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Institutional Adaptation to Climate Variability in South Africa: A Study of Buffalo City Metropolitan Municipality in Eastern Cape.

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A Dissertation submitted to the Faculty of Science, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Science

Supervised by Prof. Mulala Danny Simatele

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Last but not least, massive thanks to my ancestors for their guidance and protection, it is appreciated.

Declaration

I, Siyaxola Gadu, declare that Institutional Adaptation to Climate Variability in South Africa: A Study of Buffalo City Metropolitan Municipality in Eastern Cape presents my work, and that all the sources that I have used and quoted in this study have been indicated and acknowledged in the form of reference and this study was not submitted by me previously for a degree at another institution.

Signature:  Date: 29th October 2019

Abstract

South Africa is a country that is vulnerable to the changing climate and must adapt adequately to this phenomenon. Existing institutional and policy framework is the foundation in place to allow the government to adapt to climate change, however, the results are not yet satisfactory, especially to point whereby the expectations of the all stakeholders are met. Although climate change adaptation policies, plans and strategies are in place, the extent to which climate change is integrated within development plans and strategies at local government level is limited.

The research findings indicate that consideration of climate change adaptation, with specific focus on agriculture and water resources, within development plans of Buffalo City Metropolitan Municipality (BCMM) is limited due to several reasons such as: the structure of institutional and policy framework of South Africa, institutional fragmentation, lack of capacity, poor prioritisation and uncertainty of climate change.

Community-based adaptation (CBA) is one of the dominating adaption techniques in developing countries. The success of this climate change adaptation method is limited to areas with certain characteristics, and it cannot be used in regions with different features. This study sheds light on reasons that limit the reach of CBA when compared to institutional adaptation when it comes to tackling the scourge of climate change.

Key words, climate change adaptation, institutional climate change adaptation, community-based adaptation, institutional and policy framework, Buffalo City Metropolitan Municipality.

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List of Acronyms

APSEMO	Albay Provincial Safety and Emergency Management Office
BCMM	Buffalo City Metropolitan Municipality
CBA	Community-Based Adaptation
CCA	Climate Change Adaptation
CIRCA	Centre on Initiatives and Research on Climate
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of the Environmental Affairs
DWS	Department of Water and Sanitation
ECCCRS	Eastern Cape Climate Change Response Strategy
EU	European Union
GCCC	Government Committee on Climate Change
IDP	Integrated Development Plan
IEMP	Integrated Environmental Management Plan
IPCC	Intergovernmental Panel on Climate Change
LGP4CC	Local Government Partnership for Climate Change
MDG	Millennium Development Goals
MTENR	Ministry of Tourism, Environment and National Resources (Zambia)
NCCC	National Committee on Climate Change
NCCR	National Climate Change Response White Paper
NCCRP	National Climate Change Response Policy
NCCRS	National Climate Change Response Strategy
NWRS	National Water Resource Strategy
SANBI	South African National Biodiversity Institute
SSA	Sub-Saharan Africa
UNFCCC	United Nations Framework Convention on Climate Change

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CHAPTER ONE

FRAMES OF REFERENCE

1.1. Introduction

There is a consensus that climate change is a reality and a worldwide phenomenon that affects all the global community. It has negative impacts on water resources, agriculture, food security, environment, economy, health and environmental ecosystem. Moreover, according to Adger, et al., (2009) it is not only a scientific matter; it crosses over to political and economic spheres. Climate Change is a complex co-dependent environmental issue that is accompanied by environmental degradation, food insecurity and poverty (Koch et al., 2007). Climate change adaptation can therefore be described as an effective way to withstand the impacts of a changing climate. Intergovernmental Panel on Climate Change (IPCC) defined climate change adaptation as "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (IPCC, 2007: 6). According to Huitema et al., (2016), adaptation concentrates on adjustments to the repercussions of climate change impacts on natural and social systems. The adaptation is usually done by the government and public bodies to protect or for the benefits of their citizens (Adger et al, 2003; Adger et al, 2005). Therefore, According to Ivey et al., (2004), adaptive capacity is the potential or ability of the institution, region, system or community to adapt to the effects or impacts of climate change.

At Delhi Ministrial Declaration, in 2002, it was stated that climate change adaptation is of high priority for all countries and it requires an instant response. Although this global change affects everyone, poor people in developing countries are the most vulnerable population to climate change impacts (Najam et al, 2003; Bernauer and Schaffer, 2010; Brown and Sonwa, 2015). Mirza (2003) indicated that climate change impacts are crippling the economy of the developing countries, pushing these countries further into debt. In an African context, since livelihoods of most African population are vulnerable to climate change due to low degree of adaptive capacity and high dependence on natural resources (Challinor et al, 2007; Halsnaes and Verhagen, 2007; Simatele, 2010; Brown and Sonwa, 2015) adequate adaptation to climate change has the ability to add value in

human wellbeing and economic development. Climate change is seen as the main threat to global community in the coming century, especially for the marginalised community (Adger et al, 2003; Adger et al, 2005). Agriculture and water availability are vital for poor rural communities mainly for health and economic purposes, and both these natural resources are sensitive to climate change. Unfortunately, According to Halsnaes and Verhagen (2007), immediate development priorities such as poverty eradication, access to clean energy and water, are prioritized above climate change issues in the developing countries. Thus, Pasquini (2013) state that climate change is one of many social, economic and environmental challenges facing South Africa.

South African water resources, food security, infrastructure, health, ecosystem services and biodiversity are under threat due to climate change (Zwane and Montmasson-Clair, 2016). Regrettably, in South Africa, few institutions completely comprehend the effects of adaptation and their roles and tasks in climate change adaptation (Koch et al., 2007). Zwane and Montmasson-Clair (2016) note that there are no guidelines in South Africa for local government to accommodate the national climate change plan in to local plans. Community-based adaptation has been recognised as a leading method for adaption in rural communities of the developing world, including sub-Saharan Africa (Ayers and Huq, 2009). However, climate change impacts still have devastating effect on the South African economy (Nel and Davies, 1999). There are several reasons South Africa is vulnerable to climate change, for example, as a semi-arid region, its ecosystems is highly sensitive to changes in rainfall (Hulme, 2005), its soil is easily eroded during floods and easily degraded during drought (DRDLR, 2013); and it is one of the countries with lowest run offs in the world (DEA, 2011). Lack of coordination between institutions is one of the main causes of poor institutional adaptation to climate change in South Africa (Koch et al., 2007; Zwane and Montmasson-Clair, 2016). There is a lack of adequate institutional adaptation to climate change in most African countries (Tschakert and Dietrich, 2010). This research aims to show that South Africa is no exception.

1.2. Thematic Considerations

Torjman (2005) defined policy as the certain path that provides guidance for addressing selected society distresses. According to Ball (1993) and Lim et al., (2004) in general, policies are set of objectives accompanied by the means of implementation. Therefore, the policy is developed and implemented to achieve a certain goal that is believed to be

beneficial for the public; and governments are the main policymakers (Torjman, 2005). In climate context, adaptation is not a new concept, throughout the past, people have been adapting, even during long-term changing climate, what is new is the idea of incorporating future climate threat into policy development (Lim et al., 2004). At a policy level, adjustments in economic, political and social systems may be needed (Kolström et al., 2011). There is unanimity internationally that adaptation as a policy response by government is vital to combat climate change effects (Smit and Skinner, 2002). Hence adaptation to climate change is now an important subject in scientific inquiries and policy negotiations (Huq et al., 2004; Tschakert and Dietrich, 2010). However, Africa is one of the most rapidly reactive regions to climate change due to several reasons, including lack of institutional adaptation to climate change (Tschakert and Dietrich, 2010). Although the developing countries are vulnerable to climate change, adaptation is yet to be legislated (Danneving et al., 2012). Simatele (2010) give an example of lack of adequate institutional adaptation to climate change in Lusaka, Zambia, and how the lack of explicit climate change legislation and fragmented institutional strategies are contributing to ineffective climate change adaptation. South Africa is facing the same issue and that is elaborated below.

South Africa is vulnerable to impacts of climate change (Pasquini et al., 2013), hence, it committed to the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The government of South Africa has developed policies, strategies and plans to figure out, classify and deal with the country's climate change impacts (Zwane and Montmasson-Clair, 2016). The National Climate Change Response Policy (NCCRP) outlines the country's goals and plans to address climate change challenges. Moreover, it provides what is expected from government institutions and also what is needed by all provinces and municipalities to achieve those goals (Zwane and Montmasson-Clair, 2016). This policy was developed as a guide for adequate climate change response and a roadmap to making the country climate change-resilient. South African National Climate Change Response Strategy (NCCRS) was published in 2004, with an objective of incorporating climate change response programs across national and provincial boundaries (Koch et al., 2007; Carmin et al., 2012). However, it has been discovered that the implementation process has been challenging due to weak linkage between institutions and also lack of clear defined roles and responsibilities of different institutions in climate change adaptation (Koch et al., 2007). Weak linkage between

institutions is bound to create fragmented policies and strategies during adaptation to climate change. In response to lack of clear roles and responsibility of different institutions, National Climate Change Response White Paper (2011) of South Africa, state clearly that a critical review of the policy and legislation relating to local government functions and powers with respect to climate change is required.

South Africa's National Climate Change Response (NCCR) White Paper of 2011 contains the government's guidelines for effective climate change response and directions on making the nation climate change-resilient. The aim of the National Climate Change Response Policy is to manage climate change impacts, increase environmental resilience and emergency response capacity while decreasing greenhouse gases emission without hindering economic and social development. At the time of conception of NCCR of 2011, it was recognized that climate is changing at a higher rate than the ability of ecosystems to adapt and function effectively. This policy is the government's commitment to protect the country and its population from the climate change impacts. Sectoral response is one of the strategies where all essential actors and organisations in various sectors or subsectors play their part by preparing, submitting, implementing and reporting their detailed climate change adaptation strategies and action plan to contribute to NCCR objective in a measurable way.

Thus, several sectors, provincial and local climate change adaptations policies are guided or derived from National Climate Change Response Policy. For example, Water and Sanitation Sector Policy Position on Climate Change (2016) is the policy that is developed to guide the Department of Water and Sanitation (DWS) in adapting to climate change; and Draft Climate Change Adaptation and Mitigation Plan for the South African Agriculture, Forestry and Fisheries Sectors (2015) is the document that is being developed by Department of Agriculture, Forestry and Fisheries (DAFF) for changing climate adaptation and mitigation purposes. Whereas, Eastern Cape Climate Change Response Strategy (2011) document aims to assist provincial competencies in responding to climate change threats (DEDEA, 2011). This policy recognises the cross-cutting issues in climate change adaptation. Thus, one of its strategies is the integrated planning, where all relevant sectors, and all spheres of government are aligned. However, climate change affect different departments and institutions from different spheres of government with different mandates and capacities, thus arguably most countries will

struggle with aligning adaptation policies; hence the South African case is such that the adaptation to climate change by different institutions is not in unison, resulting in fragmentation and consequently inadequate climate change adaptation.

Zwane and Montmasson-Clair (2016), state that South African climate change polices and strategies are fragmented. Koch et al., (2007) argues that weak institutional network is one of fundamental challenges to adapting to climate change in South Africa. This issue is exposed in Mpumalanga Province, where provincial government does not have a strategy for climate change adaptation, but climate change concerns within some of the municipalities in this province have forced these local government institutions to develop their own (Zwane and Montmasson-Clair, 2016). In the study carried out by Pasquini et al., (2013), it was discovered that diversity of mandates of different institutions in Western Cape Province is one of the factors that result in constraint relationships. Although institutions, such as, parastatals, departments and different spheres of government are under the same government, they have different mandates and responsibilities, and thus climate change adaptation is not prioritised equally across these authorities.

1.3. Research Aim and Objective

In light of the aforementioned, this study will investigate **the extent to which climate change adaptation, with the focus on agriculture and water resources; have been integrated within the local development plans and strategies.**

In view of the observations above, the following questions guided the research process:

I. In what ways do changes in climate condition manifest themselves in Buffalo City Metropolitan Municipality, with specific focus on agriculture and water resources?
II. What institutional and policy framework exist within which institutional adaptation to climate change, with specific focus on agriculture and water resources, can be pursued?
III. What barriers, challenges and opportunities exist in mainstreaming climate change into local government development plans and strategies?
IV. What are the implications of the findings of this study in a wider context, particularly in Sub-Southern Africa?

In addition, the following study objectives guided the research process:

I. To understand the impacts of climate change in the Buffalo City Metropolitan Municipality (BCMM) with specific focus on agriculture and water resources.
II. To examine the existing BCMM institutional and policy framework for climate change adaptation, with specific focus on agriculture and water resources.
III. To investigate the extent of integration by the Department of Water and Sanitation (DWS) and Department of Agriculture, Fisheries and Forestry (DAFF) of climate change policies and plans into the climate change adaptation plans of BCMM.
IV. To explore how the findings of this study may assist in climate adaptation in other areas, particularly in Sub-Southern Africa.

1.4. Theoretical Considerations and Literature Review

The IPCC report of 2001 put attention on climate change adaptation as a subject in governments worldwide (Massey and Huitema, 2013). The need to concentrate on climate change adaptation was highlighted by the IPCC report of 2007, where the findings point out that even with extreme mitigation measures, the climate is changing and the world must adjust to it (Davoudi et al., 2012). In other words, the adaptation to climate change is a necessity in order to cope with climate change impacts.

Although there are several actors involved in adaptation to climate change, for example, individuals, communities, all spheres of government institutions and international agencies (Ebi and Semenza, 2008; Amaru and Chhetri 2013), adaptation is usually done by the government and public bodies to protect or for the benefits of their citizens (Adger, 2003; Adger, 2005). However, CBA approach has gathered significant attention for adapting in the poor rural region of developing countries (Shaw, 2006; Ayers and Huq, 2009). Forsyth (2013) shares the employment of CBA strategies allows the poor people in rural parts of developing countries to be involved in the development and implementation processes of climate change adaptation practices in their community. This community centred approach lowers vulnerability by building resilience of the poor to the impacts of climate change, however, it only concentrate on rural communities (Swalheim and Dodman, 2008; Ayers and Huq, 2009). Climate change affects all global communities and this adaptation approach has a limited reach. On the other hand, institutional adaptation approach has a far better reach and potential for effective climate change adaptation. However, institutional adaptation to climate change is under-

researched and it is not prioritised by governments, especially in developing countries. According to Halsnaes and Verhagen (2007) immediate development priorities such as poverty eradication, access to clean energy and water, are prioritized above climate change issues in developing countries. The other concern is that climate change adaptation is an inter-sector issue (Lim et al., 2004; Measham et al., 2011; Davoudi et al., 2012). Although institutional adaptation to climate change is a complex exercise, due to number of reasons, such as, being a cross-cutting subject and often poorly prioritised institutionally in developing countries. Institutional adaptation is the best approach for adequate adjustment to climate change for the benefit of all affected societies within a region.

1.5. Methodological Consideration

Epistemology is knowledge, especially, how a researcher knows, believes and interprets that knowledge (Dawson, 2013). Bourke (2014) points out that political stance, beliefs and cultural background of the researcher are vital factors that may influence the research process. Thus, it is believed that epistemology influences the theoretical standpoint and methodological choice of researcher (Dawson, 2013). Identifying owns biases at the beginning of the research assist the researcher to know how to approach the research process (Bourke, 2014). The researcher is influenced by ecocentric ideology, which is an inclusive perspective that recognises human and natural system destinies are intertwined (Purser and Montouri, 1996). Therefore, this study will mainly use qualitative method, interviews, with other human beings in order to comprehend their perspective about the researched phenomenon.

The questions the study seeks to answer decide the types of methodology the researcher need to use (Babbie, 2013). This study is not statistically driven, it concentrates on the quality, and therefore, qualitative methodology was applied. Qualitative methodology approach is suitable for research that is interested in participants' histories, experiences and perspective about the phenomenon of interest (Richie, 2003; Spencer et al, 2003).

1.5.1. Research Design

This research reviewed existing literature, policies and also contains information provided by informants that contributed to the unearthing of the findings of this study.

The main data sources for this research were the existing South African climate change related policies, strategies and plans from relevant government institutions. Climate change response strategies, policies and plans from relevant institutions were reviewed, examined in search of harmony or contradictions. Purposive sampling was used in this study, and officials from relevant government institutions who are knowledgeable about climate change were targeted as participants.

In this study, a population comprised of about 5 government officials, from different institutions, that are actively involved in climate change adaptation in their respective institutions. These officials are from Department of Water and Sanitation, Department of Agriculture, Forestry and Fisheries, both national and Eastern Cape Province; and from Buffalo City Metropolitan Municipality.

Semi structured but in depth interviews was the main data collection technique that was used to gather data from the participants in this study. In depth interview afford an opportunity for thorough investigation, personal perspective of the participant and in-depth understanding of the studied phenomenon (Ritchie, 2003). According to Gill et al, (2008) although semi-structured interviews are time consuming, they are ideal for in-depth investigation. Then, data analysis ensued, and it comprised transcribing the notes and data given in interviews. Key themes and perspectives of participants were searched from the data, coding of themes was done and data discussion took place. The following step was the use of existing literature to analyse the findings.

Detailed methodological consideration of the study is provided in Chapter 3.

1.6. Delimitation

Climate change adaptation is a broad subject with several theoretical areas. The interest of this research is the institutional adaptation to climate change, and the issues covered are institutional framework, institutional barriers to adaptation and community adaptation.

As mentioned in section 1.2, the focus of the study is Buffalo City Metropolitan Municipality in the Eastern Cape Province, South Africa. Therefore, only literature that is related to climate change adaptation of the study area is studied and analysed.

Buffalo City Metropolitan Municipality was chosen to illustrate the issues that exist when an institution at a poor region need to carry out its main mandate of service delivery whilst adapting to climate change. This research aims to draw out main themes that have resulted in poor adaptation to climate change from specific institutional perspectives.

Due to limited time and resources, a researcher must take a sample of a population (Archarya et al, 2013). The participants are government officials from different institutions. It was not easy to secure appointments for interviews with government officials, due to their busy schedules. Some participants are based in national government institutions in Pretoria, whereas others are based in provincial and local institutions in the Eastern Cape Province, and the traveling tested the limited resources of the researcher.

1.7. Ethical Consideration

The ethical position taken in this study is guided by the ethical policy of the University of the Witwatersrand. An ethical clearance was obtained from the university before any fieldwork was undertaken. There are certain basic principles and standards for ethical treatment of people who participate in the research (Smythe and Murray, 2000). The interviewees were given an information sheet, detailing the study and interview process. Participants were also asked for permission to record the interviews for ease of transcribing at a later stage and ensuring that the interview is no longer than the time suggested in the participation sheet. After reading and understanding the participation sheet, and agreeing to the recording of the interview, the participants were required to give their consent, by signing a consent form, before the interviews were conducted. The participants were also made aware that they can end the interview at any stage if they felt uncomfortable. There was no interaction with people who are considered to be within vulnerable groups during data collection of this study.

1.8. Structure of Dissertation

Chapter 1 provides a brief overview of the document.

Chapter 2 details a review of the existing literature on the topics of adaptation to climate change, community-based adaptation and institutional adaptation at global, Sub-Sahara Africa and South Africa.

Chapter 3 is the methodological consideration section of the study. This part details the study design and researcher's reflections after applying theory to practice.

Chapter 4 is the presentation of the empirical evidence that was found by the researcher during data collection.

Chapter 5 discusses the empirical evidence presented in chapter 4, and relating it to the findings of the literature review in chapter 2.

Chapter 6 concludes the dissertation with recommendation for further research and adaptation interventions.

CHAPTER TWO

THEORETICAL CONSIDERATIONS AND LITERATURE REVIEW

2.1. Introduction

Climate change is considered to be one of the main global threats in the coming century, as all global community and activities are sensitive to climate in one way or the other (Adger et al., 2003; Lasco et al., 2006). According to Hulme (2005), it is accepted as a main threat to the survival of species and integrity of ecosystems globally. The plight of climate change manifests in several ways, for example, slow change in average climate conditions, increased inter-annual and seasonal variability, rapid increase in natural disasters, and an increase in catastrophic disturbance in ecosystems (Tomkins and Adger, 2004). Higher temperatures, drier soils, floods, droughts and rising sea levels are predicted as a result of the changing climate. Therefore, societies have to adapt to these changes (Adger et al., 2003; Gbetibouo and Ringler, 2009; Bernauer and Schaffer, 2010).

Unfortunately, climate change cannot be eliminated; the only feasible solution is minimizing its impacts by mitigation and adaptation. Mitigation is all about reduction of Green House Gas (GHG) emission and concentration in the atmosphere, and adaptation is about reducing and living through the climate change impacts (DAFF, 2015). Furthermore, according to Hulme (2005), adaptation is mainly orientated to deal with impacts of climate change at a local level, while mitigation aims to address the impacts on the global climate system. It must be clearly stated that this study concentrates on adaptation and not mitigation of climate change.

Although climate change mitigation has been a preferred option than adaptation for a long time, recently adaptation is gaining strides (Klein and Smith, 2003; Lecocq and Shalizi, 2007). This is due to the trend in most studies that indicates that climate change will continue, even with all the mitigation efforts taking place (Klein and Smith, 2003; IPCCC, 2007; Bruin et al, 2009). The new climatic conditions created by climate change forces societies to take adaptation measures and also make use of advantages presented by this phenomenon (Amaru and Chhetri, 2013). Adaptation is a process of purposive change, usually to combat multiple pressures and changes that affect livelihoods of societies (Stringler et al., 2009). The researchers are making it clear that the world must adapt to this phenomenon (Huq et al., 2006) and failure to adapt will leave communities

vulnerable to climate change impacts (Ebi and Semenza, 2008). Hence, adaption to climate change is a crucial task for current global society (Kolström et al., 2011).

Since the publication of the Impacts, Adaptation, and Vulnerability report by Intergovernmental Panel on Climate Change in 2001, the concept of adaptation to climate change as a subject gathered significant attention across the world, and in all spheres of government (Massey and Huitema, 2013). At Delhi Ministerial Declaration, in 2002, it was stated that climate change adaptation is of high priority for all countries and it requires instant response by all countries. Moreover, in 2007, IPCC scientists released a report that indicated that the Earth's changing climate is irreversible, and the impacts of that are unavoidable even with most drastic reduction of greenhouse gas emissions; therefore, those findings resulted in climate change adaptation becoming a vital way to lessen climate change impacts (Davoudi et al., 2012). Thus, according to Massey and Huitema (2013) climate change adaptation has been gaining attention among governments around the world over the last decade. Adaptation to climate change is usually done by government to protect or for benefits of its citizens (Adger et al., 2005). Hence, it is crucial for government to put in place institutional and macro-economic conditions that assist and enable adaptation to climate change at all of its spheres (Challinor et al, 2007).

For a long time, adaptation has been on the shadow of mitigation in the climate change field. However, the importance of adapting to climate change in the science community has increased recently, especially in developing countries (Huq et al., 2004). According to Dodman and Mitlin (2013) acceptance of the significance of adaptation to climate change is a fairly new sensation. Fortunately though, there is already a consensus that adaptation to climate change is a local or regional activity (Lim et al., 2004; Measham et al., 2011; Agrawal, 2008; Huitema et al., 2016).

Section 2.1.1 examines the community-based adaptation (CBA) approach and explores theoretical assertions that adaptation to climate change needs regulations of external forces and institutions in order to succeed. Although CBA is a good climate change adaptation method, it exclusively focuses on a small proportion of society, which is the vulnerable poor population in rural areas, and it is yet to be up-scaled. Shaw (2006) points out that any climate change adaptation technique needs government policy intervention for sustainability. The need for more focus on institutional adaptation is also discussed.

2.1.1. Community-Based Adaptation

Although CBA is a fairly new participatory community based approach compared to community-based natural resource management (CBNRM) and community-based disaster risk management (CBDRM) (Dumaru, 2010), it has gained major strides in recent years (Shaw, 2006; Ayers and Huq, 2009). CBA elevated into a debate platform as one of the hot topics in the 2000s (Forsyth, 2013) and its objective is to lessen the risks of climate change to the world's poorest societies by involving them in the practices and planning of adaptation (Ayers and Huq, 2009; Dumaru, 2010; Forsyth, 2013). Thus, CBA is associated with vulnerable rural communities at local level in developing countries (Huq and Reid, 2007; Swalheim and Dodman, 2008; Ayers and Huq, 2009; Forsyth, 2013; Dodman and Mitlin, 2013). As a result, the first step of CBA project is to identify communities that are most vulnerable to climate change (Huq and Reid, 2007; Dodman and Mitlin, 2013).

For example, CECI (Canadian Centre for International Studies and Cooperation), a Canadian NGO, started a CBA project in Vietnam, at Quang Dien and Phu Vang regions, to help the communities to build resilience against climate change related disasters that are frequenting the regions. Another example is Community Based Adaptation in Africa (CBAA) which was established in 2008 in Namibia, and also implemented in South Africa, Malawi, Sudan, Kenya, Tanzania, Uganda, Zimbabwe and Zambia; and its aim is to assist poor communities in adaptation to climate change by knowledge generation and capacity building (Ayers and Huq, 2009).

Although the CBA programmes are receiving major financial backing from major donors (Ayers and Huq, 2009), such as, Department for International Development (DFID), European Union (EU) and Netherlands government, there are concerns about the sustainability of CBA initiatives (Shaw, 2006). The other issue about CBA is; it is designed in a limited reach manner, for only certain parts of the society. Although CBA is assisting communities to increase their adaptive capacity to climate change, it only concentrates on rural communities in developing countries (Swalheim and Dodman, 2008). Hence, it is concerning that this adaptation approach is excluding settlements, urban poor, cities and national levels of decision making and is only focusing on rural communities (Dodman and Mitlin, 2013). Shaw (2006) argues that the other disadvantage of CBA is up-scaling of actions. It is not possible to expand a CBA project to other parts of society,

outside the rural communities. Adaptation to climate change activities need to include all society groups and government institutions (Ebi and Semenza, 2008). However, Forsyth (2013) states that for more than ten years, there has not been a clear way of how to integrate this adaptation technique into formal adaptation policies. Regrettably, Shaw (2006) asserts that it will be difficult to sustain CBA initiatives without connections to government policies. On the other hand, the institutional adaptation to climate change is inclusive of all stakeholders within the institution's region and its government is heavily involved.

Although CBA and institutional adaptation approaches are different, they share similar characteristics. They are both climate change adaptation approaches suitable for local level implementation, and they are both for the benefit of communities. Both these adaptation methods recognize that poor rural population in developing countries are the most vulnerable people to the plight of climate change. Since, climate change adaptation is a costly exercise (Adger et al., 2003) both these adaptation techniques need sufficient capital to succeed. Lastly, these local adaptation approaches are increasingly influenced by global policy and interconnectedness with other actors across scale (Amaru and Chhetri, 2013).

Unfortunately, the literature indicates that there is more focus on (CBA) than local institutional adaptation, although both these approaches are important in climate change adaptation. For example, CBA is acknowledged as one of the essential climate change impact reduction methods (Shaw, 2006; Ayers and Huq, 2009). There should be more focus on institutional adaptation to climate change.

Local institutional adaptation concentrates on all societies within its boundaries, and it is not disconnected from national level decision makers. Hence, local institutions are an ideal platform to support adaptation to climate change in a wider range for all stakeholders (Tompkins and Adger, 2004). Agrawal (2008) notes that it is evident that local institutions play a key role in facilitating adaptation to climate change. Hence, more focus should be given to institutional adaptation to climate change. Bakker (1999) points out that an understanding of institutional adaptation is essential in a study of societal response and adaptation to climate change. To some extent, scholars recognise the important role institutions play in adaptation to climate change. For example, there are

more discussions about institutional adaptation to climate change now than ever (Agrawal, 2008).

Institutions are formed by humans as formal and informal machineries that shape the behaviour, expectations and interactions of the society (Agrawal and Perrin, 2008; Brown and Sonwa, 2015). Simatele (2010) points out those institutions have financial and political muscles that have an influence on the decisions and actions taken by poor people. Thus, institutions have a major influence in shaping the behaviour of the individuals and community, as these organisations control access to resources (Agrawal, 2008; Brown and Sonwa, 2015). According to O'Riordan and Jordan (1999) institutions are the multiple means of keeping society intact, giving a sense of communal drive and for supporting communities to adapt. Impacts of an institution can be understood when one scrutinises its internal processes, external relationships and linkages with different social groups of society (Agrawal, 2008).

According to Challinor et al., (2007) and Koch et al., (2007) government institutions are key role players in climate change adaptation. All spheres of government institutions have a responsibility of responding to climate change related impacts and also planning for future risks posed by climate change (Young and Lipton, 2006). Government, through its institutions, is responsible to carry out adaptation on behalf of society in anticipation or in response to climate change impacts (Adger, 2003). Taking everything into consideration, without institutions, adequate adaptation to climate change is nearly impossible.

With that being said, local institutions are recognized as the essential players in climate change adaptation (Naess et al., 2005; Measham et al., 2011) because they are at the frontline in witnessing the impact of climate change on communities and are expected to respond in a best possible manner (SALGRCC, 2016). Therefore, these institutions are positioned best to promote an empowering setting for local adaptation (Uy et al., 2011). In essence, better understanding of the needs and role of local institutions in shaping adaptation is vital, if climate change response is to assist poor population worldwide (Agrawal and Perrin, 2008; Agrawal, 2008, Simatele, 2010).

2.2. Global Institutional Adaptation

Climate related events in United States, Europe and Australia in recent years raised concerns about the ability of richer countries to cope with climate change (Moser and Ekstrom, 2010). Until recently, EU concentrated on mitigation rather that adaptation to climate change (Biesbroek et al., 2010). However, since 2005, members of European Union have been developing and approving inclusive National Adaptation Strategies (NAS) to encourage and advance climate change adaptation in their countries (Biesbroek et al., 2010; Massey and Huitema, 2013). The figure below illustrates NAS development of different European countries in recent years.

Country	National Adaptation Strategy (NAS)	Year	Responsible for the development of the NAS
Denmark	Strategi for tilpasning til klimaændringer i Danmark (Danish Energy Agency, 2008)	2008	Ministry of Environment, shifted in 2008 to Ministry of Climate and Energy
Finland	Finland's National Strategy for Adaptation to Climate Change (Marttila et al., 2005)	2005	Working group for preparing the NAS under the Ministry of Agriculture and Forestry
France	Stratégie nationale d'adaptation au changement climatique (ONERC, 2007)	2007	National observatory dedicated to the effects of climate warning (ONERC); Inter-ministerial delegate for sustainable development
Germany	Deutsche Strategie zur Anpassung an den Klimawandel (BMU, 2008)	2008	Environmental Ministry supported by the Federal Environmental Agency
Hungary	Nemzeti Éghajlatváltozási Stratégia	2008	Not included in study
Netherlands	Maak ruimte voor klimaat! (VROM, 2007)	2007	Adaptation to climate change in spatial planning (ARK) programme, co-ordinated by the Ministry of Housing, Spatial Planning and the Environment
Romania	Ghid privind Adaptarea la Efectele Schimbărilor Climatice	2008	Not included in the study
Spain	Plan de nacional de adaptición al cambino climático (PNACC, 2006)	2006	Environmental Ministry; National Office for Climate Change
United Kingdom	Adapting to climate change in England. A framework for action (DEFRA, 2008)	2008	Department for Food, Rural Affairs and the Environment (DEFRA)

(Biesbroek et al., 2010)

Figure 1: Overview of the National Adaptation Strategies in Europe

In England, Department for Environment, Food and Rural Affairs (DEFRA) is the government institution that is responsible for the climate change adaptation (Massey and Huitema, 2013). This institution developed the UK Climate Change Programme and Adaptation Policy Framework; and is responsible to ensure that the different sectors and government spheres are aligned and coordinate in adapting to climate change. The United Kingdom (UK) has been leading in adaptation to climate change, and passed an important piece of legislation, the Climate Change Act 2008 (Dannevig et al, 2012). Due to lack of effort in implementation of climate change adaptation strategies, the UK government adopted Climate Change Act 2008, which legally binds stakeholders to adapt to climate

change (Massey and Huitema, 2013). The Climate Change Act (2008) offers the direction for climate vulnerability assessments and adaptation measures at different spheres of government (Dannevig et al, 2012).

According to Measham et al., (2011) since 2005, the Australian government has started a number of initiatives and developed the capacity to withstand climate change impacts and increase adaptations for local government. One of these initiatives was Local Adaptation Pathways Programme (LAPP), with an objective of providing grants to local government for climate risk assessment and adaptation plans development (Bakera et al., 2012). In the study of climate change adaptation through local municipalities in Sydney, Australia, Measham et al., (2011) argues that national and provincial government policies decide the role and responsibilities of local government. However, municipalities adapt to climate change within the limits of available technologies, regulatory systems and information of future climate risks (Adger et al., 2005). Therefore, the fulfilment of the mandate of national and provincial government by local institutions depends on the availability of resources.

IPCC (2007) points out that one of the limiting factors to climate change adaptation is institutional capacity. For example, according to the results of the study conducted by Dannevig et al., (2012) in Norway, human and financial capacity and the size of the municipality play a vital role in climate change adaptation, not only regulations. The bigger the municipality, the better the chances of success of climate change adaptation due to better capacity and better connection to central government (Dannevig et al., 2012). Moreover, larger municipalities are likely to receive a larger budget and have greater resources compared to small municipalities (Pasquini et al., 2015).

Although in developing countries such as Philippines, adaptation to climate change is poorly prioritized (Lasco et al., 2006) the regions which are prone to severe weather conditions are likely to adapt to climate change (Lasco et al., 2008). For instance, Albay region in Philippines is considered as a natural disaster-prone area, it is exposed to volcanic eruptions, floods, typhoons, earthquakes and landslides (Lasco et al., 2008; Uy et al., 2011). Due to the changing climatic conditions, an increase in these natural disaster accompanied by climate change impacts, such as increase in rainfall, warmer temperatures, sea-level rise and frequent typhoons are expected in this province. The Albay government has taken climate change adaptation seriously, it even organized a

National Conference on Climate Change Adaptation (NCCCA) (Lasco et al., 2008; Uy et al., 2011); and through this platform the Philippine Climate Change Act of 2009 was approved (Uy et al., 2011). Moreover, Action on Climate Change (A2C2) is a programme that was developed and implemented by the Albay Provincial Government to combat climate change at local level (Lasco et al., 2008; Uy et al., 2011). The objective of this programme is to entrench disaster risk reduction and consider climate change during development activities (Lasco et al., 2008).

The provincial government of Albay has adopted a proactive stance in addressing climate related disaster (Lasco et al., 2008; Uy et al., 2011) for example, Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) were developed as main strategies for consideration of disaster and climate during development (Uy et al., 2011). The implementation of these strategies is the responsibility of different organizations. The CCA initiatives are undertaken by the Centre on Initiatives and Research on Climate Adaptation (CIRCA) which was established in 2008, and DDR initiative programme are undertaken by Albay Provincial Safety and Emergency Management Office (APSEMO) (Lasco et al., 2008). The goal of CIRCA is to improve the capability of Albay community and Philippine's population in general to handle the climate change impacts (Lasco et al., 2008). APSEMO is an independent department that was formed to assist the management of Albay provincial government in public safety and disaster risk management; it was institutionalised in 1994 and its mandate is to serve as the technical secretariat and administrative arm of Provincial Disaster Coordinators Council of Albay. The Albay region is a good example of how important local government institution role is for adaptation to climate change (Lasco et al., 2008).

Although government institutions play a major role in climate change adaptation (Halsnaes and Verhagen, 2007) institutional collaborations are essential to adaptation practices at local level (Agrawal, 2008). For example, according to Agrawal and Perrin (2008) in the research conducted in India, farmers in Anantapur district are struggling to cope with climate change impacts in this arid region; while the farmers of the neighbouring district, Chitradurga, are at a low risk to climate change due to local government support system. Farmers in Anantapur are struggling to adapt to climatic and economic strains due to institutional barriers. In contrast, Chitradurga farmers are not vulnerable to this phenomenon due to municipal support through subsidized drip

irrigation and policies to cultivate alternative crops from groundnuts to pomegranates and bananas (Agrawal and Perrin, 2008). Government support has assisted, and is still assisting, farmers to cope with climatic disasters and has protected the agricultural productive capacity of some regions (Zwane and Montmasson-Clair, 2016). This research by Agrawal and Perrin illustrate that poor farmers are more vulnerable to climate change without the local government as a support system. Hence, according to Agrawal and Perrin (2008) also supported by Measham et al., (2011) local institutions are essential for greater society to adapt to climate change.

Regrettably, local government usually lack the resources to successfully implement adaptation measures to climate change (Swalheim and Dodman, 2008). Fortunately, in Bangladesh, national government provide funds for local adaptation to climate change (Stringer et al., 2009) thus local government investment in shelters have assisted in reduction of cyclone's mortality rate (Adger et al, 2003). The correlation between institutions from different spheres of government is vital for a country or society to cope with climate change related natural disasters.

2.3. Institutional Adaptation in Sub-Sahara Africa

Recent studies indicate that Africa is one of the most vulnerable regions to climate change due to lack of adaptive capacity and high dependence on natural resources (IPCC, 2007; Ayers and Huq, 2009). Extended dry seasons and uncertain rainfall are forcing southern African region to adapt to climate change (IPCC, 2007). Hence, Cooper et al., (2007) states that adaptation to climate change in Sub-Saharan Africa (SSA) is not a long term objective, it is a current need. Agrawal (2008) advocates that drier regions of the world need major institutional adjustments to adapt to climate change impacts. Unfortunately, SSA is one of those regions that must significantly adjust institutionally to climate change. Nevertheless, studies show that even though developing countries might have adequate local adaptation plans, many local government institutions lack the capacity to successfully implement it (Dannevig et al., 2012; Pasquini et al., 2015).

For example, in Zambia, Ministry of Tourism, Environment and National Resources (MTENR) is the main institution responsible for facilitating and coordinating all environment associated activities, including climate change. However, Zambia Climate Change Facilitation Unit (ZCCFU) which was formed in 2009, within MTENR, is

responsible for development of climate change adaptation policies and strategies in Zambia (Simatele, 2010). In addition, lack of legislation that is developed explicitly for climate change adaptation makes it difficult for Lusaka to adequately adapt to the challenge of climate change. The other issue is that adaptation strategies from different institutions are fragmented due to lack of adequate collaboration between relevant institutions; and that is a result of competition between institutions for budget allocation from the national government (Simatele, 2010). Interaction with other institutions is essential for the effectiveness of the institutions (Koch et al., 2007). Institutional linkage with each other is very important for the success of adaptation as it allows flow of resources and influence amongst institutions (Agrawal, 2008).

Unfortunately, the issue of institutional fragment strategies in combating climate change is not isolated on one part of SSA, it is widespread. Research conducted in 2008 reveals that Cameroonian government institutions at the national level are not working with local societies or local institutions on climate change adaptation related matters (Brown and Sonwa, 2015). Agrawal (2008) and Agarwal et al., (2012) state that a strong relationship is needed between national and local spheres of government for effective climate change adaptation planning and implementation. Thus, adaptation is weak due to the fragmented relationship between local and national level institution and, that is exposing the highly forest-dependent communities to climate change impacts in Cameroon (Brown and Sonwa, 2015). Although local government institutions are assisting local communities to adapt with changing climate, they have not received a mandate from national government to do so. Henceforth local governments are acting in their own capacity when it comes to assisting local communities. The importance of the role of local institutions in protecting the interest of the poor and vulnerable populations in climate change adaptation is undisputable (Agarwal et al., 2012).

In Mozambique, climate change has increased the frequency of floods, and the government has introduced disaster risk reduction measures as part of climate change adaptation (Artur and Hihorst, 2012). Ministry for Coordination of Environmental Action (MICOA) is responsible for coordination of climate change related issues and development of regulatory tools such as National Action Plan for Adaptation (NAPA) (Artur and Hihorst, 2012). Mozambique is one of the poorest countries in the world; therefore, environmental issues compete with economic growth during allocation of

budgets. Thus, government concentrates more on Millennium Development Goals (MDG) such as eradication of extreme poverty than UNFCCC commitments (Artur and Hihorst, 2012). With that said, there are several climate change adaptation programs in Mozambique funded by different outsiders, for example, Joint Program in Environmental Mainstreaming and Adaptation to Climate Change in Mozambique funded by MDG-F Spain and UNDP; Mozambique Poverty and Environment Initiative financially supported by the Ireland government; Coping with Drought and Adaptation to Climate Change supported by GEF and Joint Program on Strengthening Disaster Risk Reduction and Emergency Preparedness funded by UNDP (Artur and Hihorst, 2012). There has been competition amongst government institutions for partnering with these programmes; and same as in Zambia; that has resulted in lack of coordination between the institutions in climate change adaptation.

The adaptation to climate change in SSA has not been entirely negative, there are positives. For example, the correlation between local institutions and communities has resulted in creative ways to adapt to climate change, for example, the Hifadhi Ardhi Shinyanga (HASHI) project, meaning "soil conservation", the institutional adaptation to climate change in northern Tanzania. This initiative was established by the Ministry of Natural Resources and Tourism of the Tanzanian government, and it is implemented by the local government of the ministry (Agrawal, 2008). The main purpose of this project is to revive the traditional conservation practices of local people, and this practice is a natural resource management system called ngitili, meaning "enclosure". Ngitili is an area that remains enclosed at the start of wet season and is open for grazing at the peak of dry season, and therefore, it is a source of a fodder. This concept is currently used when rehabilitating deteriorating environment due to climate change related impacts in this region. The local institution played a major role in planning for and mobilizing resources, coordinating the process, providing guidance and being a source of information when creating ngitilis (Agrawal, 2008). According to Tompkins and Adger (2004), society depends on natural resources need to increase its adaptive capacity to climate change. In essence, when the local institution assist in enclosing ngintilis, it is playing a pivotal role in improving community's livelihoods and adaptive capacity to climate change (Agrawal, 2008).

2.4. Institutional Adaptation in South Africa

Institutional adaptation to climate change is an interesting process in South Africa. Carmin et al., (2012) explains that South African democracy is accompanied by expectations for government to deliver rapid development and access to basic services to all citizens. Adaptation and development are linked due to direct impact of climate change on development sectors such as water resources and agriculture (Huq et al, 2004). Hence developing countries will adapt to climate change to better their livelihoods through development (Adger et al, 2009). South African government must adapt to climate change in a way that will not jeopardise the post-apartheid development achievements and goals. In South Africa's National Climate Change Response of 2011, the government acknowledges that climate change is the main threat to sustainable development. South African government adopted a top-down approach for climate change governance. The Government Committee on Climate Change (GCCC) and the National Committee on Climate Change (NCCC) are the formal bodies that are responsible for coordination and implementation of the response strategy across relevant departments and institutions. However, adaptation is a fairly new concept in South Africa, thus specific roles and responsibilities of different institutions are currently being established (Koch et al., 2007).

	Coordination and integration	Policy and regulation	Research	Capacity building and training	Mitigation	Adaptation
Department of Environmental Affairs & Tourism	✔	✔		✔		
Department of Minerals & Energy		✔	✔		✔	
South African National Biodiversity Institute			✔			✔
South African National Parks				✔		
National Business Initiative	✔				✔	

(Koch et al., 2007)

Figure 2: Institutional Roles and Responsibilities

In South Africa, there are several government departments and institutions that are tasked with climate change related issues. Climate change is not only the responsibility

of the ministry that is responsible for environment; it should be incorporated into all spheres and departments of government (Huq et al., 2006). Although the Climate Change Response Strategy (CCRS) was finalised in 2004, the implementing process has been slow due to lack of clear defined roles and responsibilities of different institutions (Koch et al., 2007). The figure above shows that only South African National Biodiversity Institution (SANBI) was mandated to adapt to climate change in 2007. National Business Initiative and Department of the Environmental Affairs (DEA) were responsible for coordination and integration of all climate change related activities of this country. However, now only Department of the Environmental Affairs ministry is a focal point for coordination of climate change in South Africa and it is responsible for aligning government responses to climate change (DAFF, 2015). Although this ministry is responsible for development of climate change related policies and strategies that guide other departments and all spheres of government, and ensuring that these departments consider climate change when developing their policies, DEA does not have the powers or mandate to ensure that other departments integrate climate change into their polices (Koch et al., 2007).

According to Adger et al., (2007) climate change adaptation objectives will differ in different societies, nations, government institutions and generations. Thus, in 2005, SANBI Specialist Scientist reported that only Gauteng and KwaZulu Natal government institutions are initiating climate change related dialogues with scientists, the other provincial institutions are not approaching this government institution (Koch et al., 2007). According to (Zwane and Montmasson-Clair, 2016) South African provincial institutions are not at the same level in terms of adapting to climate change, only Western Cape, Gauteng, Eastern Cape and KwaZulu Natal have climate change response strategies in place. Provinces such as Mpumalanga Province do not have a climate change adaptation plan despite the fact that this region has been experiencing several climate change impacts, such as excessive temperatures, floods, and fire outbreaks. Despite the lack of guidance from government institutions at the above level, some municipalities adapt to climate change (Dannevig et al., 2012). For example, there are municipalities within Mpumalanga Province that have developed climate change adaptation plans without having guidance from the provincial government institution (Zwane and Montmasson-Clair, 2016).

In the study conducted by Pasquini and co-authors in Western Cape, in 2013, it was discovered that climate change is not considered in guiding strategies of local government in South Africa. There is a lack of climate change consideration in Integrated Development Plans and Spatial Development Framework. The other issue is the diversity of objectives of levels of government institutions and between government and parastatals, such as, Cape Nature Conservation and the Western Cape provincial conservation board (Pasquini et al., 2013). The nature conservation organisation will adapt to climate change in a manner that will protect the environment, whilst the local government will adapt in a manner that will provide development and service delivery to the community. The other finding of this study is that political influence matters if adaptation to climate change is to succeed at local institutions. As the leaders of municipalities, politicians have the power to mandate municipal internal division to prioritize climate change (Pasquini et al., 2015).

In some regions of South Africa, climate change adaptation is prioritized. Although KwaZulu Natal Provincial government currently has a climate change adaptation strategy, there were no national or provincial policies that required cities in South Africa to adapt to climate change when Durban, the eThekwini Municipality, decided to pursue climate change adaptation (Carmin et al., 2012). Municipal Climate Protection Programme (MCPP) is for adapting and strategizing in order to cope with climate change in eThekwini Municipality, and it was established in 2006 to adapt to climate change without hindering post-apartheid gains (Roberts, 2010). Moreover, the Environmental Management Department of this municipality developed a strategy called Headline Climate Change Adaptation Strategy, to illustrate how essential sectors should respond to climate change in that region. This initiative in Durban, South Africa, demonstrates the important role of institutions in climate change adaptation at local level (Stringer et al., 2009).

There are several issues facing institutional climate change adaptation in South Africa. Inadequately defined roles and responsibility of institutions is one of the issues in climate change adaptation in this country (Koch et al., 2007). Weak links between institutions is also problematic, as it results in poor communication within different government spheres; and between government sectors and government spheres (Koch et al., 2007; Zwane and Montmasson-Clair, 2016). This generally results in fragmented policies and

complications during climate change adaptation (Zwane and Montmasson-Clair, 2016). Lack of resources or competition for resources between climate change and other needs for local council is another setback for adaptation at local institutions (Pasquini et al., 2013; Pasquini et al., 2015). Regrettably, local government institutions in South Africa do not receive financial or regulatory incentives to consider adaptation projects within planning (Zwane and Montmasson-Clair, 2016). The perception of South African government institutions about the importance of climate change is not the same, and that will result in priority and commitment issues. The figure below illustrates the different perception of the importance of adaptation to climate change amongst the government institutions of South Africa.

	Climate change is an important issue, but there are o ther priorities in the institution	Climate change is a long-term issue	Climate change will become a priority as awareness grows	Climate change is a problem we can do little about
Department of Environmental Affairs & Tourism	✔			
Department of Minerals & Energy	✔		✔	
South African National Biodiversity Institute	✔	✔		
South African National Parks	✔			✔
National Business Initiative			✔	

Koch *et al*., 2007

Figure 3: Institutional perceptions on the importance of climate change in South Africa

2.5. Gaps in Knowledge

In 2001, in a meeting by Tyndall Centre and the International Institute for Environment and Development, it was agreed that more research and policy development in climate change is needed. That call has been answered, nevertheless, McSweeney et al., (2010) reveals that between 2002 and 2004, Journal of Climatology and Journal of Climate and International published only 25.6% and 10.7%, respectively, articles dealing with climate research on Africa, the Middle East, South America and Asia. Instead most articles published on climate change are about Europe and North America. Moreover, according to Quay (2010) in general the literature of adaptation to climate change is lesser compared to that on climate change mitigation. Although there is literature about climate

change issues in Africa, there is still a big gap compared to other parts of the world. It has been well documented that SSA is one of the areas that are evidently suffering from the climate change impacts. However, there is generally a lack of knowledge on the institutional adaptation to climate change at local level, although these institutions are essential for climate change adaptation.

Unfortunately, there is lack of knowledge on important features for successful institutional adaptation to climate change, especially in rural regions of developing countries (Agrawal, 2008). Moreover, Adger et al., (2003) and Agrawal (2010) state that there is still a lack of literature about this importance of the manner in which institutions at local level shape adaptive responses of communities to the changing climate phenomena. Thus, according to Agrawal (2008) if adaptation is to be realised, especially for most vulnerable societies, it is of high importance to understand the role of local institutions in shaping adaptation. O'Riordan and Jordan, 1999 with the support of Koch et al., 2007 note that although there is an increase in literature on the relationship between institutions and climate change, it is acknowledged that research on adaptation and institutions is relatively new. Consequently, advancing the literature will require more investment on research in this field (Agrawal, 2010).

Most authors in the literature review researched about institutional adaptation to climate change in different parts of the world, the purpose of this study is to add on existing academic knowledge about institutional adaptation to climate change at local level, and still, this research focuses on the Eastern Cape Province of South Africa.

CHAPTER THREE

METHODOLOGICAL CONSIDERATIONS

3.1. Introduction

The Methodology chapter will sought out to explain the choice of methodological devices that were used in this research project. A critical analysis of the various research methods employed is conducted, through exploring the benefits and shortcomings of every methodological strategy. Also, the epistemological position of the researcher is pondered on, in order to establish how the researcher's personal ideologies affected the final research outputs.

This chapter begins with an explanation of the epistemological position of the researcher; this part reflects on the school of thought that influence researcher. The following section of the chapter is recapping of the research aim and objectives in order to reel back to the research purpose. Then, the research design is described in detail, in other words, how the research was done. The remaining sections examine the data collection techniques used, data analysis methods applied in the study and finally the methodological reflective.

Methodological section is important due to the fact that it explains and justifies the researcher's choices for research methodology, sampling procedure, data collection techniques and data analysis.

3.2. Research Philosophy/ Approach

Epistemology is knowledge, especially, how a researcher knows, believe and interpret that knowledge (Dawson, 2013). Bourke (2014) points out that political stance, beliefs and cultural background of the researcher are vital factors that may influence the research process. Thus, it is believed that epistemology influences the theoretical standpoint and methodological choice of researcher (Dawson, 2013). Identifying owns biases at the beginning of the research assist the researcher to know how to approach the research process (Bourke, 2014).

The researcher is influenced by ecocentric ideology, which is an inclusive perspective that recognises human and natural system destinies are intertwined (Purser and Montouri, 1996). Ecocentric is the belief that nature has moral consideration because it has intrinsic value, worth apart from its usefulness to humankind (Kortenkamp and Moore, 2001).

Purser and Montouri, (1996), stated that econcentrism is against human arrogance and moral insensitivity towards natural environment. Hence, according to Bailey and Wilson (2009) ecocentric action is driven by personal and social values to put environmental protection above human demands. Furthermore, ecocentric action is a moral reasoning to act in benefit to the environment (Donnelly and Bishop, 2007).

Ecocentrism is viewpoint which understands that human and natural system destinies are entangled (Purser and Montouri, 1996). Climate change affect natural environment and that has a domino effect on human beings livelihoods. Hence, Donnelly and Bishop, (2007) assert that protection of the environment is the basic protection of the fundamental a good human life. However, the practical and political issues of a change towards ecocentric climate adaptation are a known reality (Bailey and Wilson, 2009).

The questions the study seeks to answer decide the types of methodology the researcher need to use (Babbie, 2013). This study is not statistically driven, it concentrates on the quality, and therefore, qualitative methodological means was applied. This research applied this approach in order to understand the factors that influence the current climate change adaptation practices in South African local government. This study also intended to comprehend the different factors at play in influencing climate change adaptation in different government institutions at different levels, and draw out common themes and issues.

3.3. Recapping Research Aims and Objectives

The aim of this study is to investigate the extent to which climate change adaptation, with the focus on agriculture and water resources, have been integrated within the local development plans and strategies.

The objectives of this study are as follows:

V. In what ways do changes in climate condition manifest themselves in Buffalo City Metropolitan Municipality, with specific focus on agriculture and water resources?
VI. What institutional and policy framework exist within which institutional adaptation to climate change, with specific focus on agriculture and water resources, can be pursued?

VII. What barriers, challenges and opportunities exist in mainstreaming climate change into local government development plans and strategies?

VIII. What are the implications of the findings of this study in a wider context, particularly in Sub-Southern Africa?

3.4. Research Design

The study reviewed existing literature, policies, strategies and plans about climate change in South Africa. Existing institutional and policy framework for management of climate change in South Africa are the main sources of data for this study. The institutional and policy framework that govern the management of climate change in South Africa was reviewed. Climate change related policies, strategies and plans for institutions of interest, such as DAFF, DWS and BCMM, were also reviewed.

Due to the nature of the research, the qualitative approach was applied in this study. The qualitative methodological approach is suitable for research that is interested in participants' histories, experiences and perspective about the phenomenon of interest (Richie, 2003; Spencer et al, 2003). Furthermore, according to Clough and Nutbrown, (2012) qualitative approach is useful when a researcher question assumptions, views and perspectives that are taken for granted in everyday life. One of the characteristics of this methodological approach is the concern with the exploring of phenomena from the perspective of participants (Spencer et al, 2003). This approach is suitable for this research, as this study is interested on the perspectives of the policymakers and implementers of climate change adaptation strategies, with specific focus on agriculture and water resources, in Buffalo City Metropolitan Municipality, South Africa. There are many purposes of qualitative research, one of them is that is can be used to advance policy development and implementation (Spencer et al, 2003).

The essence of this study is to explore the practices of local government in South Africa in engaging with Climate Change Adaptation, through probing the role that the current legislative framework around climate change plays in influencing practices of local state authorities. The importance of institutional climate change adaptation, with specific focus on water and agriculture, is the main area of interest. While, the second part concentrates on interrogating existing policies and legislation that govern climate change. Thus

legislation from various government institutions related to climate change adaptation was examined. Also, officials from The Department of Water and Sanitation, The Department of Agriculture, Forestry and Fisheries and Buffalo City Metropolitan Municipality were interviewed. The primary aim of the interviews that were conducted with the selected officials was to gain understanding about the procedures and factors that are considered during the complex process of designing climate change adaptation policies and strategies.

Due to the fact that this study zoomed in on Buffalo City Metropolitan Municipality as the chosen study site, officials from the Municipality who have significant insight on the issue of climate change on a local scale were interviewed. The main goal of these interviews was to unpack the processes of forming local climate change adaptation strategies in the region, and the role that national and provincial policies play in the process. The difference between what is expected, from a national level and what is experienced on a local level, based on the availability of resources that address climate change adaptation at a local level was looked into. Asking whether there is a consistency or a divergence between national and local climate change adaptation strategies and, finding out what the main causes of differences or similarities are, was an important aspect of this research. Therefore, a significant portion of this study focused on interrogating national and local policy frameworks that address climate change adaptation.

3.4.1. Description of the Study Site

The study is located in one of the Metropolitan Municipalities of Eastern Cape Province, Buffalo City. This municipality is situated fairly central of Eastern Cape Province (ECSECC, 2012) and it consists of urban areas, rural settlements and commercial farmland (Diederichs et al., 2016). The population of this area is about 1.1 million, and it is densely populated, 2 523 people per km^2, compared to 40 people per km^2 in Eastern Cape, and 41 people per km^2 in South Africa (ECSECC, 2012). Buffalo City contributes only 1.7% towards South African economy but its contribution towards Eastern Cape Province economy is more than 21% (ECSECC, 2012; Diederichs *et al*., 2016).

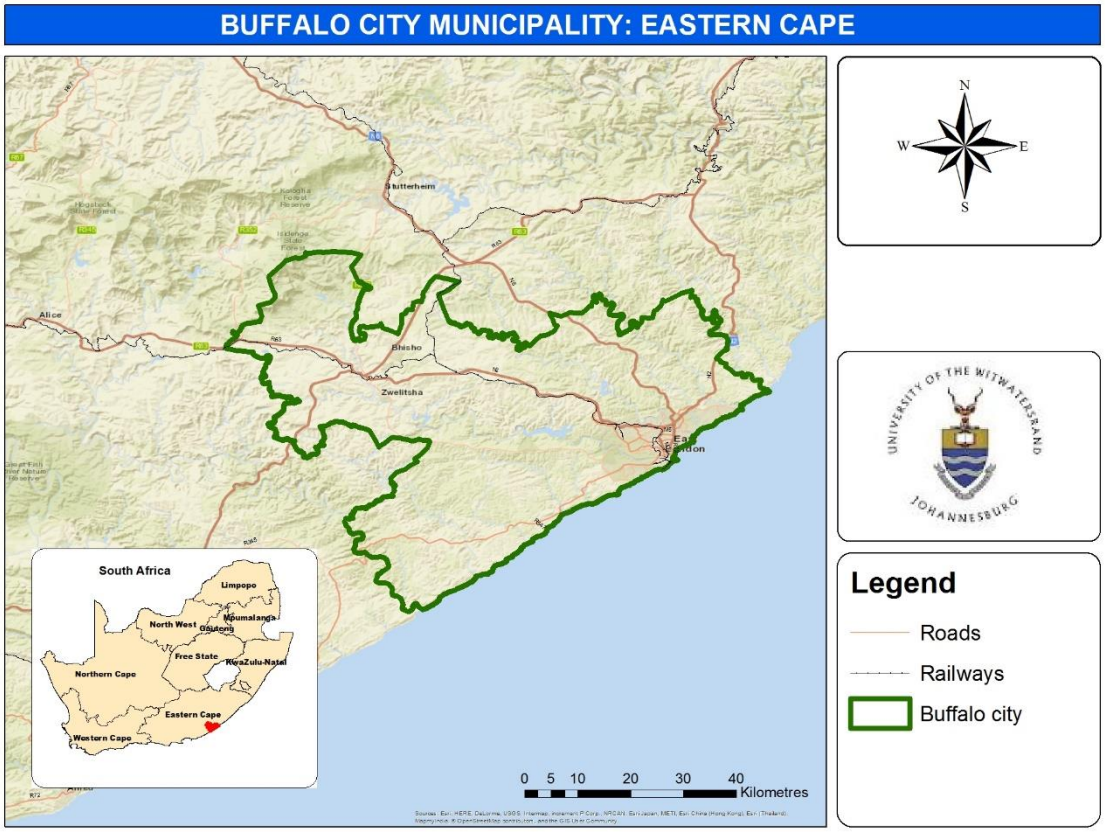


Figure 4: Location of Buffalo City Metropolitan Municipality

The characteristics of the study area make it vulnerable to the climate change impact. Poor people in developing countries are the most vulnerable population to climate change impacts (Najam et al, 2003; Bernauer and Schaffer, 2010; DAFF, 2015) and most of Eastern Cape population fall under this category. Eastern Cape is one of the poorest provinces of South Africa (Nel and Davies, 1999; Woolard, 2002; ECSECC, 2012). Rural population exceeds urban population in the province, and about 74% of the population is classified as poor (Nel and Davies, 1999). Poor population rate of this province is almost double the national poor population rate which is 40% (Nel and Davies, 1999). According to Diederichs et al., (2016) poverty and high unemployment rates are some of the challenges facing BCMM. 373 000 people, 49% of the population of Buffalo City Metropolitan Municipality live below poverty line (ECSECC, 2012).

Protection of economic wellbeing and enhancing safety are the reasons for climate change adaptation (Adger, 2005). Eastern Cape is one of the provinces that will suffer the most with drying runoffs due to climate change (DEA, 2013). This province is one of the

provinces that have the highest levels of soil and veld degradation (Gbetibouo and Ringler, 2009). Therefore, the government intervention is needed to lessen the vulnerability of this region to climate change. Adaptation to climate change is done by government to protect or for the benefits of their citizens (Adger, 2005). Local government is the most important sphere in climate change adaptation. Local government is at the frontline in witnessing the impact of climate change on communities and is expected to respond in a best possible manner (SALGRCC, 2016). Therefore, Buffalo City Metropolitan Municipality has a duty to lead the climate change adaptation for its citizens. However, this is only possible when the government institution at local level has the capacity to achieve those objectives.

3.4.2. Study Population and Sampling Process

The first step of the data collection process in social research is the selection of suitable participants (Englander, 2012). The aim of the study guides the researcher in selecting people to participate in the study, for example, their age, role in the organization, class, gender, etc. (Coyne, 1997). The sampling population is a group of people from whom the researcher seeks to find out answers to questions that address the research at hand. For example, a sampling group may consist of the following people: clients of a corporation, community members, students of a school, government officials and so forth (Khan, 2011). The population of this study is limited only to government officials that are directly involved with climate change adaptation at the following government institutions, Department of Water and Sanitation, Department of Agriculture Forestry and Buffalo City Metropolitan Municipality. Due to limited time and resources, a researcher must take a sample of a population (Archarya et al, 2013). A sample is a subcategory of a population, selected to represent a larger group in a study (Archarya et al, 2013). Therefore, some of the government officials who are directly involved in climate change policy development and implementation, from aforementioned government institutions were selected as participants in this study.

According to Etikan et al., (2016) type, nature and purpose of the study determine the sampling technique to be applied when doing research. Selective or purposive sampling is used in this research as it is thought to be suitable for achieving the objectives of the study. Purposive sampling is a non-random and non-probability sampling technique, and is valuable when a researcher has time and resources constraints (Etikan et al., 2016). In

this sampling technique, a researcher uses his or her judgement to select participants that can provide the best information to achieve the goals of the study (Khan, 2011).

Selective sampling also known as judgement sampling is purpose driven; the researcher includes people of interest and excludes people that do not suit the purpose (Etikan et al., 2016). In essence, the researcher only approaches people that are well informed about the phenomenon of interest and are willing to share information (Khan, 2011, Etikan et al, 2016). Participants are chosen in a deliberate manner; due to the qualities they possess (Etikan et al., 2016). In other words, participants are selected according to their knowledge and experience in the field of interest, and their willingness to share on it (Tongco, 2007; Etikan et al, 2016).

The advantage of purposive sampling is that prior to identifying the research sample, the researcher knows the criteria that participants need to satisfy in order to participate in the study (Ritchie, 2003; Srivastava and Thomson, 2009; Etikan et al., 2016). According to Tongco (2007) this technique is also advantageous when a researcher wants to document an event or a trend that is not witnessed by everyone, including those secret events that some community members are unaware of. Climate change is such a subject, most ordinary people are unaware of it and very few people actually understand this complex phenomenon.

The disadvantage of this method is that participants are selected on reliability and competency, if a selected participant is inappropriate then the data collected will be worthless (Tongco, 2007). Data gathering is essential in research, therefore, the source and manner of collecting information is vital for the production of reputable research (Etikan et al, 2016). Hence, reliability and competence of the participant must be guaranteed when this method is applied, so as to ensure that the information gathered is of good quality (Tongco, 2007). The other disadvantage is that the participants may be bias (Tongco, 2007). In this case, the participants may protect the reputation of their institutions when giving information about climate change.

The participants in this research met the following criteria:

i. They are government officials at Department of Water and Sanitation or the Department of Agriculture Forestry and Fisheries or Buffalo City Metropolitan Municipality.
ii. And the officials are directly involved in climate change adaptation in the above mentioned government institutions.

Only people with climate change adaptation experience in the Department of Agriculture Forestry and Fisheries, Department of Water and Sanitation and Buffalo City Metropolitan Municipality are participants in the study. The participants of this research are experienced in dealing with climate change adaptation in their respective government institutions.

In general, the sample size in qualitative research is smaller than that in quantitative enquiries, this is because in-depth interviews that aim to answer the how and why question of a certain phenomenon are used in qualitative research, whereas quantitative research aims to gain a statistical overview of a topic of interest (Ritchie, 2003; Dworkin, 2012). The researcher usually outlines the population size and is normally within the researcher's resources (Dixon and Leach, 1977). Moreover, the purpose of the study commonly determines the sample size of the study (Suzuki et al, 2007). According to Tongco, 2007 and Etikan et al, 2016, purposive sampling technique does not have a set number of participants; however the needed data should be obtained until the point of saturation. In this study, only five participants were necessary to reach the point of data saturation. The participants were as follows: one official of Buffalo City Metropolitan Municipality, two officials in the Department of Agriculture, one from the national department and the other from the Eastern Cape provincial department, and two officials in the Department of Water and Sanitation, one from the national department and the other from the Eastern Cape provincial department.

In most literature, the acceptable number of participants in in-depth interviews is considered to be between five and fifty (Dworkin, 2012). In this research there are five in-depth interviews, due to the nature of data needed to achieve the objectives of this study, which is to gain the perspective on climate change adaptation from five different government institutions. The collected data is deemed sufficient as saturation is reached. The concept of saturation is when new information is no longer collected during data

collection process, the new data is the same as the data collected earlier; however, time and fund limitation may prevent one from reaching saturation (Dworkin, 2012).

3.4.3. Data Collection Tools

The choice of research methods was based on the nature of the research project (Babbie, 2013; Noor, 2008). This study made use of both primary data and secondary data. Semi-structured interviews were used as a source of primary data, while government policies, plans, strategies and reports on climate change adaptation, were a source of secondary data.

3.4.3.1. Interviews

Interviews are a data gathering method that seeks to collect descriptive data through verbal communication (Corbetta, 2003). This specific qualitative method is effective in gathering scientific data on human behaviour and beliefs in the context that it occurs (Gill et al., 2008). Semi-structured interviews consist of open ended questions on the topic of interest. Responses to semi-structured interviews do not require a strict yes, no or maybe response, instead with semi structured interviews the interviewer has the opportunity to probe further and seek explanations on responses given by the interviewee. Thus one advantage of semi-structured interviews is that unlike structured interviews, in-depth probing can take place (Ritchie, 2003). A disadvantage of semi-structured interviews is that analysing data from open-ended questions can be complex and time consuming, because grouping often very diverse responses requires time and skill (Gill et al, 2008).

Interviews can be conducted telephonically or through the use of other telecommunication software such as Skype, the use of social media platforms such as Facebook, or following the traditional route of conducting face to face interviews. Conducting interviews through the use of various telecommunications devices can be a very effective and economical way of collecting data where the sample is accessible via telecommunication networks. However this method also automatically excludes members of the population who do not have access to telecommunications (Gibbs, et al., 2002). Although face to face interviews are more labour intensive than other methods, it is still the most effective way of collecting high quality data. Where it is a question of limited financial resources or limited experience in conducting interviews, face to face interviews are not always the best option.

This research made use of semi-structured, face to face interviews. The purpose of this body of work is to shed light on the factors that influences the content of climate change adaptation strategies and practices at a municipal level. This insight was gained through interviewing experts on climate change from relevant institutions with knowledge about the subject matter. This form of data collection was suitable because:

1) Face to face interviews ensured that the interviews were conducted in a professional manner, since the people who were interviewed were professionals.
2) Semi-structured interviews ensured that no questions were left unanswered, as unclear answers could be clarified on the spot.
3) Through semi-structured interviews the researcher gained a detailed description from the experts and the relevant individuals about the subject of climate change.

3.4.3.2. Secondary Data Analysis

Secondary data analysis is another data collection method that is applied in this study. This technique is when a researcher analyses existing data with a purpose to improve research or answer a new question (Glass, 1976; Szabo and Strang, 1997; Johnston, 2014). Reviewing existing data from archives is a useful method in qualitative research data collection (Richie, 2003). Relevant climate change related policies and strategies are reviewed in this research, with a sole purpose of understanding if the capacity at the local government is adequate to comply with these policies.

Secondary data analysis was chosen due to the readily availability of government institutional data for public use. Therefore, access to data was considered before considering this method for this study. This technique is cost effective and less time consuming for the researcher, and that is one of the advantages of using a secondary data analysis (Szabo and Strang, 1997; Johnston, 2014). This data collection method is useful for this study due to limited availability of time and resources.

National Climate Change Response White Paper (2011), National Climate Change Response Strategy for the Water Sector, Draft of Water and Sanitation Sector Policy Position on Climate Change (2016) Draft Climate Change Adaptation and Mitigation Plan (CCAMP) for the South African Agriculture, Forestry and Fisheries Sectors (2015) are some of the secondary data documents that are analysed in this study. These documents

are compiled by different governmental departments for the same purpose, dealing with climate change, and that validates the fact that climate change is an issue across different governmental departments. There are other policies that address climate change that were not analysed, the above mentioned policies and strategies, address the aim of the study, which specify that the research concentrates on institutional climate change adaptation, with specific focus on agriculture and water resources.

3.5. Data Analysis

This research is not statistically driven, it concentrates on the quality, and therefore, qualitative methodology was applied to this study. Brown and Clarke (2006) explain that the analytic process is a progression from the description to the interpretation of data. For qualitative research to produce eloquent and valuable results, the examined data must be analysed in a methodical way, although there is a shortage of the techniques to perform this task (Attride-Stirling, 2001). However, there is insufficient data on how to conduct an analysis of textual material after data collection in a qualitative process (Attride-Stirling, 2001). In this study, thematic data analysis is one of the applied data analysis methods. Boyatzis (1998) argues that thematic analysis is commonly used, although there is insufficient literature about it.

Thematic analysis is a process for qualitative analysis (Boyatzis, 1998; Alhojailan, 2012). According to Boyatzis (1998) thematic analysis is seeing through raw data what is not on plain sight. This analytical process involves searching the collected data from interviews and a range of text for repeated patterns of meaning (Brown and Clarke, 2006). It is a technique for detecting, scrutinizing and reporting themes within the data (Brown and Clarke, 2006; Alhojailan, 2012).

Thematic analysis provides the chance to code and categories data in themes (Boyatzis, 1998; Alhojailan, 2012). Brown and Clarke (2006) claim that themes emerge during thematic analysis process. A theme is important information within data collected that will assist in answering the research question (Brown and Clarke, 2006). Moreover, Boyatzis (1998) describes a theme as a pattern noted in the collected data that describes and organises possible observation or interpret aspects of the phenomenon. According to Alhojailan (2012) thematic analysis assists readers to get a sense of main and vital

themes from the collected data. However, for the thematic analysis to be credible, the researcher should ensure that the themes embody the whole text (Alhojailan, 2012).

Brown and Clarke (2006) describe thematic analysis as a useful process to apply when a researcher investigates an under-researched area, or views of participants that are unheard in the researched topic. The views of participants of this study are uncommon, especially in Africa. Moreover, this type of data analysis is suitable for a study that strives to discover using interpretations (Alhojailan, 2012). It allows qualitative research to effortlessly communicate the findings and interpretations of the study (Boyatzis, 1998). Thematic analysis seeks to unearth noticeable themes in a text in different levels (Attride-Stirling, 2001). According to Brown and Clarke (2006) this data analysis process may be used in probing the ways in which events, realities, meanings and experiences are the effects of the phenomenon operating within society. Thematic analysis creates a link between a concept and information gathered during data collection (Alhojailan, 2012). This analytical process is a way of making sense out of seemingly unrelated data (Boyatzis, 1998).

Thematic analysis process is commonly used by scholars and researchers from different disciples (Boyatzis, 1998). It is useful for studies that employ a low level of interpretation (Vaismoradi et al, 2013). According to Brown and Clarke (2006) this analysis process does not require the detailed theoretical and technological knowledge of methods such as grounded theory. Although that is the case, Attride-Stirling (2001) mentioned that thematic analysis offers practical and effective procedures for data analysis. One of the advantages of thematic analysis is that it flexible and it is easy to do, even for researchers who are still learning qualitative technique (Brown and Clarke, 2006). The other advantage of this analytical process is that it enables the researcher to access a broad variety of phenomenological information (Boyatzis, 1998, Alhojailan, 2012).

There are several dangers that a researcher has to look out for when applying this analytic process. According to Brown and Clarke (2006), the researcher should avoid the following when using thematic analysis, not analysing data at all, weak and unconvincing analysis, using data collection questions as themes, inconsistency between data and analytic claim, and mismatch between theory and analytic claim.

Boyatzis (1998) stated that the thematic analysis should follow the below sequence:

Sensing themes -> doing it reliably -> developing codes -> interpret the information and themes

There are six stages of thematic analysis (Attride-Stirling, 2001; Brown and Clarke, 2003). The stages are as follows:

i. Familiarising yourself with data

After the interviews, the researcher converted the data from audio into textual material. This process assisted in familiarizing the researcher with the collected data. Analysis comprises of relentless moving back and forth between the entire data set (Brown and Clarke, 2006). By the end of this process the researcher was familiar with the data that was collected.

ii. Generating initial codes

Inductive analysis was applied in this section of the study. Inductive analysis is a process of data coding without trying to make it suitable for a pre-existing coding frame (Brown and Clarke, 2006). The data collected in this study was organised in such a way that it was categorised under suitable questions that guided the study.

iii. Probing for themes

A theme is identified by the researcher's judgement (Brown and Clarke, 2006). Moreover, a theme may be generated from raw or secondary data (Boyatzis, 1998). At this stage, the researcher interrogated the collected data, both raw and secondary, from different sources to come up with a thematic network. Although the trends were not in plain sight, they existed within the data. These trends were not known visible during the data collection process.

iv. Reviewing themes

The themes were reviewed in order to ensure that the researcher did not make the common mistakes researchers make when applying this technique mentioned by Brown and Clarke (2006), for example, using research questions as themes.

v. Defining and naming themes

The importance of the theme is dependent on the degree to answer the research question, and cannot be quantified, it can be a single sentence (Brown and Clarke, 2006). Stand out quotes from participants were used to name the themes. During defining and naming of the themes, the importance of the subject to the topic of interest was considered. Ensuring that the themes are clear and understandable was also vital at this stage.

vi. Producing the report

This stage is all about interpreting the patterns (Attride-Stirling, 2001). Reporting is an essential part of the research as an unexceptional interpretation of patterns can result in a mediocre study. The interpretation of themes of this study was developed in a systematic manner that addressed an important but complex phenomenon in a simple way.

The second source of data is secondary data that is made up of national climate change policies. The main objective of conducting policy content analysis in this research is to unpack the influence that national and climate change legislative framework has on local climate change strategies. Therefore, it is essential to identify components of the policy that are inconsistent with the experiences on a local level. It is also crucial that elements of national legislation that are successfully implemented on a local level be highlighted (Drew and Dollery, 2015).

The policy content analysis framework that was utilized was based on the following goals:

i. **<u>Identifying and assessing the goals and objectives of the policy</u>**
   a. Language used in the policy is clear, and thus, the goals of the policy are clearly stipulated.
   b. The goals of the policy are malleable, that is, goals are attainable in various contexts (Tremper *et al*., 2010).

ii. **<u>Assessing policy guidelines for the implementation process</u>**
   a. Identifying the requirements for implementing policies, requirements for implementation must be clearly expressed.
   b. Are the requirements for implementation realizable on a local level?

c. What structures exist to facilitate and ensure that local government is able to meet the requirements for implementation?
d. What structures inhibit local municipalities from realizing the requirements of implementation?
e. Does the policy have a clear guideline on policy implementation and provide methods of monitoring the implementation process?
f. Is there resistance or opposition to the policy? (Phulkerd *et al*., 2017).

iii. Evaluating results after implementation

a. A framework for measuring results exists and clearly articulates indicators of successes or failures
b. Guidelines for remedying failures exist and are clearly articulated.
c. Guidelines for maintaining success exist and are clearly articulated
d. Overall, does the policy effectively resolve the problem that it intends to resolve? (Salamon, 2002).

iv. Comparing policies

a. What similarities or differences exist between policies?
b. Can differences in policy content cause confusion on a local level? (Baker *et al*., 2007; Srabstein *et al*., 2008).

v. Room for improvement

a. What changes or amendments can benefit local implementers?
b. Are the changes proposed feasible?
c. How can national policies effectively respond to local needs? (Tremper *et al*., 2010).

vi. Assessing the level of stakeholder involvement in the policy development process

a. Are the values and ideas of the broader community that is affected by climate change well represented in the policy?
b. Are societal needs and expectations aligned with practice recommendations in the policy?
c. Do general stakeholders view the policy as acceptable? (Swinburn *et al*., 2005)
d. Does the policy promote transparency by prompting stakeholder involvement and engagement at all stages? (Lemke and Harris-Wai, 2015).

vii. Assessing unintended effects of the policy

a. What are the unintended effects of this policy on local government?
b. Does the policy provide a framework of dealing with unintended effects? (Rychetnik *et al*., 2002).

viii. <u>Assessing costs of implementing the policy</u>

a. What financial costs were incurred by local government when implementing the policy and were the costs within the municipality's financial capacity?
b. Did the policy generate any financial gains for local government? (Salamon, 2002).

ix. <u>Assessing equity</u>

a. What effects does the policy produce on different social groupings, as characterized by various social categories?
b. Does the policy create, increase or correct social inequalities?
c. Does the policy create, increase or correct social dichotomies? (Milton et al., 2011).

The aforementioned nine goals are the backbone of the policy content analysis framework utilized in this research project. The goals of the reviewed policies, strategies and plans were identified and assessed. The goals and objectives of the policies of interest were assessed if they are clear and understandable. The implementation process of these policies was interrogated for feasibility and attainability. Since climate change adaptation is not an event but rather a continuous process, the evaluation process that is supposed to follow after implementation of policies was also examined.

Since climate change is a cross-cutting issue, the alignment of goals and objectives of reviewed different climate change adaptation policies was assessed. The possibility of contradiction, similarity or overlap in climate change policies of different institutions with different mandate is high. The areas of improvement were noted in both the developmental and implementation stages of climate change adaptation policies at all levels of government. The other area of interest during the review of policies in this study was the level of involvement of all climate change stakeholders. It was vital for this study to understand the level of involvement of all stakeholders in development and implementation of climate change policy.

In most cases, the good intentions are usually accompanied by unintended side effects. The review and the study in general, was interested at scrutinizing the unintended side

effects of policies and how are they addressed. Financing the implementation of policies is one of the vital part of this study. The financing or funding of the implementation process was interrogated during the review of the climate change adaptation policies. Since poor people are the most vulnerable to climate change, the socio-economic impact of these policies was also looked into.

3.6. Methodological Reflections

According to England (1994) researchers are part of the world they are researching. They always think of their bias or inside/outside status during data collection (Cousin, 2010). It is advantageous for the researcher to identify own biases prior data collection in order to guard them during the process (Bourke, 2014). The biography of the researcher has an impact on the fieldwork (England, 1994). The identities of the participants and researcher may affect the research process (Bourke, 2014).

According to Bourke (2014), issues of positionality will show throughout data collection process. Since the researcher is originally from the study area; there was an issue of a blind spot. From first-hand experience, citizens from the study area are generally not satisfied with government institutions. The participants of this study are government officials, and the researcher already had a perception about them and their institutions, however the data collection process exposed new aspects. The data collection process revealed the blind spot to the researcher of how the institution operates, for example, the barriers and challenges that prevent these authorities and officials to operate at their optimum level.

The other issue was the assumption that it was going to be a simple task to secure interviews with participants since the researcher is from the study area, and that was not the case. Securing an interview with government officials was not a simple task. The researcher had to go through internal procedures of different government institutions to secure the interviews, and that process took couple of months before the interviews were granted.

The aforementioned issue during data collection process added stress on the time factor as the academic research is expected to be completed in limited time period. The other issue that added stress on the limited time was the unanticipated events, such as the postponement of the interviews by the participants due to unforeseen pressing matters.

According to the ethics of the university, a researcher must conduct the interviews in the convenience of participants, therefore, the interviews were postponed and conducted at a later stage to the convenience of the interviewees. The time related issues required the researcher to revise the research schedule plan, and ensure that the study is completed in time.

The other issue was the budget related as participants of this study were based at different provinces. Although the study area is BCMM, other participants from DAFF and DWS are based at another province. The study had a limited budget, and the traveling was a costly expense.

CHAPTER FOUR

EMPIRICAL EVIDENCE

4.1. Introduction

This chapter is the presentation and discussion of the empirical evidence that was acquired during data collection stage of this research. The discussion in this chapter is based on the themes derived from the main research questions of this study, presented in section 1.3. This chapter is guided by the following main themes:

i. Manifestation of changing climatic conditions.
ii. Existing institutional and policy framework for climate change adaptation.
iii. Barriers and challenges for effective climate change adaptation at local level.

Based on the above, this chapter begins by detailing how climate change manifests itself in BCMM. The next section of this chapter outlines the institutional structure that guides climate change adaptation in South Africa. The following section is a presentation of relevant policies and legal framework that inform adaptation to climate change in South Africa. It needs to be mentioned that only relevant policies to this study are presented. The section that follows than seeks to expose barriers and challenges to effective climate change adaptation, as expressed by the participants of the study. Before concluding, opportunities presented by the changing climate at Buffalo City Metropolitan Municipality are explored.

4.2. Manifestation of Climate Change in Buffalo City Metropolitan Municipality

This section details how the climate change manifests itself in Buffalo City Metropolitan Municipality. Before that, it is important to first state the ways in which climate change is exhibited nationwide, before zooming into Eastern Cape Province and BCMM. According to Eastern Cape Climate Change Response Strategy of 2011, the manifestation of climate change in South Africa is likely to include higher temperature, frequent natural disasters such as drought and floods, altered rainfall patterns and rising sea levels. There are different ways in which the change in climate unfolds in the Eastern Cape Province, for example, by change in annual mean temperatures and rainfall, sea-level rise, loss in biodiversity, frequent natural disasters, etc. Buffalo City Metropolitan Municipality is situated in the Eastern Cape Province; therefore, it is necessary to detail the evidence of

climate change in the province in general before zooming in in to the municipality of interest.

4.2.1. Evidence of Climate Change in the Eastern Cape Province

Drought is recognized as one of the climate change impacts, and this natural disaster has been causing havoc in this region. Eastern Cape was declared one of the drought disaster stricken provinces during the 2007/2008 drought; and 20 out of the 285 million of drought relief funds was allocated for assistance of farmers based in this province (Ngaka, 2012). During the 2015/2016 drought, Eastern Cape was once again declared one of the drought disaster troubled provinces; and the drought affected farmers were assisted by establishment of fodder banks and development of both boreholes and windmills (DAFF, 2016). In 2018, Department of Water and Sanitation stated that drought has hindered farming progress and increased unemployment, poverty and inequality in the Eastern Cape.

According to section 3.4.1 of the Eastern Cape Climate Change Response Strategy (2011) the temperature is increasing by about 2% across the province. Section 5.1 of the same document points out at changing precipitation and a rise in sea level as some of the observed climate change effects in the region. Moreover, these effects have major domino effects, threatening the economy and livelihoods of a significant portion of the population. Eastern Cape provincial and local government mandates are also vulnerable to the above mentioned knock on effects. In the context of a climate change response strategy for the provincial government, it is essential to systematically identify and assess the areas where provincial plans, agencies and departmental and municipal mandates are directly at risk.

Section 5.6 of the Eastern Cape Climate Change Response Strategy (2011) highlights the fact that future climate change continues to threaten the state of water resources in the province. Water resource management issues in the Eastern Cape Province are both quantity and quality related. Change in mean annual rainfall due to climate change combined with the increased demand of water due to irrigation, manufacturing and urban requirements have resulted in decrease of downstream water quantity, quality and ecological integrity. Some of the secondary impacts of climate change on water resources include, changes to baseflows and stormflows and their variabilities, changes to annual

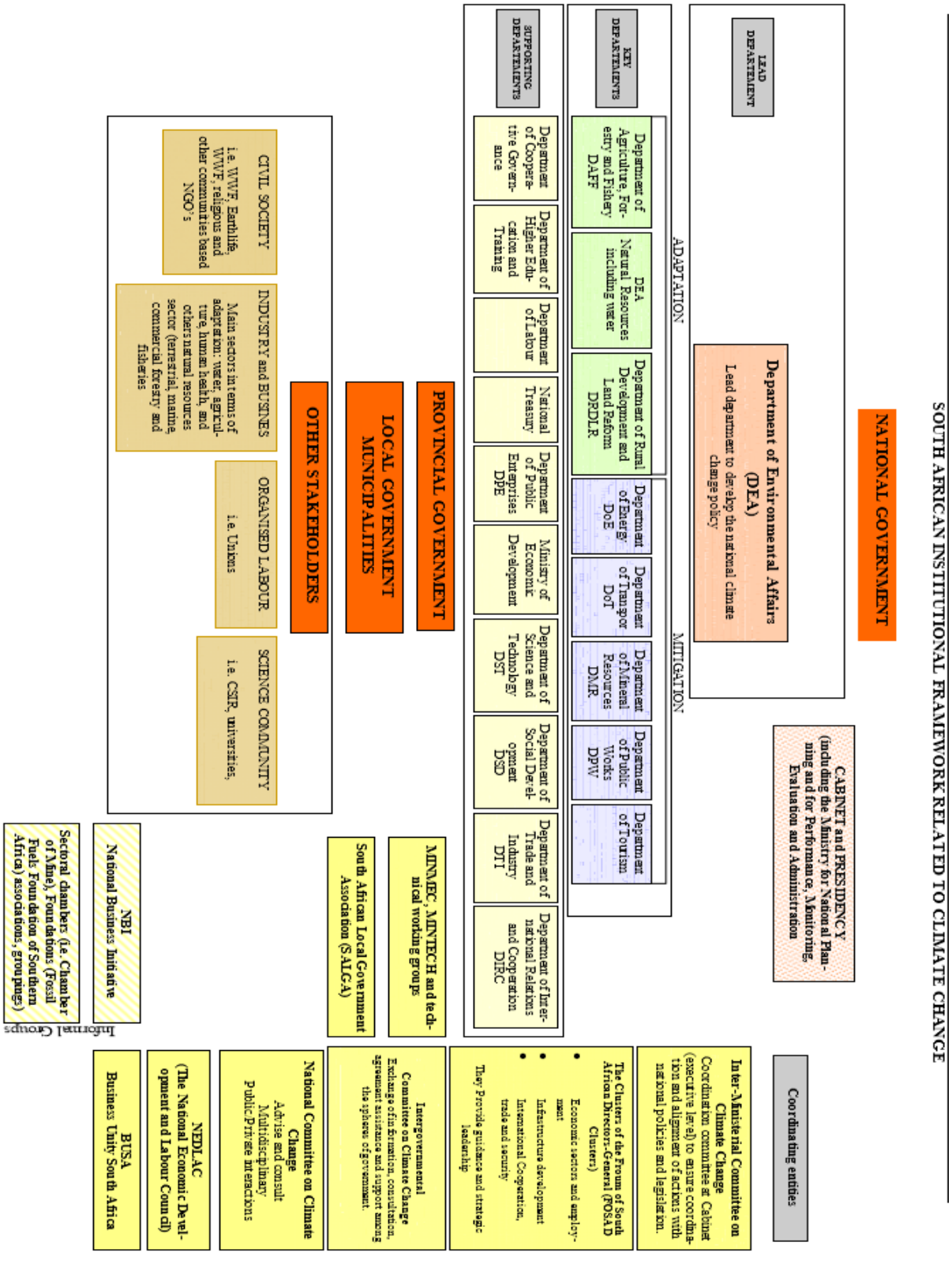
streamflows and their variabilities, changes to sediment yield and its variability; and changes to irrigation water requirements and associated losses. Stormflow, baseflow and sediment yield regimes and their associated variability have strong and direct influences on water quality and quantity, as well as the integrity of aquatic ecosystems.

Section 5 of the aforementioned document states the threats posed by the impacts of climate change on the provincial agricultural sector and Provincial Government of the Eastern Cape Fisheries and Aquaculture. The Agricultural Sector is one of the most important primary resource bases in the Eastern Cape, it is a vital source of employment, and it is critical to rural livelihoods and food security. Therefore, the threat posed by climate change to this sector is a direct threat to the livelihoods of major population in this region. Climate Change impacts are a threat to goals of the provincial economy and economic development programmes, such as, Asgisa, Provincial Growth and Development Plan, the Massive Food Programme and Eastern Cape Development Corporation. If climate change is left unattended, the success of all these economic development programmes will be in jeopardy.

4.2.2. Evidence of Climate Change in the Buffalo City Metropolitan Municipality

According to BCMM IDP (2013/14) climate change has manifested itself in many ways in BCMM including natural disasters, frequent severe storms; uncontrolled fires, flooding (worst recorded flood being 1970 floods and 2011) drought, sea surges and shipwrecks along the coast. Moreover, according to Diederichs et al., (2016) climate change has resulted in the loss of biodiversity; and increasing risk and vulnerability of people, settlements and infrastructure in the BCMM. Climate change has also had a negative impact on local food security as traditional crop yields decreased (Diederichs et al., 2016). Furthermore, changing patterns of rainfall causes more severe flooding and droughts and negative impacts on BCMM water security (Diederichs et al., 2016). Thus, the effects of climate change are expected to continue impacting negatively on the BCMM water supplies (BCMM, 2016). Drought for one has severe destructive impacts on agriculture, tourism and water resources (BCMM, 2016).

4.3. Existing Institutional and Policy Framework for Climate Change Adaptation



(DEDEA, 2011)

Figure 5: South African Institutional Framework Related to Climate Change

The above diagram illustrates the South African Institutional Framework for climate change. Although it shows that there are many key role players, it should be noted that data collected is only about few of these key shareholders due to restrictions of the study.

This part of this chapter describes the institutional and policy framework that informs adaptation to climate change in South Africa. Institutional adaptation to climate change in South Africa is directed by the policy and legislative framework. Existing policy documents, legislation and institutional setup reviews inform findings of this study. It should be noted that the reviews are not extensive but rather limited only to the parameters of this study as detailed in Section 1.7 Delimitation.

4.3.1. South African Institutional Adaptation to Climate Change

The formal bodies that are responsible the governance of climate change across relevant institutions in South Africa are GCCC and NCCC. Department of Environmental Affairs (DEA) ministry is task with the responsibility of coordinating climate change activities, policies and strategies across all government departments and institutions in South Africa. However, DEA does not have legislative powers to enforce other departments to integrate climate change into their policies. Within the boundaries of this study, the empirical evidence suggests that there are no climate change units within the investigated government institutions.

Governance of institutional adaptation to climate change in South Africa was identified through reading of relevant grey literature on policy and governance in South Africa. The 2011 National Climate Change Response Policy of South Africa details goals and plans to address climate change and what is expected from different government institutions to realise those objectives (Zwane and Montmasson-Clair, 2016). Different government institutions from different levels derived their own adaptation to climate change policies guided by the above mentioned policy. Although relevant institutions are expected to have their own climate change adaptation policy, strategy and plan, not all institutions have theirs in place. In this study, only the climate change policies that fall within the limitation of the study were reviewed.

Below is the presentation of the policies, strategies, plans and reports within the boundaries of the study, the documents inform the adaptation to climate change in South Africa.

4.3.2. National Climate Change Response (NCCR) White Paper

The NCCR White Paper contains South African government's guidelines for effective climate change response and how to ensure that the country is climate-resilient. This document was published in 2011 and its principles are derived from the Constitution, Bill of Rights, National Environmental Management Act (NEMA), the Millennium Declaration and UNFCCC. This document also states that South African government acknowledges that climate change is one of the main threats to sustainable development. One of the objectives of South Africa's response to climate change is to successfully manage the inescapable effects of climate change through interventions that build and sustain South Africa's economic, social and environmental resilience and emergency response capacity.

Due to the objective of this study, the focus will only be on the section of the document which looks specifically into adaptation to climate change. The South African government argues that the country needs to adapt to climate change by managing climate change related risks, decrease the sensitivity and increase the reliance of society to climate change. This policy reflects South African commitment to protecting the country and its people from climate change impacts. As a signatory of UNFCCC, South Africa is legally committed to develop, implement and update its climate change policies. According to this document, South Africa is also committed to develop a climate change plan to address integrated coastal zones, agriculture, land protection and rehabilitation of water resources. According to NCCR White Paper, social, economic and environmental policies must align to mainstream change.

Climate change impacts and responses are cross-cutting; therefore, the government of South Africa acknowledges that effective adaptation to climate change requires coordinated, coherent, efficient and effective national policy. Moreover, effective climate change adaptation for South Africa needs economic, environmental and social interventions that integrate mitigation and adaptation elements within the development framework, and it needs to respond to unintentional negative impacts it creates. According to this document, although responses are categorised as either mitigation or adaptation, the combination of both aspects yields positive results and thus combination is essential. Some of South African climate change principles are:

i. Aligning domestic measures to decrease the country's Green House Gas emissions and adapt to climate change with unique conditions of the country and its capacity to act.
ii. Needs of the poor and vulnerable should be considered in climate change policies.

According to this policy, sectoral response is one of the strategies where all vital actors and organisations, in sectors or subsectors play their part by preparing, submitting, implementing and reporting their detailed climate change response strategies and action plan to contribute to NCCR objective in a measurable way. Integrated planning is another strategy of NCCR, where all relevant sectors, national, regional and local policies are align and consider mainstreaming climate change. Informed decision-making and planning is another strategy, this will be achieved by prioritised research, system observation, collecting and managing data, and development of early warning systems that will assist in prediction and measure of climate change and its impacts. Early warning, identifying medium term potential resources challenges and long-term prediction of future climate are key features of effective climate change adaptation strategy. This document states that the short term goal for effective adaptation plan is to reduce disaster risk, while integrated resource management and development planning are the medium and long term goals, respectively.

The NCCR will be reviewed every five years after the publication date. Moreover, within two years of policy, strategy, legislation, regulation and plan publication of all government department and state-owned enterprises must be reviewed to ensure that they are aligned to NCCR goals and objectives. The review is done by Intergovernmental Committee on Climate Change (IGCCC) it identifies adaptation responses that need coordination between departments due to cross cutting issues. This committee also identify and prioritise important short and medium term adaptation interventions that need sectoral plans. According to this policy, National Water Resource Strategy (NWRS) and Strategic Plan of South African Agriculture (SPSAA) are some of the policies that need to be integrated in the sectoral plans.

This document emphasises that agriculture and commercial forestry sector must adapt to climate change due to its sensitivity to this phenomenon. This policy further states that the sectoral plans for climate- resilience aim to address, amongst other national issues, food security and water availability.

4.3.3. Draft Climate Change Adaptation and Mitigation Plan (CCAMP) for the South African Agriculture, Forestry and Fisheries Sectors

This document was published in 2015 and it is useful for addressing institutional arrangements, vulnerability assessment, mitigation and adaptation in the agriculture, forestry and fisheries sectors in South Africa. This climate change adaptation plan recognises that climate change resilient plans are likely to affect the rural poor the most. Thus, climate resilience must address concerns of strategic national importance, such as, food security and its links to water, health (human, livestock and plant) and land reform.

According to this document, the following are some of the matters that should be considered, explicitly or implicitly, in this plan in light of projected climate change:

i. Climate-resilient agricultural responses depend on the acknowledgement that agriculture is not only for food purposes, but also has other environmental and socio- economic benefits.
ii. As vital as input-intensive commercial agriculture is, it can sometimes have undesirable environmental, social and economic results, which may be exacerbated by climate change.
iii. The suitable use of small scale labour demanding agriculture techniques and its several overall benefits, such as, job creation, empowerment, food security, and contribution to biodiversity, should also be considered from a climate change perspective.
iv. Modelling of climate change scenarios is pivotal in informing land use planning decisions in agriculture, in as much as that determine the mix of livestock and crop cultivation, as well as the types of crops that are likely to be commercially worthwhile under projected future climate scenarios.
v. Impacts of alien invasive plant species, which reduce stream-flow and may subsequently compromise already scarce water resources as well as reducing biodiversity, need to be evaluated through a climate change lens.

This policy emphasises that, for South African climate change responses to be effective, all levels of government, academia, research, business industry and community at large need to be actively involved and commit. However, climate change is not accepted equally in all spheres of society, hence, it is difficult for some to prepare for climate change impact. This illustrate that climate change awareness is lacking in some areas of society.

This document also states that policy framework with clearly defined guidelines detailing short, medium, and long term goals for climate change responses must be provided by government. This policy document mentions that the municipalities are required to have an action plan to combat climate change effects, and also needs to have vulnerability assessment, mitigation and adaptation strategies.

4.3.4. Water and Sanitation Sector Policy Position on Climate Change

This policy was developed by the Department of Water and Sanitation (DWS) in 2016 as a guide for this department to play its role in an effort to combat climate change. The objectives of the Water and Sanitation Sector Policy Position on Climate Change are as follows:

i. Highlight and strengthen the ties between the NCCR White Paper and water and sanitation responses.
ii. To provide a framework for the implementation of the Climate Change Response Strategy (CCRS) for the water and sanitation sector.
iii. To strengthen the development, implementation and enforcement of regulations that has implications on climate change.
iv. To highlight the policy principles of the water and sanitation sector with regards to climate change.

Common but differentiated responsibilities and respective capabilities, is one of the principles of this policy and, is described as aligning domestic measures to adapt to impact of climate change with national conditions, phase of development and capacity to act. The other principle is adaptive management approach, which is a planned, iterative procedure of vigorous decision making in the face of uncertainty, with an intention to decrease uncertainty over time via system monitoring. Informed participation is also a principle for this policy, and is all about increasing public awareness and understanding of the root causes and impacts of climate change and, also promotion of the wider participation in combating this phenomenon.

The water sector principles adapted from NWRS for climate change are as follows:

i. A sound scientific foundation as the basis of all recommendations and actions.

ii. Maintenance of a balanced approach between preparedness and over reaction.
iii. Integration of potential climate change impacts into water resources and water services planning and supply at all levels.
iv. Provision of leadership by the Department with strategic partners to drive appropriate strategic responses to minimise the impacts of climate change.
v. Alignment of existing initiatives and institutions to improve the effectiveness of the sector response strategy.
vi. Elevation of climate and water onto appropriate agendas to ensure incorporation of this new field into the national agenda and adequate management.
vii. Improved knowledge of the climate-water relationship and its impact on the society.
viii. Protection and enhancement of critical natural infrastructure (ecosystems).
ix. Physical infrastructure is planned for a changing future using a no-regrets/low regrets approach.

4.3.5. Eastern Cape Climate Change Response Strategy (ECCCRS)

As part of contributing to the national goal of combating climate change, Eastern Cape government, spearheaded by Eastern Cape Provincial Department of Economic Development and Environmental Affairs (DEDEA) started developing ECCCRS early in 2010, and the final document was released in March 2011. According to this document, the government of Eastern Cape acknowledges that the province contributes to climate change and is also aware that the region is vulnerable to climate change impacts. Thus, there was a need for the development of a policy for planned and coordinated approach for mitigation and adaptation to climate change.

Adaptation Category	Adaptation objective
Coastal Infrastructure and Livelihoods	• Increased resilience of coastal infrastructure and resources to the effects of sea-level rise, storm-surges, flooding and increased sea temperature (fisheries). • Improved response to the impacts of extreme coastal events.
Water Scarcity	• Mainstreaming climate change induced water scarcity in institutional decision-making and planning in water stressed areas in the Eastern Cape Province. • Effective water resources management and efficient water use throughout the Eastern Cape Province.
Flood Management	• Flood prevention • Reducing vulnerability to flooding events; • Improved response to the impacts of flooding events
Responses to increased risk of wildfires	• Improved wildfire prevention and suppression
Managing the effects of increased temperature on human lives	• Societal adaptation to human health impacts from temperature increases associated with climate change.
Food security	• Incorporating Climate Change acclimatization and resilience in provincial food security programmes.

Figure 6: Recommended programmes in response to the impacts of extreme significance identified in the systematic risk assessment.

The table above illustrates Eastern Cape Government's perception about climate change and how the institution is planning to adapt to it. The essential vulnerable features of the region to climate change are noted and, adaptation objectives to this phenomenon are presented. This table also indicates that water scarcity and agricultural production are major contributors to climate change and its negative impacts in the province.

One of the policies that were considered in the development of ECCCRS is the National Climate Change Response Green Paper which was published in December 2010. Section six of Green Paper states that climate change considerations and responses should be mainstreamed in all government institutions, in all three levels and in all state owned enterprises. The Green Paper also asserts the need for provincial response process, and supports the concerns and priorities identified in the ECCCRS.

The Development of the ECCCRS entails four phases, namely:
Phase I - Eastern Cape Climate Change Scenario, where an understanding of the issues and context of climate change in the Eastern Cape was developed. The phase includes five components, which are as follows:

i. Legal and Policy Framework – where the international, national and local policy and legislative context for climate change response in the Eastern Cape is assessed;
ii. Climate Change Scenarios and Impacts - where the manifestations of climate change and related impacts relevant to the Eastern Cape are identified;
iii. Risk Assessments of appropriate sectors and resources of the Eastern Cape – where a systematic process of identifying and prioritising risks to various sectors is undertaken;
iv. Eastern Cape provincial development priorities – where development policies and strategies are reviewed in order to ensure that the ECCCRS process is informed by these priorities;
v. Greenhouse gas inventory – where a preliminary assessment of the greenhouse gas "footprint" of the Province is undertaken.

Phase II: Provincial Needs and Technology Assessment – where technical options for climate change mitigation most appropriate to the circumstances and needs of the Eastern Cape are identified.

Phase III: Guideline Document on Sectoral Climate Change Action Plans – where priority response options are identified and developed as cross-sectoral programmes. The response programmes are grouped into adaptation programmes and mitigation programmes.

Phase IV: Eastern Cape Climate Communications, Education and Public Awareness Strategy. With regard to the ECCCRS, the recommended target audiences for awareness are:

i. Provincial legislature and local government councillors;
ii. Provincial and local government departments;
iii. Affected industry and service sectors;
iv. Relevant committees associated with the response programmes recommended in Phase III of the ECCCRS; and
v. The general public.

For the purpose of the study, the focus is on adaptation to climate change section of this document. This document states that climate change impacts will affect all departments,

development plans and municipalities of the Eastern Cape Province. Climate change is a cross-cutting issue that cannot be dealt with by each institution in isolation, therefore, integrated response programmes amongst different sectors, government institutions and departments are needed to combat the effects of this phenomenon.

4.3.6. South African Local Government Response to Climate Change

This document was developed in 2016 by the Local Government Partnership for Climate Change (LG4CC) in partnership with other local government institutions such as South African Local Government Association (SALGA). It emphasises that South Africa is experiencing extreme climate change and local government institutions are at the forefront of adjusting to this phenomenon. This paper states that although many municipalities, especially metropolitan and secondary cities, have advanced well in preparing for and implementation of climate change response, they lack the necessary capacity at both human and financial capital levels. Thus, the LGP4CC supports the United UNFCCC and its subsidiary bodies plan to improve mechanisms for capacity building.

This document further argues that constitutional designation of local government is to channel services and development to communities, and also contribute to reduction of vulnerability of society to threats, including climate change impacts. Moreover, a transversal approach to establish adaptation response is required in order to lessen climate vulnerability and increase the resilience and adaptive capacity of vulnerable communities, particularly in the rural and peri-urban areas. Furthermore, investment is needed at municipal level for the success of climate change adaptation. Skills, resources, funding and developing enabling regulatory framework are a priority for local government. Proficiency in technical and political skills is required during implementation of climate change adaptation responses.

This paper also indicates that The National Climate Change Response Policy states that a climate change tool-kit, called Let's Respond Toolkit, will be developed for provincial and municipalities. This toolkit ensures that local government mitigate and reduce climate change impact during service delivery by integrating climate change response into the IDP and sector planning tool.

LGP4CC argue that adaptation response can be categorised into the following thematic areas:

i. Integrated adaptation response
ii. Biodiversity
iii. Water management
iv. Food security

Lastly, this document describes the action plan for municipalities as follows:

i. Municipalities need to develop or update their climate change response plans, including actionable targets and programmes to support mitigation and adaptation goals, and include these into the Integrated Development Plans (IDPs);
ii. Actively engage in opportunities to share information on the Paris Agreement and its implications for local governments in South Africa;
iii. Climate change practitioners to lead the communication with broader municipal officials on the outcomes of COP21 and associated responsibilities.

4.3.7. 2016 BCMM Advancing Economic Through Development: Metro Growth Development Strategy Vision 2030

All BCMM stakeholders contributed to the development of this document. The purpose of this document is to provide the vision, objectives and strategies of the municipality. However, for the purpose of this study, the focus is only on the climate change and implications section, under environmental sustainability sector theme section of the document. Recognition of the need to address climate change for economic development proves that the BCMM as an institution is not taking the climate change issue lightly.

According to this document, Buffalo City as a Metropolitan Municipality is assigned the function of Disaster Management. The municipality has approved a climate change strategy, including risk assessment, adaptation and mitigation measures to prepare for possible disaster scenarios.

BCMM implements environmental plans, strategies for managing land degradation, biodiversity and climate change including the following:

i. The BCMM Integrated Environmental Management Plan (IEMP) which provides an overarching framework for environmental management.

ii. BCMM Integrated Coastal Zone Management Plan (ICZMP) aimed at identifying and prioritizing existing environmental pressures; provide the recommendations for those pressures, as well as the appropriate framework to manage the BCMM coastline.
iii. BCMM Climate Change Strategy for managing energy and mitigating climate change effects.

Out of the aforementioned environmental plans and strategies, the BCMM Integrated Environmental Management Plan is useful for the objectives of this research, and it is further discussed below.

4.3.8. Integrated Environmental Management Plan (IEMP)

IEMP is a comprehensive policy and implementation framework at a local level. This strategic document was published in 2014 and it details how the municipality will implement national and regional environmental policy and plan directives, whilst prioritizing local environmental protection and management, and also considering municipality's sustainable development objectives. According to Diederichs et al., (2016) BCMM Integrated Environmental Management Plan (IEMP) is a strategic inclusive policy and programme for environmental management.

According to this BCMM plan, the NCCR of 2011 tasked the local governments with incorporating climate change considerations and constraints into municipal development tools including their Integrated Development Plans and service delivery programmes. The policy acknowledges that the roles and responsibility of local governments regarding climate change issues is not always clear.

The NCCR policy recommends the following:

i. Department of Cooperative Governance and Traditional Affairs to lead a critical review of the policy and legislation relating to local government and climate change.
ii. National Treasury to lead a process to re-examine current fiscal measures and the incentives for adaptation and mitigation measures by local government.
iii. A climate change toolkit is prepared for provincial and local government practitioners.

iv. Sharing of best practice across provinces and municipalities to be coordinated by the Department of Environmental Affairs and Department of Cooperative Governance and Traditional Affairs.

v. The South African Local Government Association to ensure the integration of climate adaptation and mitigation actions into local government plans and lobby for the measures and resources to support local government.

Theme	Issues	TOTAL SCORE
Environmental Governance	The BCMM is not compliant with environmental legislation as a result of the limited environmental management enforcement capacity and lack of integration of environmental management principles and strategies across sectors.	18
Solid Waste Management	Some landfill / refuse sites not compliant with license conditions, or unlicensed.	18
Water Resources	Significant unaccounted for water loss in urban areas (non-revenue water is 39.6%).	18
Energy	Increasing cost of electricity drives rising energy poverty and increasing cost to run municipal infrastructure.	18
Environmental Governance	Environmental assets are undervalued, with little incentive for municipal staff to prioritise management.	17
Wastewater Management	Old infrastructure with insufficient capacity, resulting in spills and ongoing pollution of receiving environment, and human health risks. Stormwater ingress into wastewater system compounds the problem.	17
Water Resources	Serious water quality impacts as a result of non-point source pollution, leaking and overflowing sewers and wastewater treatment plants – mainly the Buffalo and Nahoon Rivers – eutrophication and diminishing recreational value of water bodies, increasing treatment costs and human health risks.	17
Coastal Assets	Loss of coastal habitat to development, flood damage and recreational use.	17
Environmental Governance	Capacity of IEM&SU is insufficient to drive integration of environmental management into all sectors, coordinate actions, inform development decisions on a day to day basis, and implement projects.	16
Environmental Governance	Low priority given to environment as a result of limited capacity and leadership in the environmental sector in the municipality, and consequently low priority is given to environmental issues and implementation requirements.	16
Coastal Assets	Inadequate capacity to regulate and police development in the coastal zone.	16
Water Resources	Environmental Water Requirements are not being met.	15
Water Resources	Threats to groundwater quality in coastal villages as a result of sea level rise and coastal flooding (climate change risk)	15
Climate Change	Lack of detailed information about the likely change in climate and risk that will occur in the BCMMA as a result of global climate change, resulting in inappropriate or inadequate responses.	15
Climate Change	National commitments to reducing greenhouse gas emissions trajectory need to be dealt with locally.	15
Water Resources	Few of the rivers and wetlands in the municipal area are in good / functional condition.	14
Coastal Assets	Degradation of the marine environment as a result of urban pollution and marine outfalls.	14
Climate Change	Increasing risk and vulnerability of people, settlements and infrastructure as a result of climate change effects in the BCMM.	14
Socio-economic Status of the Population	High rate of unemployment (35.1%) = high dependency on free basic services and on the natural environment.	14
Socio-economic Status of the Population	High rate of poverty = human health and environmental issues associated with dependency on cheap fuel sources, natural resources.	14

Figure 7: Prioritisation of Environmental Management Issues

The above table presents the BCMM prioritisation list of environmental management issues. It clearly shows that climate change related issues are not at the top of the prioritisation list in this municipality. It also states that inappropriate or inadequate

climate change responses in BCMM are caused by the lack of information or uncertainty about the timing and magnitude of changing climate.

The other interesting fact presented in the above table is that BCMM view, that environmental governance as the issue that must be addressed first. Limited environmental management enforcement capacity and lack of integration of environmental management principles and strategies across sectors are seen as the root causes of non-compliance with environmental legislation in BCMM. This table also explains that the capacity of department responsible for environmental governance in BCMM, that is, Integrated Environmental Management Unit, is insufficient to drive integration of environmental management into all sectors, coordinate actions, inform development decisions on a day to day basis, and implement projects. Furthermore, low priority is given to environment as a result of limited capacity and leadership in the environmental sector in the municipality, and consequently low priority is given to environmental issues and implementation requirements.

This IEMP document also detail the action plan of the municipality in response to environmental issues. Considering the objectives of this study, only the climate change section was reviewed.

Goal	Objectives (Actions)	Indicative Budget	KPI's	Responsible Departments	Implementation Timeframe
4. Climate Change Mitigation & Adaptation	A. Evaluate the risks posed by climate change to the Buffalo City Metropolitan Municipal Area and municipal administration.	R500,000	4.A.1. Climate Change risk assessment completed.	• IEM & SD • Disaster Management	Short Term
	B. Establish and maintain a municipal Greenhouse Gas Inventory.	R500,000	4.B.1. Greenhouse Gas Inventory is prepared. 4.B.2. Greenhouse Gas Inventory is updated every 3 to 5 years.	• IEM & SD • City Health – Pollution Control	Medium Term
	C. Prepare a Climate Change Response Strategy.	N/A – undertaken in 2014, next review due in approx. 2019.	4.C.1. Climate Change Response Strategy is prepared and updated regularly. 4.C.2. Climate Change Response Strategy is presented to Sustainable City Working Group.	• IEM & SD	Ongoing
	D. Implement a Municipal Climate Protection Programme.	To be determined by Climate Change Response Strategy	4.D.1. Municipal Climate Protection Programme is established. 4.D.2. Reporting on progress of implementation of the Climate Change Response Strategy Goals and Objectives is undertaken annually.	• IEM & SD to champion and coordinate – multiple other departments will have a role to play in implementation.	Medium Term

Figure 8: BCMM implementation action plan for climate change mitigation and adaptation

The above table illustrate the BCMM implementation action plan for climate change mitigation and adaptation. The figure clearly states the municipal objectives, initial budgets, key performance indicators, responsible departments and timeframes for the action plan.

The objective of the BCMM Integrated Environmental Management Plan is to:

i. Detail the BCMM's commitment to environmental protection and sustainability.
ii. Present the Environmental Management Policy Framework of the BCMM that needs to be integrated into all municipal sectors to support the municipality's sustainable development aims.
iii. Illustrate an implementation plan for environmental sustainability projects, programmes and partnerships that need to be developed and implemented to achieve the stated environmental sustainability aims and objectives.

In the 2014 State of Environment report that informed the IEMP, climate change risks and impacts was one of the issues that were addressed in IEMP (Diederichs et al., 2016). One of the goals of the IEMP of BCMM is to address climate change through locally suitable climate mitigation and adaptation responses. The municipality states that adaptation involves planning for the elevated levels of risk associated with climate change and ensuring that people, infrastructure and ecosystems are made more resilient to cope with climate stresses and impacts.

According to this document, an evaluation of the risks posed by changing climate to the BCMM and municipal administration is needed. The evaluation is described as follows:

A climate change risk assessment should be undertaken to find the exact issues that the Buffalo City Metropolitan Municipality should be planning for. This should include risk associated with changes in availability and quality of water resources, risks to human life and municipal infrastructure as a result of natural disasters, risk to local economy and risk to the local production of food. The Disaster Management and Integrated Environmental Management units are responsible for this objective. According to this document, thereafter, the preparation of a Climate Change Response Strategy must be prepared. This strategy will address both mitigation and adaptation.

This plan further mentions that after the Climate Change Response Strategy is prepared, the next phase is to implement the Municipal Protection Programme, which is described

as an initiative that coordinates the implementation of the Climate Change Response Strategy. According to this plan, although the Integrated Environmental Management unit will be championing this objective, several departments will play a role in the implementation process.

4.4. Barriers, Challenges, Achievements and Opportunities in Mainstreaming Climate Change into Local Government Development Plans and Strategies

Adaptation to climate change is not an easy task, as it involves several shareholders with different objectives, different government departments and institutions from different spheres with different mandates. Therefore, barriers and challenges are expected in the institutional climate change adaptation process. However, adaptation to climate change does not only bring challenges, it also presents opportunities that government institutions should take advantage of. This section looks into the barriers, challenges and opportunities of climate change adaptation. It also looks into the achievements thus far of institutional adaptation to climate change.

4.4.1. Barriers and Challenges

i. *"Issue of change"*

"Change" is one of the trends that are visible in the collected data. All the stakeholders must consider change to decrease their vulnerability to climate change, for instance, all of them have to consider changing some of their old activities to new ways in order to cope with the changing climate impacts. Government institutions, farmers, businesses and society in general need to revise their climate change related activities and change them accordingly to decrease their vulnerability to this phenomenon.

This is illustrated by the following statements expressed by participants when asked about the barriers and challenges of adapting to climate change.

In an interview, when asked about challenges of climate change adaptation, Dr M. C. Moseki said:

"One of the challenges is the issue of change, people resist change, I think by nature, human beings prefer to do the same thing, the same way and expect to see the difference…

Somebody said we are all mad as a result of that" (personal communication, 17 January, 2018).

In an interview, Ms M. Macucwa responded as follows when asked about the challenges of climate change adaptation:

*"One of the problems will be the issues of change…People being used to doing what they are doing, for example, if I am doing plant production, it means I have to go back and change my guidelines. It is not causing a lot of problems but people are reluctant to change, change is not an easy thing" (*personal communication, 7 February, 2018).

The participant continued and said:

"Even farmers themselves, most of our farming community are old, if you go to an old farmer and tell him not to throw away the straws, while they are used to throwing them away, and give it to animals, put it on the soil to preserve some moisture, that will be difficult, it is a very difficult thing to change the mind-set" (M. Macucwa, personal communication, 7 February, 2018).

Section 4.6.9, Culture and Tradition Related, of Draft Climate Change Adaptation and Mitigation Plan for the South African Agriculture, Forestry and Fisheries Sectors emphasises the need for farmers to change traditional and cultural farming practices, and also the need for change in land ownership and distribution policies. This section encourages farmers to let go of their cultural and traditional farming methods and adopt sustainable methods in order to withstand climate change impacts, for example, the farmers are advised to relook into the tradition of maintaining large numbers of livestock as that put pressure on environment and can result in overgrazing and an increase soil erosion. Land ownership and distribution policies also need to change as small fields are generally unprofitable and forces famers to overload them in order to make profit and risk being over exposed to climate change related issues, such as land degradation.

According to BCMM Strategy Vision 2030, one of the vital issues is the change from managing disasters to managing the risks of disasters, which will encompass both response and risk reduction. One of DAFF short term measure against climate change is to reduce losses of extreme events by benefiting from preparation for both extreme events and changes in the current average resource availabilities to improve the

predicted impacts of climate change such as higher incidences of drought, hail, fire, and diseases (DAFF, 2015).

ii. *"Lack of capacity"*

Capacity or lack thereof, is another trend that has stood out in the empirical evidence of this study. The government institutions lack capacity to adequately adapt to climate change. The data indicates that there are several types of capacity that are in shortage for effective adaptation, for example, financial, skills and human capacity.

When asked about the challenges of institutional climate change adaptation, Dr M. C. Moseki said:

"*The other challenge is the capacity, when I'm talking capacity I am talking about the resources; it can be the financial resources, skills, humans who have the capacity to implement"* (personal communication, 17 January, 2018).

An official at local government also mentioned lack of capacity as one of the issues, the participant said:

"The institution tries all its best to follow the national policy although financial constraints hinder process pertaining to the application of some processes within policy" (N. Hanise, personal communication, 1 February, 2018).

According to BCMM Strategy Vision 2030, one of the identified vital issues is the inadequate funding for proactive risk reduction planning and activities. According to DAFF (2015), one of proposed long term measures of climate change is to secure long term funding for the sector as a whole, and more specifically for mitigation and adaptation research. Moreover DAFF (2015) states that finding means to finance and to use current and new technology and practices, especially targeted towards small scale farmers, will become important instruments of adaptation.

Government institutions find a way to operate although there is a lack of capacity, Dr M. C. Moseki explained as follows:

"In the province there are no dedicated individuals to start with to deal with climate change, so what we did in order to consider the lack of capacity, we work with the head of the

department, the head will make a plan, a plan being to assign someone even if its someone who is doing something else, to say you among other things you will coordinate climate change issues, that is how we dealt with it, because they did not appoint any climate change people, in certain provinces they do, like the Western Cape, you will find someone who is an expert in climate change, because they are a Metro or maybe they are more aware or they feel the pinch (effects) of climate change, but if you go to other provinces which are little bit under resourced or poorly resourced, you do not have anybody who specialises in climate change, and that is where you use the head to assign someone who is not qualified to deal with climate change or to coordinate" (personal communication, 17 January, 2018).

The lack of capacity is alleged to be a serious problem in climate change adaptation, Mr M. Mbikwana said:
"In some cases students in high school have better knowledge or more passion about this subject than people working in an institution that are supposed to spear-head climate change" (personal communication, 30 January, 2018).

iii. *"Insufficient and inadequate data"*

Insufficient and inadequate data was mentioned as one of the issues limiting climate change adaptation at government institutions, one of the participants said:

"Insufficient or lack of adequate information is another problem for climate change adaptation in our government institutions, you wouldn't know that you have a problem in the first place, if you do not have monitoring data (a tool to monitor), you will not know that you water is depleting" (M. C. Moseki, personal communication, 17 January, 2018)..

Diederichs et al., (2016) claims that lack of thorough information about the possible change in climate and risk that will occur in the BCMM as a result of climate change, result in inappropriate or inadequate responses. Draft Climate Change Adaptation and Mitigation Plan (CCAMP) for the South African Agriculture, Forestry and Fisheries Sectors document states that early warning systems, for example, seasonal and shorter-term forecasts of climate and extreme events, can be very useful in minimising impact of climate change related events and also in taking advantage of opportunities presented by this phenomenon.

This document also states that climate information on a day to day basis is vital for farm operational procedures such as irrigation scheduling, timing of fertiliser applications, in-field traffic control, cultivar and variety selection, timing of planting, and response farming. A major concern is timely early warnings of adverse weather and the possibility of related pest and disease occurrence. Timely information is of particular importance to the most vulnerable in remote areas, often without access to electronic media used to issue early warnings. Both the South African Weather Service (SAWS) and the Agricultural Research Council (ARC), which maintains the agricultural weather stations network, are providing such warnings by means of cell phones.

Many farmers in remote areas and marginal land are prone to reduced yields and the impacts of climate change such as crop failure due the increased frequency of drought, floods, and flash floods, as well as diminishing soil productivity and land degradation, will add an additional layer of stress. Climate forecast should be more accurate for the farmers to be able to trust it and prepare for climate change adequately. Adaptation plans have to include more knowledge of, and trust in, climate forecasts by farmers in order to counter climate variability. This document suggest that the fact that few benefits are currently derived from forecasts by poorer farmers may be attributed to them not having enough resources to act on the forecasts, and this will need to be rectified. Science will need to improve the skill and lead times of forecasts.

iv. *"Denial still exist"*

The empirical evidence further indicates that sceptics are also a challenge in adequate climate change adaptation. Those who deny or doubt the existence of climate change phenomenon are unlikely to adapt to climate change or wholly partake in the implementation of climate change adaptation policies, strategies or plans.

Denial of the existence of climate change phenomenon was identified as another issue in adapting to climate change during data collection, Dr M. C. Moseki shared:

"The other challenge is denialists, people who deny that there is a thing called climate change, there are a lot of sceptics out there despite all the evidence, they do not believe and they resist anything that has to do with climate change, 'don't tell me about climate change…' but then they do not realise that you cannot produce food without water" (personal communication, 17 January, 2018).

Denial of the reality of climate change is wide spread in South Africa, Mr M. Mbikwana alleged that outside the government institutions, the subject of climate change is still relatively unknown, especially in rural EC province, some people know about the phenomena but are in denial (personal communication, 30 January, 2018).

In an interview, Dr M. C. Moseki believes that:
"…the 2015 drought was a blessing in disguise, because drought as much as it was terrible, it was a wakeup call for many to see that climate change really exist, sometimes we need to be in crisis in order for us to listen" (personal communication, 17 January, 2018).

v. *"The uncertainty about climate change"*

The uncertainty about climate change has been identified as one of the challenges for effective climate change adaptation in this study. The empirical evidence points out that lack of certainty about the exact time, region and degree of change in temperature, seasons, frequency of natural disasters and so on is an issue in the process of adapting to climate change. Such information is critical for all stakeholders in order to adjust accordingly to the varying climate and its impacts.

The paragraph below is an extract from Section 4.6 of the Draft Climate Change Adaptation and Mitigation Plan for the South African Agriculture, Forestry and Fisheries Sectors, it highlights the issue of uncertainty in climate change adaptation and how it can be resolved:

"Science will need to continually improve answers on the when, where, how much, what impact, and how to adapt of climate change, including reducing uncertainties on, inter alia, enhanced rainfall variability and its impacts on crop production; multiple year droughts and long cycle crops when farming with crops with plant cycles of 10 -30 years (e.g. commercial timber species or deciduous fruit trees) in which case successive droughts years are critical to the survival of the trees; persistence of rain days in regard to changes in wet/wet, wet/ dry, dry/ dry or dry/wet sequences or fewer long duration, multiple day gentle rains in winter rainfall region being observed; number of rain days and future changes thereof in the growing season; and/or the onset and duration of the

rainy season and whether it is projected to set in earlier or later" (DAFF, 2015: 38). This policy further states that science must address how changes in rainfall and temperature will impact animal health with changes in the distribution, competence and abundance of vectors and ectoparasites.

vi. "*Investment returns*"

One of the standout points of this empirical evidence is the battle between financial gains and climate change adaptation. The collected data indicates that adapting to climate change is a costly process, especially for some of the stakeholders, such as, farmers.

A participant expressed that investment return is another issue in climate change adaptation and gave an example.

The other issue raised by Ms M Macucwa during an interview is the benefits, or lack thereof, of climate change adaptation, she expressed the following:

"The investment made is another issue, if the commercial farmers bought a lot of equipment, now you telling them not to use it, they still owe the bank, and that raises a question, are some of the climate change adaptation approaches financially feasible? They are used to 12 tons per hector of maize, now with conservation of agriculture they will probably get 8 tons but the returns are good for the environment, some people want the 'good' in their pockets not the environment" (personal communication, 7 February, 2018).

However, one of the analysed documents indicates that although the aforementioned climate change adaptation challenge is still and issue, DAFF is aware of it. According to Draft Climate Change Adaptation and Mitigation Plan (CCAMP) for the South African Agriculture, Forestry and Fisheries Sectors, subsidies and changing markets is one of the issues that need to be addresses. For example, agricultural subsidies in developed countries imply that it is often cheaper to import than to produce locally. The potential repercussions of changing climate might prompt government to re-look forms of subsidisation of key agricultural commodities as an adaptation measure. Where the market is changing (e.g. from dairy to sugarcane) the impacts of projected climate change need to be considered for the individual farmer and national interests.

4.4.2. Achievements

vii. *"Climate change awareness"*

Although institutional adaptation to climate change is not an easy task, there is progress. The empirical evidence shows that government institutions are reaching some of their objectives of adapting to climate change, for example, climate change awareness.

When asked about the achievements of climate change adaptation thus far, a participant answered:

"The most notable achievement is awareness, people are now aware that climate change is also a stress factor to reckon with, it is a serious threat, I think it is a good thing, because once you are aware you can start to do something about it" (M. C. Moseki, personal communication, 17 January, 2018).

According to DAFF climate change policy (2015) document for easier adaptation, subsistence farmers must be aware of policies regarding, for example, veld burning, overgrazing, or contour ploughing, as they do not always prioritise them because they tend to choose short term benefits over long-term sustainability. This document further articulates that one of the short term goals merging into long term goals of DAFF climate change policy is to integrate climate change into forestry curricula at both school and post-school levels. According to this policy, it is crucial to be aware and knowledgeable about how climate change impacts affect this sector's activities in order to lessen the vulnerability of agricultural sector to climate change. According to this document, a high percentage of those within the farming industry are either not aware of climate change and its impacts, or regard climate change as normal climate inconsistency. Hence a clear communication strategy is needed in regard to addressing climate change related issues.

This document also encourages scientist to come up with a system that will create awareness about future climate change impacts and also inform government and businesses in agricultural industry about the latest available science for climate change adaptation. This policy encourages communication between government and farming sectors in order to distribute as much relevant knowledge on climate change as possible for adequate implementation of adaptation strategies. Farmers, commercial or small scale, should share information within themselves about best ways to cope with the

climate change impacts. However, sufficient human and financial capacity is needed to create adequate climate change awareness.

Appendix 2 of Draft Communications Programme for Rollout of ECCCRS emphasises the importance of climate change communication and awareness as one of the most essential elements of climate change adaptation. This section classifies communications of climate change issues into two categories: firstly, communication aimed at promoting climate change awareness amongst broader society (for example, communities, business and government) secondly, communication aimed at ensuring effective implementation of climate change adaptation projects and programmes involving different stakeholders. ECCCRS sets out a number of desired and required outcomes and programmes in order to ensure effective climate change response in the Province.

The ECCCRS is unlikely to succeed if there is lack of effective communication and engagement with all relevant stakeholders. The communications challenge is broad in that stakeholders range from the general public, to provincial and local government officials, to politicians, to the private sector and to participants in adaptation and mitigation action plans. Thus, suitably resourced communications development and rollout process is crucial. The ECCCRS sets out certain recommendations and messages to be incorporated into a communications programme that incorporates individually tailored approaches to different classes of stakeholders. These recommendations must be developed further into a detailed plan, together with suitable communications materials. Hence, a full rollout programme needs to be resourced and executed.

4.4.3. Opportunities

viii. *"Climate change presents new opportunities"*

Although climate change is accompanied by issues, it also presents opportunities for government institutions. The empirical evidence illustrates how BCMM is strategically positioning itself to take full advantage of these opportunities.

In contrast, the impacts of climate change may present certain opportunities. These opportunities should also be systematically identified so that they may be taken advantage of (DEDEA, 2011). According to BCMM Strategy Vision 2030, although the varying conditions may be improper for certain crops and livestock, the increased rainfall

and temperatures may be favourable for plant growth and agricultural production; moreover, the resilient crop production systems and technologies present opportunities. Furthermore, climate change has created opportunities to generate jobs from green economy projects (Diederichs et al., 2016).

ix. *"Climate change as a unit within government institutions"*

The findings of the study indicate that institutions should treat climate change as a stand-alone subject, in a same way they treat electricity, poverty, etc. Dedicated officials exclusively for climate change issues are needed in government institutions to achieve effective institutional climate change adaptation.

When asked about the ways to improve the institutional climate change adaptation, one of the participants of this study said:

"Climate change is a subject on its own, it is a unit on its own… So the next thing that will be required by us is that the head office creates units within the institutions, strictly dealing with climate change but also that will have budget issues" (M. Mbikwana, personal communication, 30 January, 2018).

When asked why climate change units within government institutions can be useful, the participant responded as follows:
"most of us are committed to doing other work (besides climate change) and climate change is a subject on its own… moreover, the other complex issue is the subject itself, it is highly cross-cutting that it needs serious attention and serious special unit to look at it, even the sister departments that we working with, need to synchronize it at that level" (M. Mbikwana, personal communication, 30 January, 2018).

4.5. Implications of the Findings of this Study in a Wider Context, Particularly in Sub-Southern Africa

Although the changing climate is considered as one of the main threats to the sustainable development by the South Africa government, the findings of this study indicate that the climate change policy of Buffalo City Metropolitan Municipality is not adequately integrated to development plans and strategies of this institution. This government

institutions is situated in one of the most vulnerable regions to climate change, Sub-Southern Africa, therefore, BCMM should treat climate change adaptation as one of its top priorities; however, that is not the case. It is unlikely that these findings are isolated in BCMM in the Sub-Southern Africa, it is most likely that these findings apply to most government institutions within this region.

4.6. Conclusion

There are several themes that emerged from the findings of this research project. The perceptions of the participants have differences and similarities, as they seem to agree with some aspects of government policy framework and disagree with others. The findings show how difficult it is to ensure that government institutions and departments with different mandates are aligned in climate change adaptation process. Since climate change is a cross cutting issue across different government institutions and departments, this creates confusion in roles played by different stakeholders in adapting to this phenomenon. Lack of dedicated unit within most government institutions and department seems to be one root cause of inadequate institutional adaptation to climate change. The findings also point out that lack of awareness of climate change is another reason for effective adaptation to climate change. The following chapter will unpack, analyse and discuss the afore-presented findings in reference to literature studied in Chapter 2.

CHAPTER FIVE

DISCUSSIONS AND ANALYSIS

5.1. Introduction

The main aim of this study was to explore the institutional and policy framework that enable climate change adaptation in South Africa, and investigate the extent to which climate change adaptation, with focus on agriculture and water resources, have been integrated within the local development plans and strategies. The reason for exploring institutional linkages were based on the claim that climate change adaptation is a local activity, therefore, local government institutions have a great influence in climate change adaptation.

In this chapter, findings of the research are discussed in detail. This will comprise of the empirical evidence presented in chapter 4 and literature that was reviewed in chapter 2. The triangulation data analysis method is used on data collected from interviews and grey literature. The discussions and analysis in this chapter follows the same structure as Chapter 4. It begins by discussing the manifestation of climate change in BCMM, followed by a discussion of relevant existing policy framework for climate change adaptation in South Africa. The next section is a discussion of the barriers, challenges, achievements and opportunities of adaptation to climate change in South Africa, and concludes with the discussions of the implications of the findings in the broader context, particularly in Sub-Southern Africa.

5.2. Analysis of the Manifestation of Changes in Climate Condition in BCMM

One of the objectives of this study was to investigate how the climate change manifests itself in BCMM, with specific focus on agriculture and water resources. According to the empirical evidence, climate change manifests itself in several ways in this region, for example, increase in severe natural disasters, such as, floods and drought; sea surges and loss in biodiversity. Such climate change impacts are not unique to this area; the reviewed literature mentioned the aforementioned effects of climate change as some of the ways in which this phenomenon unveils itself in many regions, globally. For example, it was mentioned in *chapter 2,* rapid increase in natural and disturbance in ecosystems is one of the effects of climate change (Tomkins and Adger, 2004). There is a correlation between

empirical evidence and literature review about climate change impacts in BCMM and worldwide. According to the evidence, BCMM is undoubtedly experiencing climate change.

The research findings revealed the potential devastating consequences of climate change in this region. The Eastern Cape Climate Change Response Strategy identified water scarcity and agricultural production as areas of concerned in light of climate change in the region. *3.4.1.: Description of the study site* pointed out that Eastern Cape Province is one of the areas of South Africa that will experience high levels of drying runoffs due to climate change, moreover this section revealed that poverty and unemployment rates of BCMM are shockingly high, and any negative impact on agricultural production will likely increase these rates. Furthermore, in *4.2.1, Evidence of climate change in the Eastern Cape Province* showed that Eastern Cape is prone to drought, and the area was declared to be experiencing draughts twice in eight years. In *4.2.2, Evidence of climate change in the Buffalo City Metropolitan Municipality* revealed that drought has devastating impact on the BCMM water security. Therefore, BCMM must address climate change adaptation adequately in order to decrease the vulnerability of this region to draught.

It was mentioned in the literature review that impacts of climate change are accompanied by the knock on effects. The knock on effects of climate change in the empirical evidence is the same as the ones in reviewed literature. Negative impacts on water availability, agricultural sector, economy and livelihoods are some of the domino effects of climate change impacts experienced in BCMM. Evidence of climate change in BCMM is strong, and according to the literature, such regions need sufficient and adequate adaptive measures for protection of citizens and environment against the impacts and knock on effects of this phenomenon.

5.3. Analysis of Existing Institutional and Policy Framework

This part of the chapter addresses the other objective of this study, which was to examine the existing BCMM institutional and policy framework for climate change adaptation with specific focus on agriculture and water resources. The structure of South African institutional and policy framework plays a vital role on municipal setup.

The institutional framework for climate change management in South African is structured through various government departments and institutions. The South African

government is the primary mandate holder and regulator of all climate change adaptation this study is focused on. The setup of the government arms is such that there are different levels of institutional and policy framework for climate change adaptation. This is demonstrated in *Section 4.3, 'Existing institutional and policy framework for climate change adaptation in South Africa'* there are different administrative levels in the institutional adaptation to climate change. The mandate for the institutions to contribute to the objectives of the climate change adaptation is stipulated in the policies of the country.

A review of existing policy and legislation that informs climate change adaptation revealed that institutional and policy framework for managing climate change exist in South Africa. The policies, strategies and plans that were investigated for the purpose of this study, revealed that their development and implementation were influenced by the sustainability principles. Moreover, it has been discovered that, to some extent, many stakeholders are consulted during the process of development of these climate change policy. For example, the Department of Environmental Affairs consulted all relevant government departments and institutions at all levels when it was developing the NCCR of 2011. The aim of the consultation process is to ensure that all relevant government departments and institutions are involved and active in the pursued of the policy mandate.

The investigation also revealed that climate change adaptation policy, strategies and plans are developed in such a way that they do not contravene any law, Acts or other policies of the Republic of South Africa. For example, the principles of NCCR White Paper of 2011 are derived from or are aligned with the Constitution, Bill of Rights, National Management Act, the Millennium Declaration and UNFCCC. It was also discovered that the departmental and institutional climate change adaptation policy, strategy and plan are derived from the NCCR. Therefore (by default) they are also aligned to the legislation of the country. However, the study uncovered that the Eastern Cape Climate Change Response Strategy and NCCR White Paper were developed simultaneously by relevant institutions and were both published in 2011. Therefore, the NCCR White Paper was not considered during the development of ECCCRS, instead the NCCR Green Paper of 2010 was referred to.

Although the NCCR White Paper of 2011 is the umbrella policy of national climate change management, it is implemented in institutions that have their own mandates. Therefore, its implementation needs not to override the mandates of these institutions. Thus, there is a strong push for integration of the climate change adaptation to institutional policy framework to avoid any conflict between climate change adaptation and the mandate of these institutions.

The research findings regarding the institutional setup of South African climate change adaptation shows that it is not much different from other developing countries such as Philippines and Zambia. It can then be argued that due to certain level of adherence to international norms, the institutional arrangement of South Africa need not receive much analysis and dissecting.

The interesting part to note about the institutional and policy framework in South African climate change adaptation is the manner in which the different institutions interact with one another. The NCCR White Paper of 2011 revealed that the government of South Africa believes that adequate adaptation to climate change requires coordinated, coherent, efficient and effective national policy. The research discovered that DAFF believes this can be taken a step further, by ensuring that all levels of government, academia, research, business industry and community at large are actively involved and committed to climate change adaptation. For the limitations of this study, the research findings revealed that as a cross-cutting issue, climate change requires coordination between government authorities for successful institutional adaptation.

There is presence of collaboration between institutions during the development of policies, nonetheless, it was weak. Sections *4.3.2, 4.3.3, 4.3.4 and 4.3.5,* highlighted the interaction between various institutional policies during development and implementation stages. However, the research discovered that the climate change adaptation policies are fragmented. Although different ministries derived their sector specific climate change adaptation policies from one umbrella policy, the NCCR of 2011, these policies are designed not to override the mandates of these institutions. For example, the municipality design climate change policy in such a way that it does not override the mandate of service delivery. Thus, the Department of Agriculture, Forestry and Fisheries stated that most South African climate change policies and strategies are fragmented, sector-specific and too widely framed (DAFF, 2015). The fragmented

adaptation policy is not a unique adaptation issue to South Africa in the Southern African region, Simatele (2010) discovered similar findings in the research about climate change adaptation policies in Zambia, although the root causes were different.

To some extent, relevant policies are considered when an institution develops its own climate change adaptation policy. For example, it was discovered that one of the objectives of the Water and Sanitation Sector Policy Position on Climate Change is to highlight and strengthen the ties between NCCR White Paper and Department of Water and Sanitation. In essence, the Department of Water and Sanitation considered the NCCR White paper of 2011 when it was developing its adaptation policy. It was also revealed that the relevant NWRS principles were considered during the development and implementation of the DWS climate change policy. For example, the Water and Sanitation Sector Policy Position on Climate Change principles that was adopted from NWRS is the protection and enhancing of critical natural infrastructure, ecosystems.

Upon further investigation it was uncovered that climate change adaptation is closely linked to sustainable development in South Africa. The post-apartheid government of South Africa is committed to accelerate the development to correct the unpleasant economic conditions that it inherited from the previous regime, and it acknowledges that climate change is a serious threat to sustainable development. For example, the Department of Environmental Affairs states that climate change impacts due to lack of effective adaptation responses will slow down and eventually reverse development made in South Africa (DEA, 2011). Section *2.4: 'Institutional Adaptation in South Africa*' highlighted the point that South Africa is adapting to climate change in a way that the post-apartheid developments are not hindered or slowed down.

This adaptation approach echoed in the reviewed documents, for example, the NCCR insist that the adaptation to climate change must be mainstreamed by relevant government institutions so that it can be integrated into the broader national economic, social and environmental development plans. The other example is that one of the principles adopted by DWS in its climate change policy is from NWRS, which is the integration of potential climate change impacts into water resources and water services planning and supply at all levels. This is a good example of how South Africa is planning to accommodate climate change adaptation into the national development plans. This consideration of climate change in development plans is at all levels of government in

South Africa. The study revealed that climate change adaptation is also considered in the development plans of local institutions. For example, it was discovered that the Metro Growth Development Strategy Vision 2030 of BCMM considers climate change adaptation as one of the subjects that must be addressed as it is critical for the success of development in this region.

The research findings showed the complex process of institutional adaptation to climate change at a local level, as several policies, mandates and objectives from different government levels need to be considered to avoid contravening and contradiction. Climate change adaptation at local level falls under the IEMP, which is the policy and implementation framework for local level environmental plans. The IEMP states that local government institutions must implement national and regional environment policy and plan directives, prioritize local environment protection and management and consider municipality's sustainable development objectives.

Several policies from upper levels of government, local institution commitments and mandates must be considered when implementing IEMP. For example, the Draft Climate Change Adaptation and Mitigation Plan for the South African Agriculture, Forestry and Fisheries Sectors document mention that the municipalities are required to have an action plan to combat climate change, and also needs to have vulnerability assessment, mitigation and adaptation strategies. Therefore, all municipalities need to adhere to the abovementioned compliance. The 2014 IEMP of BCMM reveals that this institution planned to conduct vulnerability assessment, prepare and implement Climate Change Response Strategy and through the Municipal Protection Programme. The 2016 BCMM Metro Growth Development Strategy Vision 2030 states that the aforementioned IEMP plans were approved. Therefore, the BCMM adhered to the suggestion of climate change adaptation policy of the Department of Agriculture, Forestry and Fisheries.

5.4. Analysis of Barriers, Challenges, Achievements and Opportunities in Mainstreaming Climate Change into Local Government Development Plans and Strategies

One of the objectives of this research was to investigate the extent of integration of the Department of Water Affairs (DWA) and Department of Agriculture, Fisheries and Forestry (DAFF) climate change policies and plans into the climate change adaptation plans of BCMM. Thus, during data collection process, different questions were asked to

research participants regarding the barriers, challenges, achievements and opportunities in mainstreaming climate change into local government development plans and strategies. This section analyses the literature review stand point and fieldwork findings about the above mentioned objective.

Section 4.3.5 and 4.3.6, indicated that the NCCR of 2011 tasked local governments with incorporating climate change considerations and constraints into municipal development tools including their Integrated Development Plans and service delivery programmes. However, there are several barriers that prevent this process from being a smooth task.

The first obstacle identified from the findings of the aforementioned research objective is the structure of the South African institutional framework. The structure of the Republic of South Africa institutional framework is designed in such a way that the DAFF and DWS operations are almost ran parallel to the municipal sector. Although there is overlap between these departments and municipalities, it is minimal. For example the National Water Act (36 of 1998) which is a pillar of the DWS, does not impose legal obligations upon municipalities, however, the municipalities have to safeguard the water within its boundaries against wastage and pollution, and also put remedy measures in place in situations where pollution has occurred.

The study discovered that DAFF and DWS implement their climate change related policies through their provincial institutions, and not in municipalities, although there are few areas of policy compliance from these government departments that municipalities have to adhere to. For example, DAFF climate change policy urge municipalities to develop climate change action plan, and also, municipalities need to have vulnerability assessment, mitigation and adaptation strategies. However, the policy lacks indications of how this department is planning to collaborate with municipalities in climate change adaptation. Therefore, weak collaboration between government institutions is a serious issue when adapting to varying climatic conditions in South Africa.

The research findings further exposed the challenge of unclear roles and responsibilities of institutions in climate change adaptation. *Section 2.4: 'Institutional Adaptation in South Africa*' revealed that the roles and responsibilities of government authorities are not

clearly defined. Also *section 4.3.5*, uncovered that NCCR of 2011 acknowledges that the roles and responsibilities of municipalities in climate change adaptation are not clear. Unclear roles and responsibilities result in inadequate adaptation to climate change, as institutions are not certain about the roles they need to play and their tasks in pursued of the national objective of adjusting to the altering climatic conditions. It is highly unlikely that the national objective of adequate coordination between government bodies can be achieved if the roles and responsibilities are not clearly defined. This issue may be one of the causes of the fragmented climate change adaptation policies in South Africa.

This study also revealed the difference in standpoint about climate change amongst South African government institutions. Figure 3 in *Section 2.4* highlighted that different government authorities have different perceptions about the urgency of combating climate change. It must be noted that success in climate change adaptation requires these institutions with different perspective about climate change to adapt in a coordinated manner. Decision makers or stakeholders are at different wavelengths about the importance climate change and are likely to be at odds about the adaptation process. Perception on climate change plays a big part during climate change adaptation decisions by stakeholders (Koch et al., 2007; Simatele, 2010; Roberts, 2010). According to Adger et al., (2009) difference in climate change knowledge of different decision makers can be a major hurdle for adaptation.

Success in coordination is highly unlikely if government institutions are not aligned about how urgently the climate change issue needs attention. The difference in perspective may be the source of weak linkage between institutions during climate change adaptation. The root cause of differing perceptions amongst the institutions may be revealed in *Section 4.4.1: Barriers and Challenges,* the findings highlight that there are those, within government institutions, that are in denial or sceptical about the existence or seriousness of climate change. There are those who still deny climate change, or at least certain parts of it (Häkkinen and Akrami, 2014). According to McCright and Dunlap, (2011) climate change denial has increased over the time period between 2001 and 2010.

Generally, climate change is not well understood, especially its effects and timing due to its complexities. As a result of that, climate change is not accepted equally in all spheres of society, and that results in difficulties in climate change adaptation (DAFF, 2015). According to Massey et al., (2015), uncertainties over the magnitude, type, timing, and

location of climate impacts increase the complications of making choices in this field. Section *4.3.5* revealed that uncertainty or lack of information about the timing, magnitude and type of changes resulted in inadequate responses in BCMM. Therefore, the municipality cannot plan appropriately for climate change adaption due to unavailable details. The uncertainty of climate change gives room to denial of this global phenomenon. This factor is one of the reasons for poor prioritization of climate change adaptation in government institutions.

Furthermore, the research findings show that in developing countries, adjusting to changing climatic conditions is usually poorly prioritized by local government due to many more pressing demands by citizens. Although local institutions in South Africa have an essential role to play in climate change adaptation (Pasquini et al., 2015), service delivery is prioritized way above adaptation to climate change (Pasquini et al., 2013). This is due to the urgent need to address the socioeconomic imbalance inherited by the post-apartheid government (Carmin et al., 2012). According to the study conducted by Pasquini and other authors in 2013, out of 8 municipalities in the Western Cape Province that participated in the research, only 2 municipalities included climate change in their strategic plans, but all 8 municipalities are some of the best performing municipalities in South Africa. Therefore, combating climate change is not emphasized in the performance of local government institutions in South Africa. Dannevig et al., (2012) stated that in most cases adaptation measures are not implemented in legislation, therefore, they are not compulsory and there is no legal obligation. In essence, there are no serious repercussions for local government institutions if they do not integrate climate change adaptation into their policy framework.

One of the discoveries of this study is highlighted in *section 4.4.1,* this part pointed out that resistance to change is another issue in institutional adaptation to climate change, people are creatures of habit, and climate change adaptation requires change in the usual approach to processes. Therefore, change resistance is one of the root causes of challenges in institutional adaptation to climate change. The research revealed a regrettable finding, which is, the recent frequent climate change related disasters in South Africa may be good for uprooting denial, sceptics and resistance to change in climate change adaptation. These recent climate change impacts may be the proof that is

needed to convince the sceptics and lead to better prioritization of climate change adaptation in government institutions.

The research outcomes of this study exposed the lack of capacity as one of the issues in climate change adaptation at most government institutions in South Africa, similar to most developing countries. The South African national government institutions develop of climate change related policies; however, the implementation is done by local institutions. Although lower structures of government are consulted during development of climate change related policy, there is little done to ensure that these institutions have sufficient capacity to implement the policy. Most participants alluded that it is difficult to ensure that all institutions that are responsible for implementation are well equipped for the task, as they have different capacities. However, the capacity of the institutions responsible for implementation should be adequately considered in the development and implementation process of climate change policy for the success of adaptation to varying climatic conditions.

Section *4.3.5* revealed that climate change adaptation is poorly prioritised in BCMM due to lack of capacity within the municipality to tackle this issue on a day to day basis. Although the municipality is aware of the dangers posed by this phenomenon, it cannot adequately adapt to it, partly due to lack of capacity. Inadequate environmental governance in BCMM due to lack of capacity is identified as a root cause for the non-compliance of BCMM with environmental legislation. Therefore, lack of capacity to address environmental related issues, such as climate change and environmental governance, is a major concerned in BCMM.

Currently in South Africa, adequate policies are in place, however, addressing climate change is usually an add-on responsibility assigned to an individual or department that has its own mandate within the institution. For example, climate change related issues fall under the Integrated Environmental Management and Sustainable Development Departments in BCMM. *Section 4.3.6* uncovered that good policies, plans and strategies in South African government institutions are not enough for successful adaptation to climate change. Human and financial capacity is needed to address climate change, thus there are difficulties during the implementation phase. This finding corresponds with what was revealed in the literature review, that there is usually a lack of capacity to adapt to climate change at local government institutions. South African government must

ensure that its institutions have sufficient capacity to implement climate change adaptation policy, as the failure to do so may have a negative impact on one of the main national objectives, sustainable development.

Insufficiency in capacity is highlighted by the fact that there are no units within government institutions exclusively devoted to addressing climate change, although the South African government recognised climate change as a serious threat to one of its most important objectives, which is sustainable development. The findings revealed the strong perception from those involved in development and implementation of climate change adaptation policies that formation of units, within institutions, dedicated to climate change will improve the institutional capacity to adapt to climate change. However, additional financial means will need to be allocated to addressing climate change, and that is unlikely as this task is currently lowly prioritised compared to more pressing matters such as service delivery at local government institutions.

The study findings uncovered a couple of climate change adaptation achievements. The most notable achievement of institutional climate change adaptation is the establishment of formal bodies for the governance of climate change. GCCC and NCCC are the formal bodies that are responsible for the governance of climate change in South Africa. One of the responsibilities of these government bodies is to review the NCCR. Since climate change impacts and responses are across-cutting issues, the NCCR is reviewed every five years after the published date by the Intergovernmental Committee on Climate Change (IGCCC). Since sectoral climate change policies are derived or influenced by the NCCR, the sectors are also required to review their policies every five years after the published date. This committee also identifies the need for coordination between government departments or institutions in adaptation to climate change. For example, it was discovered that the committee identified the need for the NWRS and Strategic Plan of South African Agriculture (SPSAA) to be integrated in the sectoral plans. Therefore, the constant reviewing of policies improves institutional adaptation to climate change.

One of the achievements that was noted was the development of the toolkit, Let's Respond Toolkit, that assist local government to mitigate and reduce climate change impact during service delivery by integrating climate change response into the IDP and sector planning tool.

Another achievement that is picked up from the research findings is the increasing awareness about climate change. The participants believe that the recent but frequent climate change related disasters was the best awareness campaign of the seriousness of climate change in South Africa. The increase in number of people that are aware of this phenomenon decreases the resistance of those who are in denial or sceptical about climate change and, that results in smoother adaptation processes.

Since the aim of the study was to investigate the extent to which climate change adaptation, with the focus on agriculture and water resources, have been integrated within the local development plans and strategies of BCMM. The outcome of this study revealed that climate change adaptation has been integrated to some extent. However, there are several obstacles preventing adequate integration within local development plans and strategies of BCMM. The study identified several reasons for inadequate integration of climate change adaptation, with the specific focus on agriculture and water resources, within development plans and strategies at BCMM. For example, the South African institutional and policy framework structure, fragmented institutional policies, lack of capacity are factors that influence climate change policy development and implementation. The national institutional and policy structure and fragmented institutional policies make it difficult to integrate climate change adaptation into local development plans. Moreover, influential and intertwined factors, such as perception and capacity, are important in development and implementation of adaptation to climate change policy, plans and strategies, especially at local level institutions. For instance, the uncertainty about the timing and magnitude of climate change influences the perception, in return the perception influences the prioritisation and the urgency rate of addressing the matter, and those factors affect the institutional allocation of resources to address climate change. Furthermore, the allocation of resources has a direct impact on the institutional capacity to adapt to changing climatic conditions.

5.5. Analysis of the Findings of this Study in a Wider Context, Particularly in Sub-Southern Africa

According to the findings of this study, the integration of climate change into the local development plans and strategies of BCMM is not adequate. This study also revealed that

BCMM is not an exception, as most South African government institutions are struggling to adequately integrate climate change into their developmental policy framework.

Since section 2.3, *Institutional Adaptation in Sub-Sahara Africa*, revealed that Sub-Southern Africa has been vulnerable to climate change impacts for a while. In a wider context, it is likely that most of the government institutions in the Sub-Southern African region are faced with the same climate change adaptation issues that their South African counterparts are struggling with.

The findings of this study reveal that the local institutions of South Africa, such as BCMM, do not have sufficient capacity to integrate the climate change adaptation into the local development plans and strategies. The collected data of this study strongly suggests the need for units or personnel, exclusively for climate change, within the South African government institutions. If South Africa, as one of the leading responders to climate change in Africa is in need of such units, clearly, that is the case for most, if not the rest of Sub-Southern African countries. The findings of this study recommends that South Africa should treat climate change as one of the main issues, instead of secondary, thus the strong call for exclusive climate change units within these institutions. In a wider context, the concept treating climate change as one of the main issues should be spread across the rest of Sub-Southern Africa.

The following chapter concludes the research findings of this study. The next chapter makes recommendations for adequate adaptation and points out areas still requiring further research.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1. Introduction

This chapter presents a summary of the main findings of this research. It begins by highlighting some of the main themes that emerged during the research process. It then concludes by putting forth recommendations for improved institutional climate change adaptation in South Africa, and then points out further research opportunities.

6.2. Summary of the Research Findings

Adapting to climate change is viewed as a necessity for sustainable development of poor areas in developing countries, especially in Africa. Literature however, documented limited success of local government institutions that are adequately adapting to climate change and thriving in their sustainable development and service delivery quest. The reviewed literature for this study showed that the institutions at a local level are struggling to adapt to climate change due to several reasons, such as lack of capacity and poor prioritization of climate change adaptation. The observations of the researcher confirmed the limited levels of integration of climate change adaptation within development plans and strategies in the study area, which is Buffalo City Metropolitan Municipality.

The structural setup of national institutional and policy framework limits the extent of involvement of local government authorities in development of national climate change adaptation policies. The lack of consultation of local government institutions about their capacity to implement the developed policy highlights the limited involvement of these authorities.

The research finding indicate that although community-based adaptation has been effective to some extent, it is limited to certain regions with specific characteristics, and is not expandable to other areas with different features. This shortcoming of CBA is an issue as climate change affects all communities, thus an adaptation solution need to have a far better reach and be implementable in other regions. The adaptation method that is believed to have a far better reach and can be implemented in other different regions is the institutional adaptation to climate change. However, there are issues about this

technique. Research findings illustrate that there are several issues that limit the integration of climate change adaptation into the development plans and strategies of local government institutions, for example, lack of capacity and poor prioritisation of climate change issues.

The institutional framework of a country is a key enabler for climate change adaptation. In the case of South Africa, institutional and policy framework create an enabling environment for adaptation to climate change. Policies, plans and strategies have been developed, implemented and updated in recent past. There is commitment, at least on paper, of integrating climate change adaptation into policy and development framework of government institutions. However, the reality on the ground is different, as most institutions have not transformed to climate change savvy organizations due to challenges such as lack of capacity. In essence, these institutions are not adequately adjusting to the changing climate conditions.

The research uncovered that climate change adaptation is an expensive exercise, and it is competing with other institutional objectives for resources at local government level. The research findings also show that climate change is regarded as one of the main threats to sustainable development by the government of the Republic of South Africa; however, the integration of climate change adaptation within development plans and strategies is limited.

Furthermore, coordination between government institutions for climate change adaptation exists but is not satisfactory. The findings of this research show that although climate change is a sectoral cross-cutting issue, there are several obstacles that affect the collaboration of institutions. The obstacles uncovered in this research are as follows, the structure of the South African institutional and policy framework, fragmented policies, the different perceptions about the urgency to address climate change amongst government authorities and the need for each institution to ensure that climate change adaptation does not override the main institutional mandate. Another finding highlighted that the lack of collaboration between institutions exists during the development of climate change related policies; institutions responsible for developing policies do not adequately consider the capacity of the authorities responsible for implementation.

It can be concluded that climate change adaptation in South Africa leaves much to be desired. The study area in this research clearly illustrates many of the underlying issues that hinder the achievement of adequate adaptation. Uncertainty and lack of information about the timing and magnitude of climate change impacts results in inadequate climate change responses at local government institutions. Government institutions at local level lack the capacity to implement well-developed policy and, that result in poor prioritisation of climate change adaptation. Institutional fragmentation is an obstacle to a coordinated and holistic climate change adaptation.

6.3. Recommendations

Based on the discussions and findings above, the institutional framework for climate change adaptation has a generally functional status, however, there is a need to improve this, especially in light of frequent climate change related disasters in South Africa lately. Due to lack of capacity and poor prioritisation of climate change related issues, there is a need for the government to find a way to finance climate change related responses. Literature review shows that climate change is an issue that cuts across many communities, therefore, a coordinated venture that combines the adaptation of community based projects (CBA) business industry and government institutions (institutional) is recommended. This venture will ensure that all adaptation methods are linked to central government, including the CBA, and also this venture will ensure that these different adaptation techniques cover each other's weaknesses.

Local government institutions should look at integration of climate change adaptation within development plans as an exercise that will assist the institution to achieve its main mandate in a sustainable manner, and not an exercise that is competing with the mandate of the institution for resources. Moreover, the South African government should ensure that all its institutions have the same perspective about the urgency to address climate change, and also improve the alignment of policies in order to eliminate fragmentation as that will improve the coordination between the authorities.

The lack of units, within government institutions, that are dedicated to climate change was an unexpected finding, as South African government identified climate change as one of the main threats to one of the major objectives of the country, sustainable development. Therefore, it was anticipated that the government was attending

accordingly to any threat to sustainable development, including climate change, but the study findings indicate otherwise. It is recommended that relevant government institutions establish units within, that will be devoted to climate change related issues. In the case of BCMM, a recommendation would be to ensure that it increases its capacity and better prioritise climate change adaptation in order to successfully adjust to the changing climatic conditions. Due to the history of the country, the South African government is understandably under pressure to provide service delivery to its citizens; however, it is recommended that government institutions, especially at the local level, prioritise adequate integration of climate change adaptation within development plans and strategies. The failure to do so may threaten the very same mandate the municipality is trying to achieve, service delivery.

Recommendations for further studies would be to explore a way to measure the institutional capacity for climate change adaptation. The current study was too focused on exploring the institutional and policy structures for climate change adaptation whilst a look at measuring the institutional capacity has a potential to improve the understanding of the factors affecting the capacity to adapt to climate change. Instead of only stating "lack of", the study can show exactly how much capacity is needed for adequate adaptation by an institution. The proposed study results may further assist policy developers to understand which government institutions responsible for implementation will need to improve their capacity to successfully implement the developed policy.

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APPENDIX A

Interview Guide Questions for Department of Agriculture Forestry and Fisheries (National)

1. Will you be able to share the mandate of this government institution?
2. Are you in a position to share your function within this organization?
3. May you please share for long have you been in this position?
4. May you kindly explain which legislation guide the mandate of institution?
5. Within these legislations, may you kindly share what policies are important that guide the mandate?
6. May you please share if DAFF has a climate change adaptation policy/ strategy/ plan?
7. Please share when was the policy developed, and when was it active?
8. May you kindly describe the process of developing the climate change policy?
9. May you please share which other government policies/ strategies/ plans were considered during the development of the climate change policy?
10. If yes, may you briefly explain why it was important to consider these particular policies/ strategies/ plans?
11. May you please share which unit is responsible for implementation of this policy, and please briefly explain the implementation process/ plan?
12. Kindly describe the achievements, challenges and lessons of the implementation process?
13. If it is implemented at provincial level, may you kindly share if the provincial institutional capacity was considered during the development of the policy?
14. May you kindly share in what extent/ ways did the provincial DAFF contribute to the development of this climate change policy?

15. May you kindly share, when last was this policy reviewed or how often is/ will it be reviewed?
16. Do you have any other source of information that you could suggest for the benefit of this academic research?

Is there any other information or opinion that you will like to add/ share for the improvement of this academic research?

APPENDIX B

Interview Guide Questions for Department of Agriculture, Forestry and Fisheries (Provincial)

1. Will you be able to share the mandate of this government institution?
2. Are you in a position to share your function within this organization?
3. May you please share for long have you been in this position?
4. May you kindly explain which legislation guide the mandate of institution?
5. Within these legislations, may you kindly share what policies are important that guide the mandate?
6. May you please share if DAFF (Provincial) has a climate change policy? **If not, answer 6.1 – 8, if no, jump to question 9 – 15.**
    - 6.1. Please share when was the policy developed, and when was it active?
    - 6.2. May you kindly describe the process of developing the climate change policy
    - 6.3. May you please share which other government policies were considered during the development of the climate change policy?
    - 6.4. May you please share which unit is responsible for implementation of this policy, and please briefly explain the implementation process/ plan?
    - 6.5. Kindly describe the achievements, challenges and lessons of the implementation process?
    - 6.6. Kindly share, when last was this policy reviewed or how often is/will it be reviewed?
7. Do you have any other source of information that you could suggest for the benefit of this academic research?

8. Is there any other information that you will like to add for the improvement of this academic research?

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9. May you please share if this institution adhere to DAFF or any other institution's national climate change policy?
10. Kindly share in what extent did this institution contribute to the national climate change policy?
11. May you please share which unit is responsible for implementation of this policy, and please briefly explain the implementation process/ plan?
12. Kindly describe the achievements, challenges and lessons of the implementation process?
13. Will you be able to share if the institution has sufficient capacity to adequately comply with DAFF national climate change policy?
14. Do you have any other source of information that you could suggest for the benefit of this academic research?
15. Is there any other information that you will like to add for the improvement of this academic research?

APPENDIX C

Interview Guide Questions for Department of Department of Water and Sanitation (National)

1. Will you be able to share the mandate of this government institution?
2. Are you in a position to share your function within this organization?
3. May you please share for long have you been in this position?
4. May you kindly explain which legislation guide the mandate of institution?
5. Within these legislations, may you kindly share what policies are important that guide the mandate?
6. May you please share if DWS has a climate change adaptation policy/ strategy/ plan?
7. Please share when was the policy developed, and when was it active?
8. May you kindly describe the process of developing the climate change policy?
9. May you please share which other government policies/ strategies/ plans were considered during the development of the climate change policy?
10. If yes, may you briefly explain why it was important to consider these particular policies/ strategies/ plans?
11. May you please share which unit is responsible for implementation of this policy, and please briefly explain the implementation process/ plan?
12. Kindly describe the achievements, challenges and lessons of the implementation process?
13. If it is implemented at provincial level, may you kindly share if the provincial institutional capacity was considered during the development of the policy?
14. May you kindly share in what extent/ ways did the provincial DWS contribute to the development of this climate change policy?

15. May you kindly share, when last was this policy reviewed or how often is/ will it be reviewed?
16. Do you have any other source of information that you could suggest for the benefit of this academic research?
17. Is there any other information or opinion that you will like to add/ share for the improvement of this academic research?

APPENDIX D

Interview Guide Questions for Department of Water and Sanitation (Provincial)

1. Will you be able to share the mandate of this government institution?
2. Are you in a position to share your function within this organization?
3. May you please share for long have you been in this position?
4. May you kindly explain which legislation guide the mandate of institution?
5. Within these legislations, may you kindly share what policies are important that guide the mandate?
6. May you please share if DWS (Provincial) has a climate change policy? **If not, answer 6.1 – 8, if no, jump to question 9 – 15.**
    - 6.1. Please share when was the policy developed, and when was it active?
    - 6.2. May you kindly describe the process of developing the climate change policy
    - 6.3. May you please share which other government policies were considered during the development of the climate change policy?
    - 6.4. May you please share which unit is responsible for implementation of this policy, and please briefly explain the implementation process/ plan?
    - 6.5. Kindly describe the achievements, challenges and lessons of the implementation process?
    - 6.6. Kindly share, when last was this policy reviewed or how often is/will it be reviewed?
7. Do you have any other source of information that you could suggest for the benefit of this academic research?

8. Is there any other information that you will like to add for the improvement of this academic research?

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9. May you please share if this institution adhere to DWS or any other institution's national climate change policy?
10. Kindly share in what extent did this institution contribute to the national climate change policy?
11. May you please share which unit is responsible for implementation of this policy, and please briefly explain the implementation process/ plan?
12. Kindly describe the achievements, challenges and lessons of the implementation process?
13. Will you be able to share if the institution has sufficient capacity to adequately comply with DWS national climate change policy?
14. Do you have any other source of information that you could suggest for the benefit of this academic research?
15. Is there any other information that you will like to add for the improvement of this academic research?

APPENDIX E

Interview Guide Questions for Department of Buffalo City Metropolitan Municipality (BCMM)

1. Will you be able to share the mandate of this government institution?
2. Are you in a position to share your function within this organization?
3. May you please share for long have you been in this position?
4. May you kindly explain which legislation guide the mandate of institution?
5. Within these legislations, may you kindly share what policies are important that guide the mandate?
6. Will you be able to share if the institution has sufficient capacity to adequately comply with national climate change policy?
7. May you kindly state what climate change policies exist in municipal level, and how are these aligned to national climate change policies/ strategies/ plans?
8. May you kindly share in what extent/ ways did the BCMM contribute to the development of this climate change policy?
9. May you please share if BCMM has a climate change adaptation policy/ strategy/ plan?
10. Please share when was the policy developed, and when was it active?
11. May you kindly describe the process of developing the climate change policy?
12. May you please share which other government policies/ strategies/ plans were considered during the development of the climate change policy?
13. If yes, may you briefly explain why it was important to consider these particular policies/ strategies/ plans?

14. Please briefly explain how complex is the process of considering all relevant national policies/ strategies/ plans when developing BCMM climate change policy/ strategy/ plan?
15. May you please share which stakeholders were consulted during the development of climate change adaptation policy/ strategy/ plan? if there was consultation, why was it important to consult these stakeholders
16. May you please share which unit is responsible for implementation of this policy, and please briefly explain the implementation process/ plan?
17. Kindly describe the achievements, challenges and lessons of the implementation process?
18. May you kindly share, when last was this policy reviewed or how often is/ will it be reviewed?
19. Do you have any other source of information that you could suggest for the benefit of this academic research?
20. Is there any other information or opinion that you will like to add/ share for the improvement of this academic research?