforts to improve conditions in rural localities. It is taken as a starting point to bring in SK since rural communities are deeply rooted within their IK on issues relating to their development. This suggests that the only way the communities believe they could achieve their success is through the use of knowledge that has been passed from one generation to another because it is believed to have been tried and tested hence efficient for sustainable development. Similarly, Hinkel et al. (2007) and Kolawole et al. (2014) note that despite the existence of huge differences in the criteria employed in defining seasonal phenomena by farmers and scientists, there is however a significant overlap between IK and SK with regards to weather and climate forecasts. This, as a result, makes IK potentially useful for SK forecasting, particularly in the tracking of change. Moreover, it is important to acknowledge the fact that both SK and IK weather forecasting strategies are produced through observation and validation which suggests that there is a meeting point between the two forms of knowledge. Orlove et al. (2010) demonstrate that smallholder farmers in rural communities are open and willing to incorporate IK and SK into their weather forecasting methods as demonstrated by their readiness to discuss the use modern scientific forecasts. This has also been supported in this

thesis by the willingness and efforts made by farmers to use both IK and SK in their strategies of adaptation.

6.4 Spirit Mediums and Spirituality

IKS climate governance is incomplete without the role of spirit mediums. It is important to note that African people are spiritual and their spirituality is largely connected to spirit mediums. The researcher conducted a focus group discussion with ten community members and among them was a headman of one of the villages. One of the topics discussed were about the role of spirit mediums in climate governance. From the discussion, it emerged that spirit mediums known as *Mhondoro* in the *shona* language have control over the natural world. Rains, rivers and dams are directly influenced by spirit mediums. Also, mineral resources in the area are influenced by spirit mediums. If there are no sufficient rains in a particular season, smallholder farmers receive little farm produce, spirit mediums open up mines and there will be abundant mineral resources such as gold. Cyclone Idai which severely affected parts of Zimbabwe and Mozambique in the early months of 2019 is considered by participants of this study to be as a result of the anger of the spirit mediums. However, according to scientific knowledge, cyclones are caused by various scientific processes. Generally, according to the community members, climate change is a result of the anger of the spirit mediums because communities have frequently failed to observe the existence of spirit mediums and to acknowledge them accordingly.

Furthermore, the inquiry into the role of spirit mediums discovered that the communities in Mutoko have great regard for spirit mediums. The function of spirit mediums is perceived as guardian angels who oversee communities in their day to day lives. Hence, it was found that when communities embark on any developmental projects such as the construction of dams and building of bridges, they consult spirit mediums first and failure to do so would result in the collapse of the dam before completion. One of the participants had this to say:

...We consult spirit mediums in many cases because we believe they look after us and they know what we want at any given point. I want to give you an example, the rains which resulted in cyclone Idai that we recently experienced came as a result of consultations with the ancestors because we had experienced successive dry spells. However, it is also believed among our circles that the cyclone came as a result of the

anger of their ancestors due to the fact that people are no longer observing them. It is also believed that the cyclone came because there are people who killed a mermaid and it angered the spirit mediums.

[Mujuru: Focus Group Discussion July 2019]

There are numerous speculations on the incidences that are caused by spirit mediums. Some believe that they caused the cyclone because of the previous dry spell in the area whereas others believe that the cyclone was caused by the spirit mediums because they were angry at people who killed a mermaid in one of the major rivers in the area. It is believed that mermaids are connected to spirit mediums and any harm to them would result in some form of catastrophe to the entire community. In support of the role of spirit mediums on issues relating to the daily activities of the community, one participant had this to say:

...In this place we now alternate gold mining and farming because sometimes farming is not giving us the results that we are always happy with. As such, in cases like that, we go for gold mining. It has also become trend that during times when there are little rains we also have successful mining activities and we get more gold. It is believed that the gold is controlled by the spirit mediums and that happens as compensation for the lack of sufficient rains for agriculture. Also, it has been noted that when you get into the mine you need to be of good conscience. For instance, if you argue with someone before you get into the mine you won't get anything because the spirit mediums will be angry with you. Also when you get into the mine you leave everything else outside except for the clothes that you will be wearing. We also consult the spirit mediums before we get into the mine in order to be protected. Also, all the white people who came and failed to observe the spirit mediums perished in the mines. However, there are a few who followed the procedure and up to now, they are successfully mining in the mines.

[Hwende: Focus Group Discussion July 2019]

It has also emerged that despite going to church, the community still believes that there are spirit mediums that protect them and oversee their daily activities. One participant who shared this view had this to say:

...spirit mediums are critical in everything we do. Their role is instrumental in the success of anything we do. For instance, we do pray and go to church but at the end of the day, we understand that every place and every area has its own belief systems and practices. So we do obey and observe the connection between the ancestors and the spirit mediums because that's our life.

[Munemo: Focus Group Discussion July 2019]

From the narratives of the participants, this thesis reveals that spirit mediums and spirituality play a very important role in climate-related issues vis-à-vis the development of communities in Mutoko district. The phenomenon of climate change and variability seem to be highly related to the existence of spirit mediums and their anger is also highly connected to preceding weather-related calamities. In support of this finding, Jiri et al. (2011) assert that in Southern Africa, spiritual rainmaking ceremonies are at the heart of many traditional societies. The author opined that these rituals are performed by conducting prayers, using medicine portions, brew and drink traditional beer and dance under trees among other activities as a way of manipulating the falling of rain. The activities are considered effective in yielding positive results among African indigenous people. The findings of this thesis revealed that in some cases when communities embark on such activities by the time they go to sleep the rains would have already come. Further, Memmott (2010) supports this finding and contends that there is a clash between IK beliefs and Christian beliefs insofar as climate change is concerned. Some traditional elements believe that the changes noticed are a result of the failure of the communities to observe their traditional IK roots and focusing entirely on Christian values which are now considered superior. Due to the existing contestations, Mapfumo et al. (2015) suggest that there is need for further research to provide empirical evidence that supports traditionalists and smallholder farmers' claims of climate change and the role of spiritual ceremonies in reducing vulnerability.

6.5 Conclusion

The conclusion drawn from this chapter is that climate change adaptation is not a universal component but rather a plethora of components that are context-specific and unique. It has also been revealed that climate change adaptation, indigenous resource management and climate relief programs are fundamental aspects of climate governance. The chapter also found that adaptation as a form of climate governance comes in different forms. For instance, in this study

adaptation is categorised in forms of cotton farming, crop change, crop diversity and irrigation. These forms of adaptation are administered in numerous ways which form an important aspect of governance such as social capital which brings about the importance of social networks in climate change adaptation.

The argument brought forward was that social networks are important in sharing knowledge of adaptation as well as the different skills and technologies that are used in climate change adaptation. Further, the chapter went on to acknowledge the use of SK-IK nexus in climate change. This also brought about the significance of spirit mediums and spirituality which was revealed to be fundamental in the construction of an ideal African society. IK was presented as fundamental because it makes use of knowledge that is passed from one generation to another which is inculcated within communities and believed to be the most valuable forms of knowledge. This knowledge is then considered to be fundamental in that it provides the backbone for the use of SK in that policymakers, government and NGOs make significant use of SK to understand the community before they introduce their proposed methods and in the process of providing solutions to communities they also at times provide an IK-SK nexus. As such, these aspects are imperative in determining indigenous climate change adaptation and governance for sustainable development.

CHAPTER SEVEN: INDIGENOUS CLIMATE GOVERNANCE CONCEPTUAL MODEL: A PARADIGM SHIFT FROM WESTERN TO AFROCENTRIC ONTOLOGY AND EPISTEMOLOGY

7.0 Introduction

The previous chapter tackled the indigenous climate change adaptation and governance for sustainable development. From the knowledge gathered in the chapter as well as climate change and variability in the first empirical chapter, this chapter formulates an IKS based climate governance conceptual model whose aim was to provoke a paradigm shift from Western to Afrocentric ontology and epistemology. To better place the model within the parameters of the African ontology and epistemology, the chapter begins by giving a background to the African ontology and epistemology. This is alluded by the fact that there is an African mode of knowledge that is peculiar to Africans denoting that it is context-dependent and social bound and essentially considered to be superior to other epistemologies. As a theory of knowledge, epistemology can be culturally reflected, provoked and generated. Further, African ontology comes into being through the premise that “African thinkers tailor their thoughts towards addressing the lacuna in the schemata of things as it affects the general existential lives of African people” (Ekanem, 2012:306). As such, the excursus in this chapter is to demonstrate the IKS climate governance structure as well as the ontological and epistemological underpinnings that are evident within it.

In light of the African epistemology and ontology, the climate governance model presented in this chapter is a unique overview of the Indigenous climate governance that exists in African communities in Mutoko district. The emphasis in this trajectory is the significant role of traditional leaders and spirit mediums as well as the centrality of community members who are a common denominator in the IKS climate governance structure. To put this into perspective, other organs within the model such as NGOs and government, Rural District Council and smallholder farmers, in general, all work to ensure that the community as a whole achieves sustainable development and other outcomes of a comprehensive climate change adaptation and resilience system. As such, the main objective of this chapter was to provide a theoretical understanding of climate governance from an African indigenous perspective. In order to achieve this objective, the researcher developed a theoretical model rooted in the premise that African epistemology is rooted in African ontology. In essence, the epistemological view of

the traditional African is consonant with his metaphysics. This implies that the knowledge of climate governance and practices around it in an African context cannot be separated from the African way of life. This is essentially because epistemology deals with the claims that are made concerning the facts of people's experience and consequently the facts are interpreted within certain concepts, theories and worldviews.

7.1 Understanding epistemology and ontology

Smith (2003:1) defines Ontology as "...a branch of philosophy which is the science of what is, of the kinds and structures of objects, properties, events, processes and relations in every area of reality." Moreover, Tennis (2008:103) defines Epistemology as "how we know and how we make implicit epistemic statements about knowledge of concepts, acts (such as representation), entities, and systems. In so doing, we create knowledge, and our epistemic stance dictates what kind of knowledge that is. Some common names of epistemic stances are pragmatic, positivistic, referential, instrumental, empiricist, rationalist, realist, etc. Each of these makes claims as to what kind of knowledge can be created through research, and how it is gathered and how it is presented." The conceptualisation of epistemology and ontology by Smith and Tennis establish the notion that there is always a philosophical standpoint through which reality or empirical findings should be interpreted. In most cases, scholars employ philosophical approaches such as the positivist paradigm or the constructivist approach to explain social phenomena. However, this empirical study takes a swipe at adopting either a purely positivist or constructivist approaches. That is despite the fact that the constructivist approach is considered important for understanding Indigenous Knowledge and Indigenous practices that are employed by local communities to adapt to climate change risks (Theodory, 2016). Instead, the thesis opted for a consideration of what is termed African ontology and epistemology which are context-specific in the study of IKS climate governance and also as attributes of the Afrocentricity theory.

7.1.1 The African ontology

Anselm & John (2015) emphasises the African cultural and ontological reality in which culture plays an important role in cognitive knowledge of reality. In that respect, Brown (2004) asserts that one needs to be intimately familiar with the ontological commitments of a culture in order to appreciate and understand the role and nature of such ontological commitments. In that regard, the understanding of the Africa cultural and conceptions of reality is through leads to a

rich knowledge of the African approach to knowledge. The centrality of traditional African thought is born out of the premise that there exist ancestral spirits whose intentions are known to African people. Despite the fact that those ancestral spirits belong to the dead it is within the African reality that they play a fundamental role in the day to day lives of African people in their communities. As a result, Anselm & John (2015) acknowledge that for African people, reality is immensely consequential compared to what is recorded within the realm of empirical inquiry. Consequentially, there are spiritual components of nature that are responsible for influencing human experience and perception.

Furthermore, Brown (2004:54) clarifies this by asserting that “...when a phenomenon is not readily explainable by empirical verification, it can be explained by the causal efficacy of the spiritual components of nature. By spiritual components of nature, we mean incorporeal components that have consciousness. That means they have an awareness of nature as much as humans have”. Brown’s contribution to African ontological and cultural view of reality provides a fundamental distinction to the Western ontological and cultural view of reality. The major distinction is that Western culture significantly cherishes the role of science in determining what is real and not real. This suggests that if anything is not confirmed by science it is therefore considered to be a metaphysical fantasy or mere superstition (Ekanem, 2012). A consideration of the African culture and ontology of reality significantly informs the development of an IKS climate governance model. This is so considering the fact that the model developed in this study acknowledges the role of spirit mediums in IKS climate governance. Further, it also gives credit to the role of traditional leaders in an African context in giving direction on how climate change could be managed. Hence, the knowledge derived from the model is essentially and fundamentally drawn from an African cultural and ontological reality which significantly opposes the Western ontology of reality.

7.1.2 The African epistemology

Akanmidu (2005) suggests that the proponents of African epistemology always direct attention to the cultural components of knowledge. However, this significantly opposes the ideological framework of European colonisation that hails the supremacy of Western reason over non-Western people and cultures. Akanmidu (2005) further acknowledges that there is a distinctive African way in which the world is perceived and that is what constitutes African epistemology. Asante (1999) acknowledges that it is difficult to establish that Africans possess different

cognition about the world from their Western counterpart. This is fundamentally because despite the uniformity of human nature, cultural and environmental dictates impose themselves on people's understanding of reality (Asante, 1993). As such, African epistemology entails what the African means and understands in the process of making a knowledge claim. This, in other words, can be considered to be the epistemology of African ontology considering the fact that it consists of how the African views and talks about African reality. In that respect, epistemology just like ontology is fundamental in presenting the IKS climate governance model developed in this chapter. This is so considering the fact that in most instances facts and knowledge that is accepted as true in the society, differ in other sections of the society. The difference may also be noticed in the manner in which knowledge is acquired, certified and justified.

7.1.3 Afrocentricity and IKS climate governance

Afrocentricity acknowledges the fact that imperialism imposed on Africa two major experiences that are namely the denial of African identity and the imposition of Western thoughts and cultural realities (Asante, 1993). The dominance of European colonial mentality has seen Africans gradually denying 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" (Keto, 1995:57). As such, African experiences are fundamental in the development of a climate governance model that explains how climate change is managed in an African community. As such, this sociological approach to climate governance is within the Afrocentric paradigm that requires Africans to be studied in their own contexts. Asante (1993) argues that Afrocentricity has an impact on how Africans view their identity and way of doing things relating to activities such as farming practices and other indigenous practices that they employ in their day to day lives.

Considerably, Afrocentricity has implications for indigenous African culture because it locates research from an African viewpoint and fundamentally helps in the creation of Africa's own intellectual perspective. Its major objective is to study Africa as the cultural centre that is utilized in studying African experiences such as the manner in which climate governance is administered from an IKS perspective as presented in the conceptual model. In that regard, Asante (1998) is of the view that the Afrocentric paradigm delivers methods that Africans could

use in interpreting their everyday experience in an indigenous African point-of-view. It is important to note that major climate hazards largely impact the livelihoods of rural communities that heavily rely on natural resources for survival. Hence, an indigenous approach to adapt and manage climate change is of paramount importance. In support of this assertion, Jianchu (2007) opined that local communities have developed culture-based harsh weather adaptation mechanisms to improve their livelihoods.

7.2 Climate governance models for Zimbabwe

Contemporary scholars in environmental humanities Mugambiwa and Rukema (2019) hinted a proposed IKS climate governance model for Zimbabwe. The model gives precedence to the nature of climate governance piqued in this chapter. The proposed model developed by Mugambiwa and Rukema was based on the experiences and perceptions presented by their study participants. Their proposed structure presented the local community as central to the process of climate governance which correlates with the proposed conceptual model in this thesis. The argument of the scholars was that all processes that evolve from the community are aimed at developing and improving adaptation strategies for the community. In essence, decision-making was proposed to begin in the community with the guidance of the local chief and other relevant stakeholders who comprise the local headmen.



Source: Author

Figure 7.1: Mugambiwa & Rukema proposed IKS climate governance structure

Source: Adapted from Mugambiwa & Rukema (2019).

The proposed model also suggested that community members are also central because they understand the nature of the challenges they are facing better. Further, Dodman and Mitlin (2015) present a political based climate governance structure for Zimbabwe. The governance structure for climate change in Zimbabwe as presented by Dodman and Mitlin (2015) is composed of the following elements:

- National Climate Change Office which is based in the Ministry of Environment and is funded by the UNDP. Its responsibility is engaging with UNFCCC and producing national communications.
- National Climate Change Task Team which is coordinated by the Office of the President and Cabinet. It is responsible for producing the National Climate Change Response Strategy such as the National Climate Change Plan.
- National Climate Change Steering Committee which has a wider range of participants from government and civil society, and is intended to guide the production of the National Climate Change Response Strategy.

Dodman and Nitlin's (2015) structure is largely limiting because its major focus is on national politics approach to climate governance. Hence, this thesis made an attempt to divert from the national politics of climate change which significantly informs methods of governance. Moreover, it should also be noted that Dodman and Mitlin's climate governance structure is a symbol of the Western epistemology due to the fact that reference is only given to national political structures. No attempt was made to consider indigenous people who are fundamental on climate governance matters. As such, this chapter presents a climate governance structure that is uniquely African and ought to be used to inform governance models in Africa.

7.3 IKS Climate Governance Conceptual Model

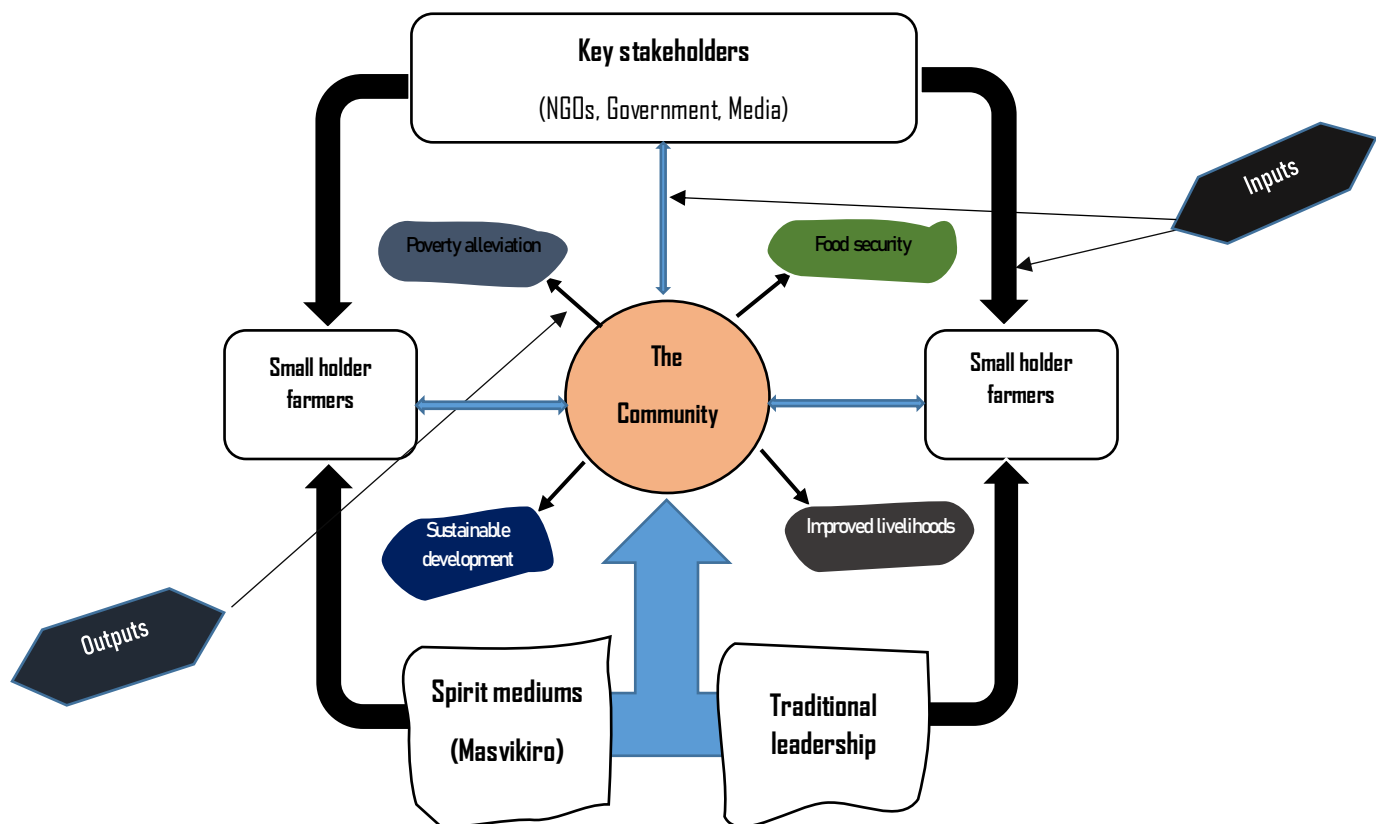


Figure 7.2: IKS Climate governance conceptual model

Source: Author

7.3.1 An introspection of the model

The model reflects and interprets the indigenous based climate governance structure in Zimbabwe. The term IKS consequentially provokes one to imagine an ancient way of doing things. However, this study undressed the hidden meaning behind the term. Numerous definitions of IKS presented earlier amounts to the understandings, skills and philosophies that are engineered by communities bearing in mind the histories of interaction with their natural surroundings. Orlove et al. (2010) relate IKS to the knowledge that is place-based in the sense that it is rooted in local cultures in which community members have strong ties with the natural environment around them. In that regard, local knowledge informs decision making about fundamental aspects of day to day lives. Indigenous knowledge is considered to be unique and

culture-specific and should be developed by people in a particular community. In that regard the model is termed IKS climate governance conceptual model.

Chapter six presented the indigenous management of resources where traditional leaders are fundamental in the distribution of resources such as government inputs. This is a fundamental indigenous aspect that relates to the ancient times in the Shona communities where traditional leaders were key players in all aspects that relate to the wellbeing of the community. For instance, the Shona culture has what was known as *Zunde raMambo* (the chief's granary). Bhatasara (2016) described *Zunde raMambo* as a strategy that was used to address issues pertaining to food insecurity that people in the area have always employed at the community level over the years. It is an indigenous food security strategy where households contribute various grains such as maize, sorghum, rapoko and millet to *Zunde raMambo*. The grain would then be given to deserving households at the chief's discretion in cases of droughts and other emergent crises. Arguably, the employment of IKS in climate governance is of paramount importance because it evokes the adoption of methods familiar to indigenous people on climate change adaptation and management. This is in line with Chanza and de Wit (2016) who argue that IKS has the capacity to transform the technocratic community in the ongoing debates where climate science and policy regimes are increasingly being interrogated to test their sustainability.

Furthermore, the method used in the *Zunde raMambo* and many other indigenous practices employed by Shona people reflect the importance of traditional leadership in the management of resources. Also, reflecting on the outcome in Chapter six, this thesis reflects on the importance of merging IKS and SK considering the dynamic nature of modern societies. The logic of merging the two was that IKS without SK is limiting inasmuch as SK without IKS complicates the lives of indigenous people. On that note, Chanza & de Wit (2016) also emphasized the importance of embracing inclusivity in designing mitigation and adaptation strategies by all climate stakeholders affected by climate change. This came into being after an indication that Dodman and Nitlin's (2015) structure of climate governance in Zimbabwe is largely limiting because its major focus is on national politics approach to climate governance. As such, the model in this thesis reflects the role of the political leadership and key stakeholders as important components of the indigenous management of resources vis-à-vis inclusivity.

Borrowing from the traits of the *Zunde raMambe* classic example, one would establish that the role played by the non-traditional organs such as the key stakeholders significantly portrays the indigenous ways of resource management. For instance, just like the chief would collect grains for redistribution among community members, the key stakeholders are directly involved in the provision of fundamental services to communities despite the fact that they would not have collected from the same people. Of note is also the fact that the manner in which the services are distributed largely borrows from the indigenous way where the village headman is tasked with the distribution as indicated in chapter six. A study by Turner and Clifton (2009) on indigenous citizens of Hartley Bay in the British Columbia relates befittingly to this finding because the study revealed that there was a strong recognition of the relationship between land utilization and the spirituality to the effect that all land and forest resources belong to ancestry and the spirits. This suggests that there are procedures and protocols that should be observed when people make use of the resources.

The various organs represented in the model provide various services considered to be inputs meant to assist the community to adapt to the effects of climate change. The inputs are directed at the community and smallholder farmers. Of note is the fact that the community is at the centre of this matrix. The community plays an important role in the structure of the model because the inputs from all organs are directed at the community and even though smallholder farmers are also an important recipient of inputs from all other organs, they refine and channel the inputs to the community in form of farm produce. The nature of inputs directed to the smallholder farmers includes farming skills, agricultural inputs and irrigation strategies which equips them to produce good harvests. The inputs directed to the community are multifaceted, that is, all organs involved are focusing on the community. The aim is to ensure that the community delivers sustainable outputs in the name of sustainable development. The model suggests that the ultimate goal of climate governance is to achieve four important outcomes referred to in this thesis as outputs. These are namely; poverty alleviation, food security improved livelihoods and sustainable development. This is supported by Munang et al. (2013) who opined that IKS climate governance entertains ecosystem-based adaptation whereby the use of natural capital produces a plethora of benefits such as protection of livelihoods and poverty alleviation.

7.3.1.1 Poverty alleviation

One of the major effects of climate change in rural communities is poverty. The effects of climate change hamper agricultural productivity which results in widespread poverty and hunger among community members. Anriquez & Stamulis (2007) assert that around the world, extreme poverty continues to be a common phenomenon in rural communities and a majority of the world's extremely poor people live in the rural areas where they largely depend on agriculture, forestry and fisheries for survival. This suggests that rural people rely largely on the natural environment and the effects of climate change are prone to quickly affect their survival hence the huge rate of poverty. Chapter five presented the negative effects of climate change where poverty was acknowledged to be a major concern. Hence, the model presents poverty alleviation as an intended output that comes into being through the provision of various strategies (inputs) presented. The overall belief is that if all organs in the model effectively provide relevant inputs they will manage to achieve poverty alleviation at community level. In support of this, Mawere (2014) argues that the adoption of IKS is fundamental because it gives African communities a sense of responsibility in environmental resource exploitation, which results in ensuring food security in the event of environmental shocks like drought as stipulated by the Sustainable livelihoods approach.

7.3.1.2 Food security

Food security is a fundamental aspect of the overall development of the community. Ahmed and Abah (2014) suggest that food security exists when communities at a family level have access to food in quantity and quality that is considered to be adequate and consistent all the time. The effects of climate change negatively affect the productivity of farmers which results in challenges pertaining to food insecurity. Climate change is associated with various weather calamities which include hot temperatures, lack of sufficient rains and erratic rainfall patterns. Ndiweni (2015) opines that most households in southern Zimbabwe are involved in rain-fed agriculture which has been under the threat of drought for some time and consequently agricultural input has been impacted. Also due to successive droughts, the communities have suffered the loss of livestock especially cattle. These consequences significantly affect the productivity of farmers in communities and increase the incidence of food insecurity. As such, the inputs reflected in the model are aimed at ensuring that smallholder farmers achieve their full potential so as to acquire one of the major outputs which is food security.

7.3.1.4 Improved livelihoods

The livelihoods of the community are of paramount importance in the overall deployment of any community. Climate change affects the livelihoods of communities in their entirety. The sustainable livelihoods approach reiterates that “...A livelihood comprises the capabilities the capabilities, assets (including both material and social resources) and activities required for a means of living” (Chambers & Conway 1991: 43). As such, the various inputs presented in the model are fundamental in achieving improved livelihoods as an output. Chapter five demonstrated the effects that climate change has on the livelihoods of communities with particular emphasis on the health, social stability and economy of the communities. Hence, as part of the outputs in the model, the fundamental aim of the organs that provide inputs to the community is to achieve improved livelihoods whereby the community leads a considerably improved livelihood where community members access desirable facilities and services such as safe water, free from climate change-related health hazards and afford their basic needs.

7.3.1.5 Sustainable development

Achieving sustainable development is one of the major objectives of a comprehensive climate change governance system. This is so considering the fact that climate change poses serious threats to communities and their natural resources. Sustainable development is defined as the principle and efforts aimed at meeting human development aspirations while at the same time sustaining natural systems’ ability to provide the natural resources upon which the economy and society depend (Shaker, 2015). Hence, in the IKS climate governance conceptual model presented in this study the key stakeholders, traditional leaders and spirit mediums play a significant role in the provision of support (Inputs) to the community and smallholder farmers. This form of support is essential for one of the major outcomes (output) which is sustainable development. The government as a key stakeholder is responsible for providing communities with Agricultural extension officers who are accessible to communities. Their role is to render agriculture related support to farmers and this form of support is fundamental for sustainable development because the officers are professionally trained. Departments such as EMA provide essential serves related to ensuring the sustainable management of natural resources and protection of the environment, prevention of pollution and environmental degradation.

7.3.2 The community

According to the model, the community forms the core of climate governance. All institutions represented in the model are aimed at the wellbeing of the community. For instance, key stakeholders such as the political leadership in rural communities which comprise councillors in every ward are there to deliver political mandate for the well-being of the community. In all the communities, the councillors are from the ruling ZANU PF party. They are involved in representing the government at the rural level. The findings this study revealed that the community looks up to the political leadership in times of difficulties though the current leadership seems to be more concerned about delivering services during election time because they will be campaigning for retention of power. However, on climate-related issues the political leadership provides farming inputs such as seeds and fertilisers to smallholder farmers. Such gestures by the political leadership show that the community is an important part of the structure because it stands as the reason for the existence of all other organs. Further, just like the key stakeholders, smallholder farmers, spirit mediums and traditional leaders the major objective is to deliver services to the community in their peculiar ways.

7.3.3 Smallholder farmers

Smallholder farmers are the backbone of all rural communities insofar as sustainable development is concerned. The role of smallholder farmers is to provide food for the community. They determine the state of food security in their communities. However, they are directly affected by the effects of climate change. They need to be equipped at all times so that they have sustainable adaptation strategies in place. The manner in which smallholder farmers adapt to the effects of climate change determines the state of sustainability in any community. However, the farmers in this thesis revealed a plethora of challenges they are facing and among them were the high prices of fertilisers. Fertilizer was considered to be of paramount importance due to agro-ecological conditions that are characterised by poor sandy soils which immensely require that they invest in fertilizer. One respondent indicated that:

...as farmers we face numerous challenges that hinder the production of crops to our expectations. These challenges include failure to afford fertilisers and other important inputs we readily need. Of special concern is fertilisers because the soil has been overused and we ought to continue using it because that's all we have. In some instances, we get supplements from the government but it tends to be not enough

because there are many beneficiaries. Well, I can also say that we at times benefit from inputs provided by 'the donor' (NGOs).

[Eliot: in-depth interviews July 2019]

The narrative by Eliot signifies the importance of external support demonstrated in the IKS climate governance model. The model reveals that key institutions are there to render support to smallholder farmers as much as they do to the community. This is significant because without such forms of support, the productivity of a smallholder farmer is at risk and that consequently threatens food security and sustainability. In support of this finding, Jack (2013) opines that smallholder farmers play an important role in ensuring food security, poverty reduction and sustainable development. Hence, it is essential for all relevant key stakeholders to render their maximum support to the smallholder farmers in order for them to produce to the best of their ability.

7.3.4 Key stakeholders

Among key stakeholders, there are government agents, the media and NGOs. The role of these institutions on climate governance is fundamental. Some of these institutions work hand in hand with the government yet others are independent but at the end of the day the focus is to improve the livelihoods of the communities in the face of climate change.

7.3.4.1 Government agents

The government treasures the wellbeing of small scale farmers in communities such that it deploys various stakeholders to render them the services they require. The stakeholders include AGRITEX officers, Livestock Production and Development Officers, Veterinary officers and officers from the District Development Fund. The role of these officers is to provide support to farmers in order for them to improve their production. They are physically present in communities in order to ensure that they provide their much-needed skills to the farmer. In support of this, an AGRITEX officer who was a key informant acknowledged that:

...I can say our main duty is to provide our expertise to the farmers in various ways which include encouraging them to use crop residues mainly from maize. We also help farmers prevent insect attacks on their crops. There are numerous worm infections

experienced by farmers hence our duty is to encourage farmers to report these diseases early so that we assist in prescribing solution.

[James: Key informant interview July 2019]

The role played by AGRITEX officers complements other officers such as livestock production and development officers. This is because they are both aimed at improving the productivity of the farmer. As demonstrated in the model presented in this thesis, the support rendered to farmers is a key determinant of the wellbeing of the entire community, that is, the productivity of farmers puts communities at a better place.

7.3.4.2 Mass Media

The mass media is a very important institution in climate governance. The findings of the current study revealed that smallholder farmer and community members, in general, rely on the mass media for updates on weather forecasting by the meteorological department. There are programs that some participants acknowledged to listen to from the radio and television which are important insofar as climate change is concerned. The participants revealed that they watch and listen to programs like *Murimi wanhasi* (Today's farmer) where fellow successful farmers appear on the national television to share their experiences, challenges and success stories. This is important in motivating smallholder farmers and the sharing of important information that is essential in enhancing production. Hence, as presented in the model, Mass media also provides essential inputs to smallholder farmers for them to channel processed inputs to the community to guarantee the production of the aforementioned outputs.

7.3.4.3 NGOs

Non-governmental organisations are instrumental in climate governance. There are several NGOs that are in operation in Mutoko district and many other rural communities in Zimbabwe whose focus is on climate change and improvement of the livelihood of the community in general. The NGOs operating in the area are the Community Technology Development Organization (COMMUTECH) and Plan Zimbabwe (Mutoko Sub-Unit). Bhatarasa (2016) revealed that NGOs play an important role in assisting farmers with developmental projects in Mutoko. The author emphasised the role of NGOs in projects related to diversifying indigenous and hybrid chickens. In Bhatarasa's (2016) study on understanding climate variability and livelihoods adaptation in Mutoko Zimbabwe, NGOs played an important role in promoting the

rearing of indigenous chickens, in particular COMMUTECH. This was because indigenous chickens were perceived to fare well during drought and dry conditions. Hence, the structure of the model presented in this thesis reveals NGOs as part of the organs that inject inputs to farmers and community members in general in order for them to achieve the intended outputs mentioned earlier on in this chapter.

7.3.5 Traditional leadership

Traditional leadership is key to climate governance. One of the most important roles of traditional leadership is to ensure that the community observes their traditional rules and values with regards to the management of natural resources and climate in general. Traditional leaders are the custodians of customary law and scholars like Mahamed-Katerere (2002) and Turner and Clifton (2009) emphasized the importance of traditional leadership in climate governance and opined that recognizing traditional leadership enhances the environment-spiritual connection which is fundamental in the regulation of resources as well as the productivity of the farmers. In the model, traditional leadership is considered to be an essential organ that renders inputs to both farmers and the community at large. Three categories of traditional leadership are presented, these are village headmen, the elders and spirit mediums.

7.3.5.1 Village headmen

The most important organ of traditional leadership is the village headman (*Sabhuku*). These are people who work and relate with the community on a daily basis. The current study has revealed that traditional leaders play an important role in climate governance. Their duties include direct and indirect support of farmers in their day to day activities. They also come in when there is need for the community to observe their customs and traditional beliefs. One of the headmen who took part in the study revealed that he had records of all residents in his area and occasionally he invites them for meetings that are either meant to distribute resources or knowledge pertaining to ways of farming and other important activities.

7.3.5.2 The elders (*Vakweguru*)

The elders are all elderly people in the community. They play a fundamental role on issues pertaining to indigenous practices and customary law. They are one of the major channels through which IKS is passed because they pass the wisdom and knowledge from previous generations to the current generations. That wisdom is fundamental insofar as climate change

is concerned. These elders are referred to as *Vakweguru/Mdzimbuya neMadzisekuru* in the Shona language.

7.3.6 Spirit mediums (*Masvikiro*)

Spirit mediums are immensely important in climate governance. There are numerous cultural practices that are observed in African communities. These include rain making ceremonies (*Mafuwe*) and other rituals which cannot be executed without the instruction of spirit mediums known as *Masvikiro* since they are the ones who have access to God and the ancestors. To substantiate this position Mahamed-Katerere (2002) reflects on the significance of spirituality and customary law in land use and management. The author gave an example of Zimbabwe where land-use practices are interwoven with cultural beliefs which are under the administration of local traditional leaders and the scenario was termed ‘environment-spiritual connection’. In that regard, spirit mediums are there to provide spiritual rules that restrict the use and condemn unsustainable exploitation of land and other natural resources.

7.4 Conclusion

This chapter established the IKS climate governance conceptual model and triumphed in establishing a paradigm shift from Western to Afrocentric ontology and epistemology. The model demonstrated that African experiences can be incorporated into the wider climate change discourse vis-à-vis IKS climate governance. This was achieved by focusing on the African cultural and ontological reality in which culture plays an important role in cognitive knowledge of reality. This form of knowledge is important for strengthening the education of the Africans which is considered to be a necessary foundation for sustainable development. This is also important because a plethora of key issues pertaining to climate governance can be inferred from the IKS conceptual model. The model presents a form of governance that is holistic, empowering and participatory in nature. This is because all major organs of the African indigenous society and the other supporting organs and their roles are all deemed essential. This is achieved by the understanding and cherishing of the African cultural and conceptions of reality which allows all stakeholders to take part in processes relating to the overall development of the community. This is largely opposed to the ideological framework of European colonisation that hails the supremacy of Western reason over non-Western people and cultures. As a result, the distinctive manner in which the African world is perceived constitutes African epistemology which largely informs the model established in this chapter.

The overall objective of the model was to demonstrate how sustainable development, poverty alleviation, improved livelihoods and food security could be achieved if there is a coordinated structure of various organs working together for the development of the community.

CHAPTER EIGHT: SUMMARY, KEY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

8.0 Introduction

The previous chapter developed the IKS climate governance conceptual model and triumphed in establishing a paradigm shift from Western to Afrocentric ontology and epistemology. This chapter presents the conclusions drawn from the study. In this chapter, the researcher reflects upon the entire thesis by revisiting the various questions that immersed in the development of the thesis. The chapter takes off by summarising the entire thesis and presents the key findings and conclusions thereof. In the later part of the chapter, the emphasis was put on the importance of applying the grounded theory in a study of this nature focusing on how this thesis contributes to knowledge through the key findings drawn and most importantly from the conceptual model developed. This was done within the confines of Afrocentricity and SLA theoretical perspectives.

8.1 Summary of thesis

The overall objective of this thesis was to investigate climate governance through the use of IKS for sustainable development in Mutoko district. The first chapter provided a background to the phenomenon of climate change, which was important insofar as climate governance is concerned and the chapter triumphed in locating the study within the field of environmental sociology. It was established that climate change has become a topical issue among scholars and the quest for this study to divert from focusing on the scientific aspects of climate change to dwell on the socio-economic and political phenomena was found to be essential. The reason being a few studies have focused on the study of climate governance through IKS. At this stage, the researcher also made efforts to link climate change, governance and IKS in order to pave way for the overall objective of the study.

Chapters two and three of the thesis provided the fundamental conceptual and theoretical underpinnings of the study whereas chapter four provided the appropriate methodological lenses. The conceptual underpinnings that were drawn from other scholars were meant to shed light on the concepts of climate change, climate governance, adaptation, resilience, sustainable development and IKS. As such, it was established that a plethora of scholars has contributed to the field of climate change, which gave the researcher room to explore in-depth the concepts

surrounding the problem statement of the thesis and the main objective thereof. As such, having established the conceptual lenses of the thesis, the researcher took a swipe to pinpoint the theoretical lenses that informed the thesis. The thesis's intention was to investigate climate change through the use of IKS for sustainable development which suggests that there was need for the study to be rooted in a theoretical perspective that is identified with IKS and sustainable development. As such, a triangulation Grounded theory, Sustainable Livelihoods Approach and Afrocentricity was established. Nevertheless, the thesis was largely informed by the Grounded theory taking into consideration the quest of the researcher to develop a conceptual model that demonstrates climate governance through IKS in a Zimbabwean rural community. As such, the triangulation was justified by the fact that Grounded theory paved way for the development of the conceptual model, Afrocentricity informed IKS in climate governance and Sustainable Livelihood Approach substantiated the livelihoods opportunities that were established in the thesis. In that regard, a methodological section that identifies with the aforementioned fundamental traits of the thesis was necessary. Hence, the researcher employed a qualitative methodology that was grounded in Afrocentric ontological standpoint in which the method of analysis and data collection among other fundamental aspects were informed by the Grounded theory.

Chapters five, six and seven provided the empirical findings of the thesis. The focus of chapter five was to interrogate climate change and variability discourse among community members and smallholder farmers. The chapter established how the knowledge of climate change and variability discourse plays an important role in paving way for good climate governance. Chapter six then provided the indigenous climate change adaptation and governance which appeared to be a broad and diverse concept. The main purpose of the chapter was to accentuate how knowledge passed from one generation to another is significant for community members in general and smallholder farmers, in particular, to adapt to climate change. This was continually established through the development of the IK-SK nexus that emerged on numerous adaptation strategies and governance processes unravelled in the chapter. Chapter seven developed an IKS based climate governance conceptual model and this was done to provoke a paradigm shift from Western to Afrocentric ontology and epistemology.

8.2 Key findings and conclusions

8.2.1 Observations as triggers of climate change knowledge

The study found that it was fundamental for community members to have knowledge of climate change generally since it was considered to be essential for any action to be taken on climate change matters. However, the knowledge of climate change by rural communities was found to be achieved largely through observations compared to reading materials and other forms of knowledge used in urban communities. This conclusion was reached upon after the researcher enquired if the participants of the study had knowledge of climate change. The study established that community members understood climate change and emphasis was made on the fact that even though they might not have understood the scientific term ‘climate change’, they had sufficient knowledge of the changes taking place in weather conditions and this was a product of their daily observations. The thesis established that that community members are aware of the numerous changes that have occurred over time. In that regard, the changes noticed and hinted on include temperature shifts, erratic rainfall patterns and early drying of rivers. These are important observations inasmuch as climate change is concerned. This awareness of climate change was found to be essential in the determination of adaptive capacity. Nevertheless, the thesis established that the knowledge of climate change in rural communities is achieved by the ability to observe the key factors that determine climate change which are namely temperatures, rainfall patterns and river flow patterns.

8.2.1.1 Temperature as a factor

One of the major factors that were established to ensure knowledge of climate change was temperatures. The study revealed that observations of the changes in temperatures are fundamental to ascertain that the phenomenon of climate change is upon the community. As such, the fact that a large number of participants hinted on changes in temperatures as one of their major yardsticks to determine that they are under climate change signifies the importance of temperature as a factor. Further, temperature was qualified to be a factor because a plethora of participants in the study acknowledged that temperatures had shifted remarkably over the years. In that regard, the most notable changes that were hinted are hot days which are said to be extending into winter and perpetuating in summer.

8.2.1.2 Rainfall patterns as a factor

Rainfall patterns were considered to be a fundamental factor qualified to be used to determine knowledge of climate change. A majority of participants in the study established that unpredictable rainfall to them is what climate change can be defined as because rainfall is no longer as predictable as it used to be before. The study established that it is difficult for the participants to stick to the normal agriculture calendar because of the constant changes that they are observing. This is because there are no more constant time frames wherein precipitation is expected. This has numerous consequences for the farmers and community in general because planning for farmers is affected since no farmer would be in a position to know when the rains come and goes. Hence, it has been established that erratic rainfall patterns as some scholars would name it is a fundamental factor that one needs to consider to ensure that they do possess the knowledge of climate change.

8.2.1.3 River flowing patterns as a factor

River flowing patterns were considered to be a fundamental factor that can be used to determine the knowledge of climate change. This is so considering the fact that if one could observe the changes in river flow patterns that could translate to the knowledge of climate change because the flowing of a river is subject to the level of precipitation which is informed and influenced by climate change. Therefore, given the fact that people in rural communities are not at the same level of understanding scientific processes as people in urban areas, their knowledge comes from observations of factors like river flowing patterns and the other aforementioned factors. The study has revealed that the communities are often experiencing early drying up of rivers which has been widely considered to be an effect of climate change. The narrative on the change in weather conditions was backed by the fact that many rivers are drying before their time to dry comes. This argument was substantiated by the fact that participants made a comparison between the 1990s and the 2000s and drew a conclusion that the period of flowing has significantly reduced. Hence, observation of river flowing patterns were established in this thesis as one of the important factors used by rural communities to ascertain the incidence and phenomenon of climate change.

8.2.2 Climate change challenges as triggers of knowledge

Climate change has numerous challenges that it imposes on communities. These challenges are many and they are severe. The thesis has established that climate change has triggered many

challenges on the lives of community members in Mutoko district. The major means of survival in the area is agriculture and the farmers depend largely on rainfall for their crops, hence climate change becomes a serious threat on their farming activities because agricultural productivity has been diminishing over years. Livelihoods in the area are dependent on agriculture such that failure to materialise the community would be greatly affected. A plethora of participants indicated that there are numerous effects that climate change is posing on their livelihoods. It has also been echoed that agriculture forms the backbone of the community and its dearth would mean tragedy to the people. Hence, the challenges that were identified as factors that one could use to ascertain knowledge of climate change include food security, hunger, health and water shortages.

8.2.2.1 Food security as a factor

Ensuring food security is one of the major challenges that was associated with climate change in the study. As such, the fact that the community is no longer in a position to achieve food security should translate to be a factor that determines knowledge of climate change. The study reported that there is a high level of uncertainties posed by the lack of sufficient rains. This is because agricultural produce is becoming low such that farmers and families cannot survive to the next season with their produce. Rural communities rely largely on smallholder farmers for the supply of their food such that if productivity is low there is a likelihood that the food produced will not be sufficient for all community members and to take the community to the next level. This should not be an occurrence of one season for it to qualify to be a factor. As such the study has established that low production and food insecurity has been experienced for some time now. As such the consistent occurrence of low production threatens food security and the ability of the community to notice that food security has consistently been threatened over the years can be a factor to determine that the community has knowledge of climate change.

8.2.2.2 Hunger as a factor

Hunger as a challenge that is largely necessitated by the incidence of the phenomenon of climate change could as well be used as a factor to determine knowledge of climate change. In that regard, if the hunger caused by climate change is consistent, then it should give communities a hint of climate change and it should be employed in collaboration with the aforementioned factors. The reason being using it alone as a factor could produce misleading

results because generally there are many causes of hunger. To that effect, this thesis has established that communities in Mutoko district are faced with hunger as a huge threat and it was blamed at climate change after linking it to other factors such as erratic rainfall patterns and temperature shifts.

8.2.2.3 Health effects as a factor

It has also been established that the health of the community is at risk as a result of the phenomenon of climate change. The health challenges that were reported include malaria, cholera and typhoid. The study revealed that the struggle that the communities are facing expose them to the aforementioned diseases. For instance, some participants reported that the manner in which too many people scrambled for a small source of water in Sinyerere area has resulted in the contraction of Cholera. Also, it is important to note that health effects as a factor should not be accommodated independently to determine knowledge of climate change because diseases have many other causes. Hence, it should have employed in collaboration with the other aforementioned factors.

8.2.2.4 Water shortages as a factor

Water shortages resemble another important factor that should be used to determine knowledge of climate change in rural communities. Such factors as water shortages are of paramount importance because they are evident and can be easily interpreted and linked to the incidence and phenomenon of climate change. In this thesis, water shortages are presented as a huge challenge and the indication of a majority of community members was that climate change is to blame. The study revealed that water shortages are caused by the early drying of the available sources which are dams and rivers which is directly a result of erratic rainfall patterns which adversely is a result of climate change. The study revealed that the rivers and dams that the communities rely on have for the previous years been drying early which should be argued to be a result of climate change. As such, given the fact that water shortages have consistently been experienced in the communities, it can be considered to be a factor to determine knowledge of climate change in rural communities. This implies that if one can observe that there is a consistent shortage of water resources that results from other climate change-related causes then the person could be said to have knowledge of climate change.

8.2.3 Indicators of climate change

The thesis further goes on to establish knowledge of indicators of climate change as factors that could be used to ascertain knowledge of climate change in a rural community. This should be dealt with bearing in mind the fact that knowledge of climate change is considered to be of paramount importance before any exploration of adaptation strategies. As such, some of the factors that should be taken into consideration to determine if a community has knowledge of climate change is the possession of knowledge of the indicators of climate change. The indicators are then translated into factors that should be used to demonstrate knowledge of climate change, as such the indicators that were covered in this section are tree/animal species and clouds.

8.2.3.1 Tree/animal species and clouds indicators as a factor

The thesis has established that tree species signals are a common indicator of impending weather conditions in the community. This implies that if community members are in a position to interpret the signals they encounter that will significantly translate to the knowledge of climate change. A majority of participants in this study have reported the existence of a variety of trees that they use to foretell the impending changes in weather conditions. Most of these trees show by failure to bear fruits when they are expected to. Nonetheless, it has been established that tree species are not the only non-meteorological/ scientific indicators that translate to the knowledge of climate change in the community. In that regard, there are also animal species that could be used to determine knowledge of climate change. On animal species communities are expected to be in a position to explain the behaviour of the animals which translate to the knowledge of climate change.

Furthermore, apart from trees and animal species, there are also clouds signals that are considered important in determining knowledge of climate change in this study. It has been established in this study that clouds are believed to be an important indicator of the impending weather conditions in rural Mutoko communities. Paradoxically, it can be interpreted in scientific ways since clouds are an impeccable scientific signal of the imminent changes in weather conditions especially when it is about to rain. Nonetheless, the explanation of participants on the role of clouds indicated that they are a unique form of African indigenous indicator. To that effect, the indicators presented in this section are regarded to be indigenous weather forecasting indicators that have been used by Shona people from ancient times.

8.3 Climate as a threat to culture

The observation of how climate change threatens cultural activities has been established to be another factor that could be used to measure knowledge of climate change. The study has established that cultural activities play an important role in the lives of the Shona people. Hence, the cessation of cultural activities was often interpreted as a consequence of climate change. Hence, this study concludes that cessation of cultural activities can also be considered to be a factor. This is so considering the fact that many participants referred to cultural activities as an important component of the Shona people because it helps them to trace their origin and observe their ancestors who play an important role in the African religion as mediators between people and God. As such, the role of gods is also very important insofar as climate change is concerned.

Moreover, it has always been part of the traditions and customs of the *shona/Buja* people in Mutoko that that before the rain season comes they would go consult the ancestors and embark on ceremonies to appease the ancestors to provide them with rains. As such, the fact that the ceremonies such as *Mafuwe* are no longer practised could mean that the community is not in a position to request for the rains and as such they will not receive accordingly. Further, the mushrooming and widespread Christian beliefs have also been blamed for the cessation of cultural activities. This is because Christianity and culture have provided numerous contradictory elements as revealed by participants as some of the causes for the phenomenon of climate change. As such, the ability of the community to notice cessation of cultural activities for whatever reason has been established in this study as one of the ways in which African communities are able to ascertain knowledge of climate change.

8.4 Climate change adaptation: An essential facet for climate governance

Climate change adaptation which comes in different forms has been established to be an essential facet of climate governance. In essence, the most important and elementary stage of climate governance should be climate change adaptation. The reason for that is the ability to survive under conditions of climate change depends on adaptive capacity. As such, there will be no climate governance to talk about without climate change adaptation. Hence, the findings of this study have established that climate change adaptation is of paramount importance in climate governance and sustainable development. This implies that climate change has severe effects on the livelihoods of communities to the effect that if there are no adaptive strategies

that are sustainable, communities could face serious challenges that threaten their livelihoods. Given that adaptation has been established to be an important facet of adaptation, it has also been established that the adaptation process is diverse. That is so considering the fact that there are many approaches that are used as adaptive measures. That includes land-based adaptation and none land-based adaptation which in this thesis is referred to as adaptation beyond the land.

8.4.1 The diversity of adaptation

One of the conclusions that were drawn from the assessments of adaptation strategies employed by communities in Mutoko is that climate change adaptation is a diverse process that takes different shapes and angles. The study found that the severe effects of climate change pose serious threats on the growing of traditional crops such as maize and it has been reported that the growing of maize is now a risk considering the fact that the community receives insufficient rains. In essence, that calls for the employment of a wide pool of adaptation strategies. The study has established cotton farming as an adaptation procedure. The indication of the narratives on the growing of cotton revealed that when the community used to receive sufficient rains cotton farming was minimal. Now considering the fact that the plant suits the changing temperature and it is a cash crop, it qualifies to be an adaptation strategy. The other adaptation strategies that are employed by smallholder farmers in communities include irrigation, crop change and crop variety.

8.4.2 Climate change adaptation as social capital

Climate change adaptation has been considered to be a social capital owing to the fact that the numerous processes of adaptation that are employed in this study have been learned through social networks that were established by individual farmers. Social capital is usually viewed from two unique levels that are namely collective action and individual level. Lin (2001) asserted that group-level entails how a certain group develops and maintains social capital as a collective asset, and also the manner in which such collective assets play a role in enhancing members of the group's initiatives and activities. This brings about Bourdieu's (1986) assertion that social capital refers to groups that are made up of social obligations or connections. That describes the adaptation methods presented in this thesis such as irrigation, crop change and crop variety which are influenced by the strong connection that smallholder farmers have and those connections are used to share knowledge and skills.

This study revealed that farmers travel around communities to identify trends and developments employed by other farmers in their agricultural activities. After observing the developments and trends, many farmers have resorted to copying the methods on their farmlands because they claim to be influenced by their fellow farmers in their communities. One of the methods that reveal social capital is irrigation. It has been indicated that due to lack of sufficient rains in the region, the community has seen the mushrooming of different forms of irrigation systems over the years. These include bucket, diesel-powered, petrol-powered, hand/leg (*Kabhasikoro*) and the most recent submersible solar-powered irrigation system. This thesis has revealed that farmers make use of water from river waterholes and boreholes for their farming activities. All the participants who reported to use the method confirmed that they are inspired by fellow smallholder farmers whom they have seen adopting the strategy. Crop variety and change are said to have been communicated by smallholder farmers on their own or through AGRITEX officers both serving as agents of the purported social capital.

8.4.3 Adaptation beyond the land

The other conclusion drawn from the practices of adaptation was that there are two forms of adaptation that exist in rural communities. These are adaptation beyond the land and land-based adaptation. As mentioned earlier on, adaptation strategies such as irrigation, crop change and cotton farming among others are a form land-based adaptation strategies. However, there are adaptation strategies that go beyond the land and makes use of institutions within and outside the community. A good example of these institutions is the government which is the initiator of relief programs that are aimed at community development. An example of government-supported relief program is the government subsidised maize program which many households in Mutoko were found to be benefiting from. An impeccable example of a community-based relief program identified in this study is the indigenous management of resources.

8.4.3.1 Relief programs as adaptation beyond the land

Community-based institutions are also involved in this form of relief. Institutions such as the Chief's office (*dare ramambo*) or the village headman's office (*dare rasabhuku*) are responsible for initiating the community-based relief programs. The programs at a local level are referred to as indigenous management of resources. In most of these programs the village headman is responsible for resource management in his village. This thesis has indicated that the village headman has records of all people in his area of control. In case there are resources

from the government or any other institution that the village ought to benefit from, the headman put together the names of the community members and if there is a subsidised payment, he collects the payment on behalf of the supplier.

8.5 IKS Climate governance conceptual model

The most important contribution of the study was the developing of the conceptual model on climate governance through IKS. The model made an important theoretical contribution through initiating a paradigm shift from Western to African epistemology and ontology in describing and interpreting climate governance through IKS. The model is a unique overview of IKS climate governance that exists in African communities. This is because the emphasis in this trajectory was the significant role of traditional leaders and spirit mediums as well as the centrality of community members in general who were considered to be a common denominator in the IKS climate governance structure and process. The IKS climate governance process also demonstrated that it is not independent of the other organs and institutions in society such as the government, media and NGOs. This implies that the model also plays an important role to inform policymakers as stated earlier in this thesis that the IKS is the backbone of the community and all developmental aspirations and policy initiatives should bank on IKS. This suggests that the success of the community vis-à-vis sustainable development is vested in the approach in which IKS is cherished. This is also important taking into consideration the outputs that are produced by the model such as poverty alleviation, improved livelihoods, sustainable development and food security.

8.6 Areas for future research

The empirical findings of this thesis and the literature reviewed exposed some gaps that could be exploited in the form of future research. This thesis has explored climate governance through IKS for sustainable development from a sociological perspective. One of the major contributions was the development of a conceptual model on IKS climate governance. This was achieved through the use of grounded theory employed with the aid of the Afrocentricity and SLA in order to exploit essential theoretical underpinnings. Given the fact that the thesis triumphed in developing the model, the researcher suggests that more research needs to be conducted in the field of climate change from a sociological perspective. Scholars need to develop theoretical and conceptual perspectives that reveal sociological components of climate governance. This is because a wide pool of research that has been conducted in the field makes

use of existing western paradigms without appreciation of the possibility of context-specific models and theories that they could develop in their assessments.

8.7 Recommendations

This section presents the recommendations which are suggestions on how initiatives on climate governance could be effective. As such, the recommendations are outlined under general headings and they were drawn from the major findings and conclusions of the thesis.

❖ IKS-SK nexus Policy support for climate change in rural communities

IKS policy support is important in enhancing climate change awareness and adaptation strategies. The study revealed the importance of IKS in climate change adaptation in rural communities. Paradoxically, it was also revealed that the Zimbabwe climate change policy says little on the role of IKS in climate change. This comes as motivation for a wider inclusion of IKS in the National climate change policy because IKS provides options that community members are well versed with. However, it should be acknowledged that the use of IKS alone has not yielded expected results given the availability of the alternative SK practices. As such, since the use of SK has widely dominated communities in every aspect, the adoption of IKS-SK nexus should then be considered in policy documents. This is because IKS present rural communities with methods they can easily relate with. It has also been revealed that some SK methods are employed with the guidance of IKS such as some irrigations processes that are presented in chapter six which are said to have a lot of common traits as the indigenous ways of irrigation despite the fact that the ones employed on are covered with SK traits.

❖ Ensure agricultural diversification schemes and planning

It is recommended that the government through the RDC should ensure agricultural diversification schemes. To achieve this, the RDC should design strategies that are meant to promote agricultural diversification in the form of provision of agricultural inputs and appropriate skills that are needed to counter the rapid change in the climate. This is in response to the findings of the thesis to the effect that farmers are failing to achieve their maximum potential due to numerous factors such as erratic rainfall patterns. This is against a background where crop production is the largest source of food and the livelihoods of the communities rely heavily on it. Crop production is also considered to be a major source of income considering that the farmers also produce cash crops. Further, agricultural planning is another important

aspect that should be taken into consideration. Farmers are currently facing weather changes that often do not abide by the commonly known trends on their agricultural calendar. As such, agricultural planning enables them to respond accordingly to the changes that they are witnessing.

❖ **Enhance climate change Education**

This study recommends dissemination of climate change information as critical in order to equip farmers for the challenges that they currently face as well as the impending climate hazards. Societal development and improved livelihoods are a product of knowledge. Hence, knowledge of climate change as stipulated in the climate governance model (see. figure 7.2) is important as the key players and agents around the community and smallholder farmers are there to provide knowledge to the community in order to improve their livelihoods opportunities and societal overall development. Among the providers of inputs AGRITEX officers play an important role in providing information to convey messages about climate change related weather forecasts in order to equip smallholder farmers in rural communities. Climate change education should also incorporate the education of communities about drought and wind management strategies. This includes activities that are aimed at minimizing the impact of drought and wind on production systems generally among smallholder farmers. Climate change was established to result in increased food insecurity and consequently threatens livelihoods. Hence, there is a need for communities to better understand appropriate adaptation measures that should be implemented.

❖ **Climate change knowledge management**

Knowledge management of climate change is important for sustainable development and improved livelihoods for rural communities. The study has established that the most fundamental way of ensuring adaptive capacity is through the amount of knowledge one has about climate change. This implies that those who possess more knowledge about the phenomenon have better chances of adapting to the effects of climate change. The study has revealed that the communities in the district possess rich IK on climate change. Hence, it is also important for authorities to ensure that there is a collaboration of IK-SK nexus knowledge in order to strengthen the knowledge base and adaptive capacity of farmers and general community members. This implies that the perceptions on climate change by farmers as

indicated in chapter 5 should be incorporated in the policy documents on climate change and a comparison with the SK based perceptions should be established.

❖ **Formalising social networks as a Climate governance procedure**

Social networks were established in the manner in which communities and smallholder farmers engage in agriculture activities. Many of the methods employed are said to have been borrowed from other farmers in the communities. The indication of the findings was that the methods borrowed from other farmers seem to be yielding positive results. Hence, this thesis recommends the formalization of social networks in order to enhance their effectiveness. This will also enhance the community resilience to climate change which Zhong et al. (2010) assert that it is a system's ability to adapt to fluctuation in weather conditions so as to maintain an acceptable level of functioning. As such, in order to achieve resilience there is need for social, institutional and informational resources that are meant to ensure that the community is able to respond effectively to a hazard effect. In that regard, formal social networks that are organized and presided over by the community leaders such as the village heads or the chiefs and also government and NGOs in that regard can be accommodated so that the sharing of knowledge is also accompanied with the sharing of resources. Take, for instance, the farmers in Matedza and Nyamuzizi have learnt a lot from other farmers about the effective solar-powered irrigation system but most farmers cannot adopt it because they do not have sufficient resources. Hence, if the knowledge is shared at a national level it enhances opportunities for the sharing of resources as well so that farmers will equally adopt the shared initiatives.

8.8 Conclusion

In this chapter, the researcher reflected upon the entire thesis by revisiting the various questions that emerged in the development of the thesis. The chapter also drew upon the major conclusions that were reached by the researcher in the form of key findings and conclusions. In essence, the thesis has triumphed in achieving its objectives. The major objective was to explore climate governance through the use of IKS. The findings of the study revealed that the process of climate governance is complex and IKS is not what it is assumed to be rather it is an immensely complex approach. The thesis made an effort to develop a context-specific conceptual model that describes climate governance from an Afrocentric perspective. The study made an important contribution to the effect that the first aspect to be taken into

consideration in any inquiry on climate change is to assess the level of knowledge and understanding of the phenomenon of climate change among community members.

It has also been established that knowledge of climate change comes at different dimensions and levels based on socio-economic factors. The knowledge of climate change among community members was considered essential because it informs any action to be taken on climate change adaptation. Henceforth, the knowledge of climate change by rural communities was found to be achieved largely through observations compared to reading materials and other forms of knowledge used in urban communities. From understanding the level of knowledge the next essential aspect was adaptive capacity and the different adaptation strategies that are employed in the community. The methods such as irrigation, cotton farming and crop change were established and from there a blend of all the processes and activities that are aimed at dealing with the phenomenon of climate change gave birth the concept of climate governance and there was evidence of the dominance of IKS.

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APPENDICES

Appendix A: Ethical clearance certificate



27 May 2019

Mr Shingirai S Mugambiwa 218082877
School of Social Sciences
Howard College Campus

Dear Mr Mugambiwa

Protocol reference number: HSS/0220/019M

Project title: Climate governance through Indigenous Knowledge Systems for sustainable development in Mutoko District of Mashonaland East Province, Zimbabwe.

Full Approval – No Risk / Exempt Application

In response to your application received 03 March 2019, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. **PLEASE NOTE:** Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 1 year from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

.....
Dr Rosemary Sibanda (Chair)

/px

cc Supervisor: Dr Joseph R Rukema
cc Academic Leader Research: Prof M Naidu
cc School Administrator: Ms N Radebe

Humanities & Social Sciences Research Ethics Committee

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Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

Appendix B: Informed consent form (English)

I voluntarily
participate
in the project about: **Climate governance through Indigenous Knowledge Systems for sustainable development in Mutoko district of 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 climate governance through Indigenous Knowledge Systems for sustainable development in Mutoko district of Mashonaland East Province, Zimbabwe.

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: Informed consent form (Shona)

Ini ndinobvuma pasina kumanikidzwa kuva nhengo yetsvakurudzo ino: **Climate governance through Indigenous Knowledge Systems for sustainable development in Mutoko district of Mashonaland East Province, Zimbabwe.**

Kuva nhengo yetsvakurudzo ino hakususudzwe kana kumanikidzwa munhu. Kana muchinge manzwa kuti hamuchakwanise kupindura mibvunzo pane ipi zvayo nguva munotenderwa kubuda mutsvakurudzo. Uyewo kana paine mibvunzo yamusina kusununguka kupindura munotenderwa kuregedze kupindura.

Mhinduro dzenyu dzamuchapa hadzizoudzwe ani kana ani zvake. Nhaurirano ino iripakati penyu nemutsvaki weruzivo.

Kuisa siginecha yenyu pagwaro rino kunoratidza kuti kuti mapa mvumo yakazara kuti manzwisisa zvizere zvataurwa pamusoro uye mava nhengo yakazara yetsvakurudzo.

Siginecha

Nhengo yetsvakurudzo.....	Zuva.....
Hwitinesi.....	Zuva.....
Mutsvaki weruzivo.....	Zuva.....

Appendix D: In-depth interviews guide (English)

Interviewee's biographical information

Life history

Could you please explain how you came into this area where you stayed before and if possible the reason for your relocation?

Theme 1. Perceived climate change impacts on the livelihoods of the communities

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 last five to ten years?

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

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

1.5 What are the indicators of climate change in your area?

Theme 2. Indigenous climate change adaptation strategies employed by the communities.

2.1 What adaptation measures do you use to adapt to the impacts of climate change?

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

Theme 3. Communal approach to climate change adaptation

3.1 How are Households that are involved in farming (Smallholder farmers) in this area adapting to and dealing with the effects of climate change?

Theme 4. Traditional leaders' roles in climate change

4.1 I understand this community has experienced successive droughts. What methods are you applying to adapt to the effects of droughts

4.2 Do you have any programmes aimed at educating your community about protecting the environment?

4.3 Do you have any idea about climate change policy. If yes, please explain to me how you are implementing it and how effective is it?

Appendix E: In-depth interview guide (Shona)

Nhau dzirimayererano neugaro neupenyu hweNhengo dzetsvakurudzo

Nhorowondo yehupenyu

Munganditsanangurewo here nhorowondo yehupenyu hwenyu mayererano nekwamakabva chikonzero makauya munharaunda ino nezvimwe zvakawanda zvamungangode kutaura mayererano nehupenyu hwenyu muno?

Nhaurirano yekutanga: Zvimhingamupini zvinounzwa neshanduko yemamiriro ekunze

1.1 Munganditsanangurewo here manzwisisiro amunoita kushanduka kwemamiriro ekunze?

1.2 Pane shanduko yamurikuwona here mayereno neMwando, Mwaka uye kunaya kwemvura munharaunda yenyu tichiyenzanisa nemazuva akare?

1.3 Ndezvipi zvimhingamupini zvamunofunga kuti zvrikukonzerwa keshanduko yemamiriro ekunze zvinokanganisa hugaro nemabasa ekurima nehupfumi hwavanhu munharaunda yenyu?

1.4 Pane here chivanhu kana mhemberero dhamunoita dhamungati dzirikukanganiswa neshanduko yemamiriro ekunze?

1.5 Ndezvipi zviratidzo zveshanduko yemamiriro ekunze zvirimunharaunda yenyu?

Nhaurirano yepiri: Nzira dzechivanhu dzinoshandiswa kudzivirira zvimhingamupini zvinokonzerwa neshanduko yemamiriro ekunze

2.1 Ndedzipi nzira dzechivanhu dhamunoshandisa kudzivirira zvimhingamupini zvinokonzerwa neshanduko yemamiriro ekunze?

2.2 Pane shanduko here dhamurikuona pachivanhu chedu dhamungati dzirikukonzerwa neshanduko yemamiriro ekunze?

Nhaurirano yetatu: Machengetedzerwo anoitwa nharaunda nevagari mumubatanidzwa

3.1 Misha yemunharaundo ino kunyanya iyo inoita mabasa ekurima irikushandisa nzira dzipi kudzivirira zvimhingamupini zvinounzwa neshanduko yemamiriro ekunze mukurarama kwavo zuva nezuya.

Nhaurirano yechina: Zvirikuitwa nevatungamiri munharaunda mayererano nekureisa zvimhingamupini zvinokonzerwa neshanduko yemamiriro ekunze

4.1 Ndinoziva kuti munharaunda ino munosangana nematambudziko ekusanaya kwemvura nenzara. Ndedzipi nzira dzamunoshandisa kudzivirira zvimhingamipini zvinounzwa nekusanaya kwemvura?

4.2 Munehurongwa here hurimayererano nekudzidzisa nharaunda yenyu mayererano nekuchengetedza shanduko yemamiriro ekunze?

4.3 Munezivo here mayererano negwaro rehurumende rinechekuita neshanduko yemamiriro ekunze? Kana muchinge muchiziva ndokumbira kuti munditsanangurirewo magamuchiro amunoita gwaro iri uye hurongwa hwamuniawo hwakatarwa mugwaro iri?

Appendix F: Focus group discussion guide (English)

Interviewee's biographical information

Themes discussed

1. What methods of adaptation to the effects of climate change are common in this community?
2. What is the role of spirit mediums in climate change?
3. Do you think spirituality is important in climate change?
4. Is spirituality important in climate change adaptation and if so what are the methods used e.g. rain making ceremonies?
5. Do you think the wide spreading of Christianity in a community where cultural beliefs were once treasured has influence on climate change?

Appendix G: Focus group discussion guide (Shona)

Nhau dzirimayererano neugaro neupenyu hweNhengo dzetsvakurudzo

1. Ndedzipi nzira dzamuri kuzshandisa kudzivirira zvimhingamupini zvinokonzerwa neshanduko yemamiriro ekunze?
2. Ndeapi mabasa amunofunga kuti anoitwa nemasvikiro munezveshanduko yemamiriro ekunze kana kuti mamiriro ekunze chete?
3. Monofunga here kuti nyaya dzezvemeya idzi dzine chekuita nemamiriro ekunze kana kuti shanduko yemamiriro ekunze?
4. Munofunga here kuti zvemweya izvi angava Masvikiro kana kuti vekereke chaivo vangava nechekuita nenzira dzatingashandise kudzivirira zvimhingamipini zvinokonzerwa neshanduko yemamiriro ekunze?
5. Munofunga here kuti kufararira kwaita chitendero chechikristu munharaunda munenhorowondo yemidzimu kungava nechekuita neshanduko yemamiriro ekunze?

Appendix H: Key informant interview guide (English)

Institution.....

Position.....

Period of service.....

1. What is your role in this community?
2. How do you assist community members/farmers?
3. Do you think the service that you provide is important in climate change adaptation?
4. Do you have any programmes in place to enhance community members/ farmers to actively participate and be aware of climate change and its effects?
5. As a service provider what challenges are you facing in the fight against climate change?

Appendix H: Key informant interview guide (Shona)

Institution.....

Position.....

Period of service.....

1. Munaita nezvei munharaundo ino?
2. Munobatsira sei varimi kana kuti vagary vemunharaunda ino?
3. Munofunga here kuti basa ramunaita rinobatsira mukuvandudza magariro evanhu vakatarisana neshanduko yemamiriro ekunze?
4. Mune mitambo here kana kuti maprograms amurikuita anaita kuti nharaunda kana kuti varimi vade kuva vachikwanawo mukurwisa shanduko yemamiriro ekunze?
5. Munezvimhinga mupini here zvamurikusangana nazvo zvamungati zvinokudzoserai kumashure mukurwisa shanduko yemamiriro ekunze?